CONDENSAMAX R9/R18 ATMOSPHERIC GAS FIRED CONDENSING BOILERS

INSTALLATION, OPERATION & MAINTENANCE DOCUMENTATION

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BRITISH GAS APPROVAL

British Gas Approval for the Condensamax range detailed in these instructions, refer to the use of the boiler within open systems only.

PRINCIPLES OF OPERATION

The Stokvis Condensamax boiler incorporates a Landis & Gyr, temperature control unit type RWF 31 on all models.

On the series R9 model types 34-77 a L&G LFL 1.148 flame safeguard control is used. On the R9 and R10 model types 90-290 a Landis & Gyr, type LFL flame safeguard control is also used.

Other components are listed on drawings GB-0-34-35-36-37-38 pages 82-84.

These drawings also indicate the schematic electrical circuit, and the components of the gas train.

Note : RWF 31 & L&G 1.148 are internally fused

1.1. TEMPERATURE CONTROL AND SERVOMOTOR OPERATION

The flow temperature from the boiler is detected and the signal compared with a pre-set value in the control box.

The difference between these two signals is fed to a servomotor which, depending upon the polarity of the signal drives the butterfly valve in the gas train open or closed. The adjustment of the required flow temperature is carried out by removing the cover of the control box (15 fig.1 page 7 & 11 or 12 page 8). Details of the adjustment are given in the Installation Instructions.

1.2. AUTOMATIC AIR DAMPER

The servomotor referred to above, also operates an air damper, situated below the boiler at the same time as varying the gas flow. This damper reduces excess air passing through the boiler and therefore improves the efficiency, particularly at low loads.

1.3. SAFETY DEVICES

All the boilers are fitted, as standard, with an overheat cut-off device, a water flow switch, spark ignition with flame ionisation safeguard and a temperature/pressure gauge. The appliance in its standard form is equally suitable for sealed or open systems.

Should the overheat cut-off or water flow switch operate, or flame failure occur, the boiler will go to lock out and requires manual re-setting by operating the re-set button on the overheat cut off device and flame safeguard control. The boiler is provided with manipulation connections suitable for a number of different control schemes, cascade, sequential, lag lead etc. details of which are available on request.

1.4. PUMP OVERRUN

It is important that boiler pumps and system pumps are kept running for 5 & 10 minutes after boilers are switched off.

2.1. GENERAL

The Condensamax is a condensing boiler, which maintains the modulating qualities of the Econoflame boiler. The Condensamax series R9 is not fitted with a flue fan and with a correctly designed flue, will operate under natural draught. The Condensamax R18 has a built in flue gas extraction fan. The condensating unit has replaced the draught diverter of the Econoflame and is, therefore, an integral part of the boiler.

2.2. CONDENSATION PRINCIPLE

As a result of considerable height between the burner tray and heat exchanger in the combustion chamber of the Condensamax a strong updraught is created by the combustion of the gas.

The force of the updraught is sufficient to overcome the resistance of the secondary heat exchanger, with the R9 Condensamax this is placed horizontally above the primary heat exchanger. With the R18 Condensamax the secondary heat exchanger is placed vertically above the primary heat exchanger.

Condensation occurs as a result of the cooling of the flue gases by the secondary heat exchanger.

The specific Condensamax R9 combustion characteristics make it unnecessary to utilise a flue gas extraction fan, while the R18 flue gasses are removed with a built in extraction fan without influencing the combustion.

Condensation can only be obtained at a return water temperatures below 57 Deg C. In this range the latent heat energy of the combustion gasss can be regained and utilised as direct heat energy through condensation.

The Condensamax is ideal for applications in low temperature systems or with outdoor temperature compensated systems.

The boiler also has the ability to operate with a split system. The primary heat exchanger operating in medium temperature circuits (60-80 Deg C) while the secondary heat exchanger operates separately in a low temperature circuit.

R9 SERIES

PHYSICAL CHARACTERISTICS

TYPE	HEIGHT		WIDTH		DEPTH		CONNECTIONS. WATER Prim'y / Sec'y	CONNECTIONS. GAS	FLUE SIZE NOMINAL		WEIGHT	
	MM	IN	MM	IN	MM	IN			MM	IN	KG	LBS
34	1606	63	1289	50.3	1003	40	65		300	12	277	611
41	1606	63	1399	54.6	1003	40	PN	R 1	300	12	297	655
48	1616	64	1511	58.9	1003	40	16/2		350	14	320	705
56	1616	64	1637	63.8	1003	40	65		350	14	347	765
66	1616	64	1796	70	1003	40	PN		400	16	375	827
77	1636	64.5	1991	76.8	1003	40	16/2	R 1½	450	18	413	910
90	1636	64.5	2177	84.9	1003	40			450	18	451	994
105	1646	65	2415	94.2	1003	40			500	20	495	1090

R18 SERIES

132	1965	77	1611	62.8	1310	46	80	50	450	18	689	1519
154	1965	77	1786	69.7	1310	46	PN	PN	450	18	741	1634
180	1965	77	1992	77.7	1310	46	16/2	6/2	450	18	795	1753
210	1965	77	2230	87.0	1310	46	65		450	18	852	1879
244	1965	77	2500	97.5	1310	46	PN	65 PN	450	18	914	2015
280	1965	77	2756	108.6	1310	46	6/2	6/2	450	18	981	2163

Flanges to BS 4504

R9 - Injectors are 1.85 mm
Main burner pressure full output 7.3 mbar. Pilot pressure 3.0 mbar (2.76kW)

R18 - Injectors are 1.85mm
Main burner pressure full output 8.3 mbar. Pilot pressure 3.0 mbar (2.76 kW)

R9 SERIES

PERFORMANCE CHARACTERISTICS

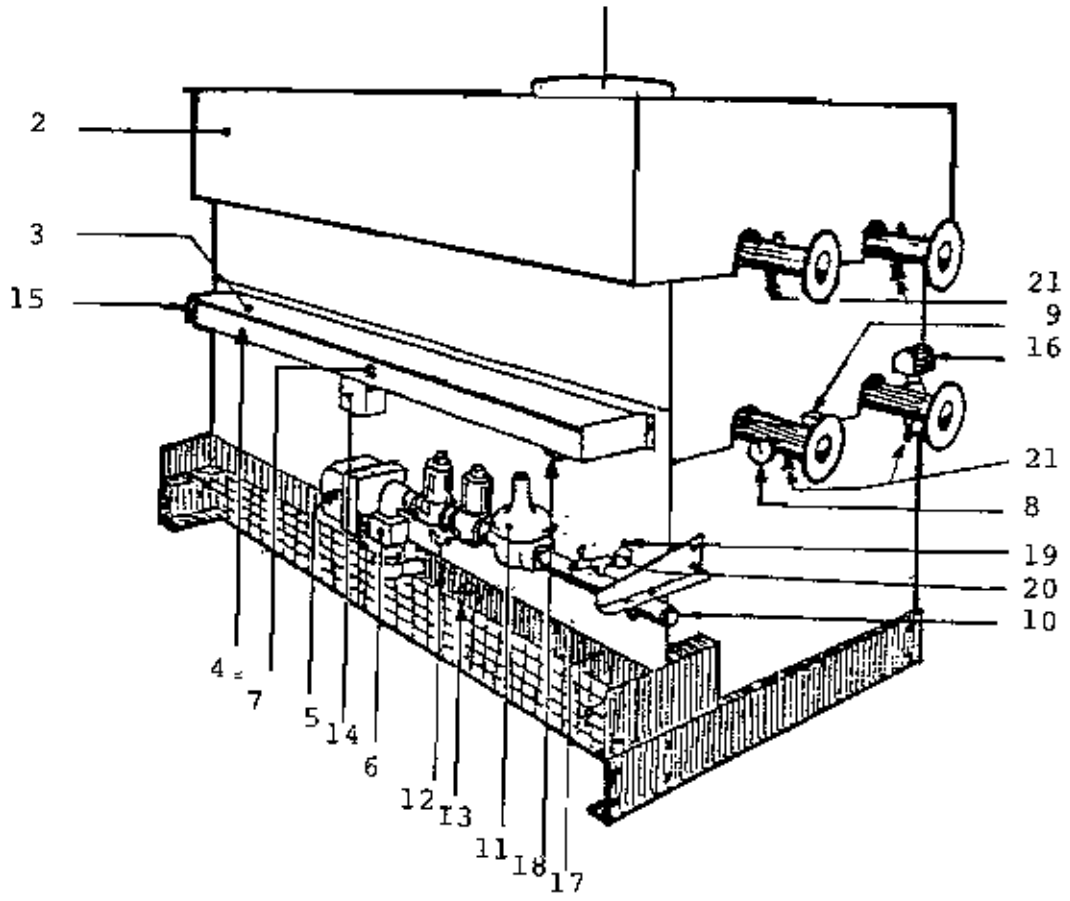
	HEAT INPUT		HEAT OUTPUT (return 40°C)		HEAT OUTPUT (return 60°C)		GAS CONSUMPTION NATURAL GAS		WATER CONTENT	
TYPE	kW	Btu/h/10^3	kW	BTU/h/10^3	kW	BTU/h/10^3	m^3/h	Ft^3/h	Litres	Gallons
34	128.5	438.4	112.3	383.2	106.8	364.4	12	424	13.7	3.0
41	154.9	528.5	135.4	462.0	128.7	439.1	14.5	511	14.5	3.2
48	181.5	619.3	158.6	541.1	150.8	514.5	16.9	598	15.3	3.4
56	211.9	723.0	185.2	631.9	176.1	600.9	19.7	698	16.3	3.6
66	250.1	853.3	218.6	745.9	207.8	709.0	23.3	824	17.5	3.8
77	291.6	994.9	254.9	869.7	242.3	826.7	27.2	961	18.8	4.1
90	340.4	1161.4	297.5	1015.1	282.9	965.3	31.8	1122	20.3	4.5
105	397.3	1355.6	347.2	1184.6	330.2	1126.6	37.1	1310	22.1	4.9

R18 SERIES

132	533	1818.7	478.5	1632.8	455.5	1554.3	49.7	1757	46	10.1
154	621.8	2121.7	558.2	1904.9	531.3	1813.2	58.0	2049	49	10.8
180	726	2477.3	651.8	2224.1	620.4	2117.1	67.7	2394	52	11.4
210	847	2890.2	760.4	2594.8	723.8	2469.9	79.0	2792	55	12.1
244	984.9	3360.7	884.2	3017.3	841.6	2872.1	91.9	3247	59	13
280	1129.3	3853.5	1013.8	3459.7	965.0	3293.2	105.4	3723	64	14.1

2.3: STANDARD LAYOUT FOR THE CONDENSANAX SERIES R9

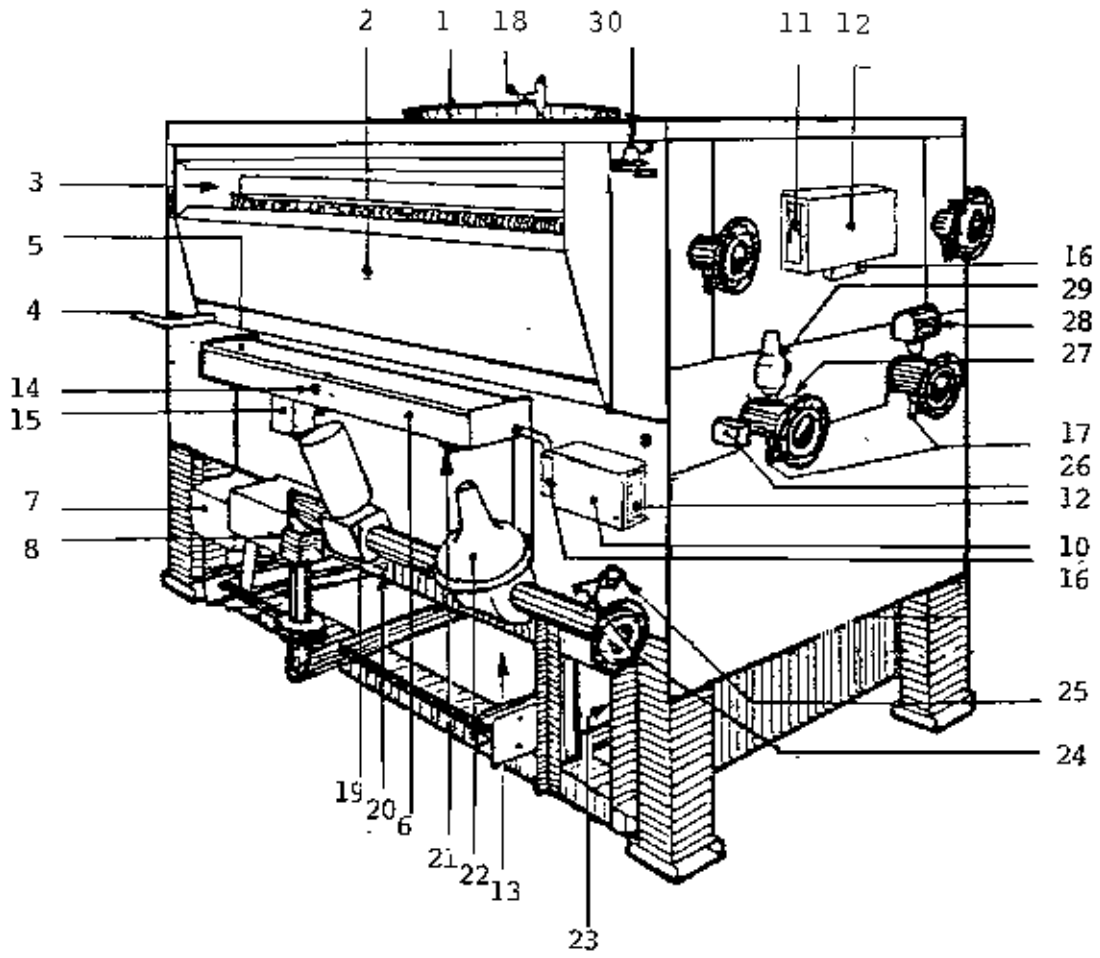
Fig 1



1. Flue connection
2. Draught diverter
3. Cover for electrical connection box
4. Electrical connection box
5. Servomotor
6. Modulating gas valve
7. On/off switch
8. Pressure gauge/thermometer
9. Flow temperature gauge/ thermometer
10. Gas connection
11. Gas governor
12. Main gas valves
13. Burner pressure test point
14. Flame safeguard control box
15. Temperature control unit
16. Water flow switch
17. Pilot pressure test point
18. Solenoid valve for pilot burner
21. Drain cocks

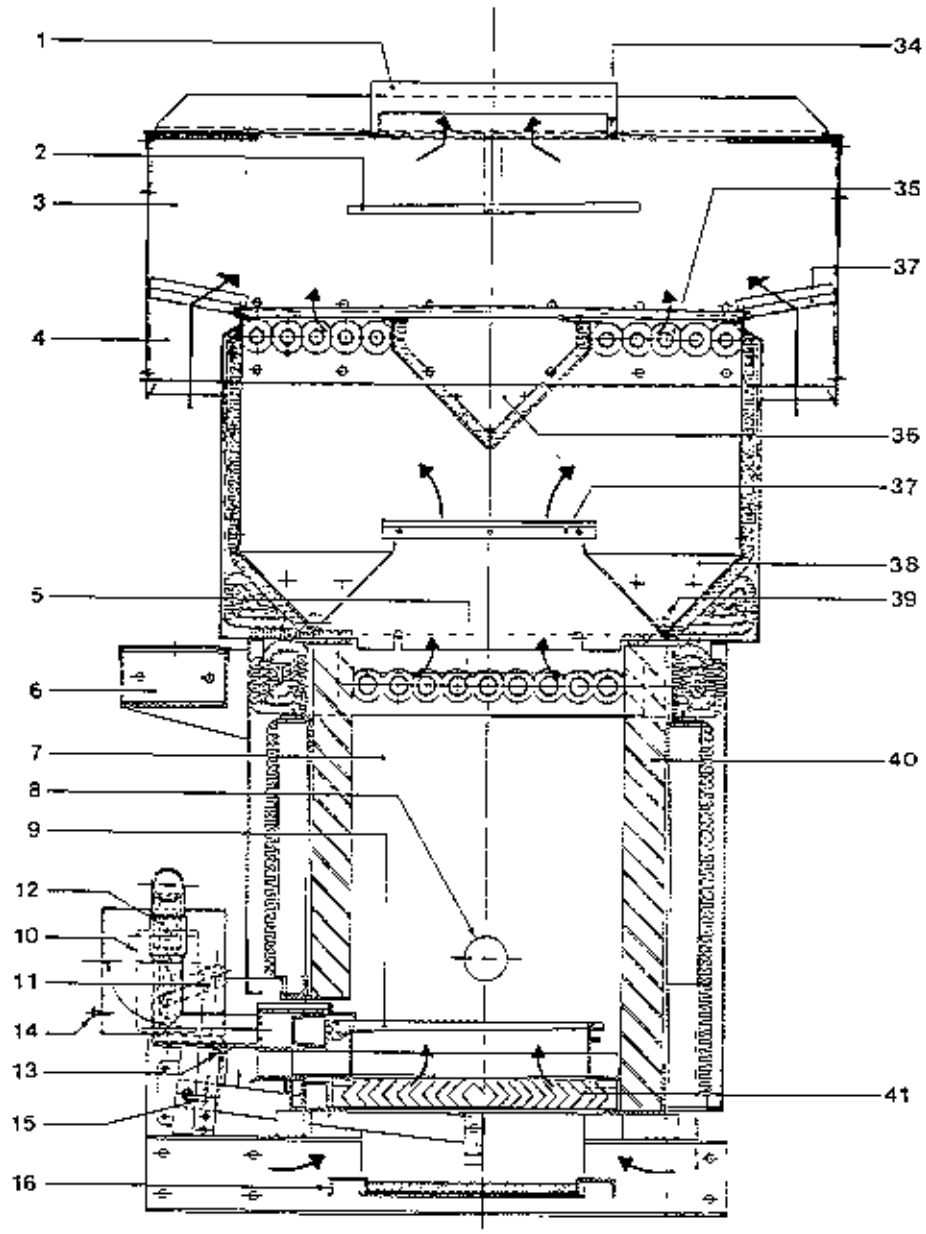
2.4. STANDARD LAYOUT FOR CONDENSAMAX R18

Fig 2



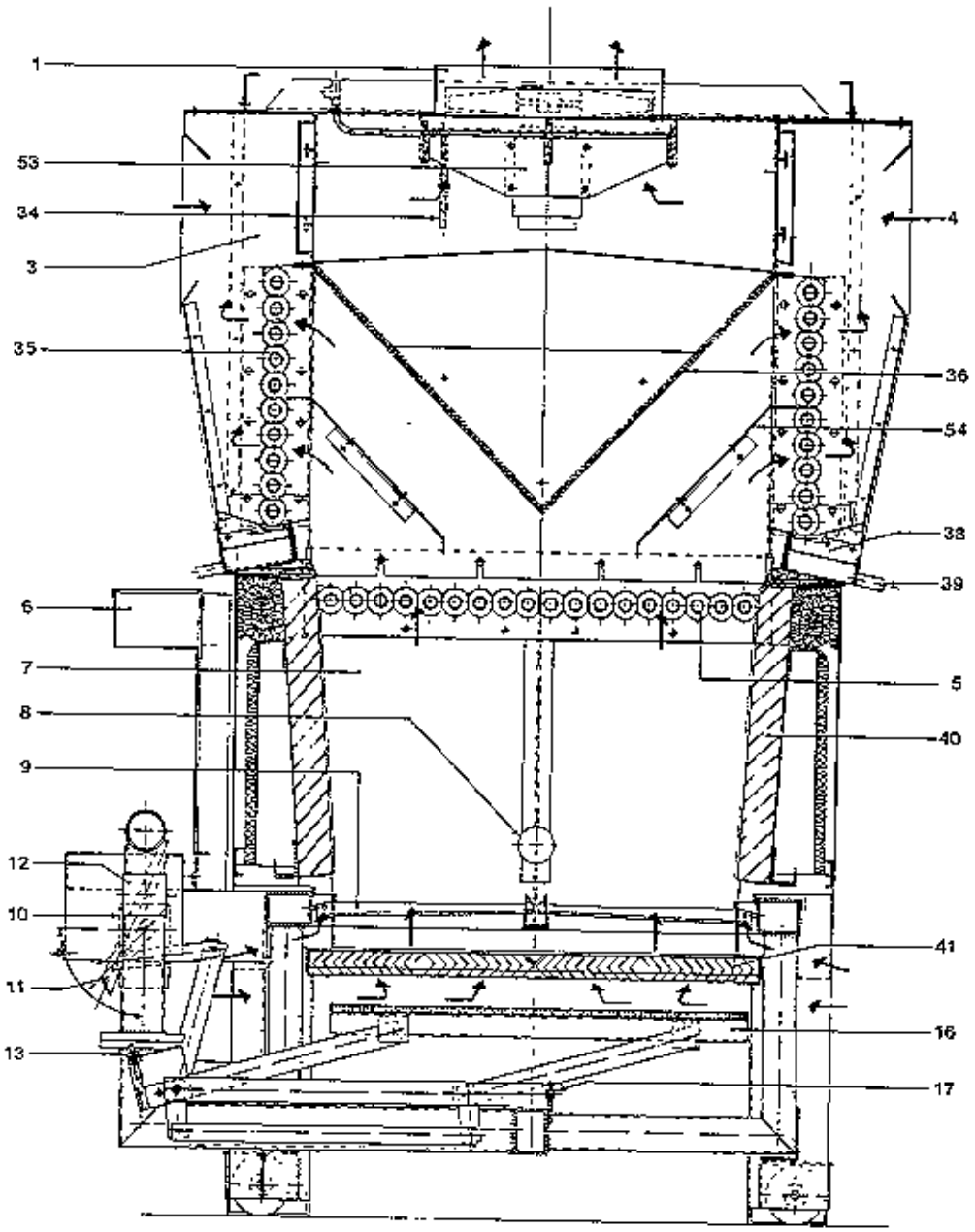
1. Flue connection and fan
2. Draught diverter
3. Air intake
4. Condensate discharge pipe
5. Cover for electrical wiring tray
6. Electrical wiring tray
7. Servomotor
8. Modulating gas valve
9. Electrical connection box 132-154
10. Electrical connection box 180-280
11. Temperature control unit 132-154
12. Temperature control unit 180-280
13. Modulating air damper
14. On/off switch
15. Flame safeguard control box
16. Electrical connection
17. Drain cocks
18. Pressure test point for draught
19. Main gas valve
20. Main burner pressure test point
21. Pilot solenoid valve
22. Gas governor
23. Pilot pressure test point
24. Pilot gas cock
25. Pilot governor
26. Flow temperature sensor
27. Temperature/altitude gauge
28. Flow switch
29. Safety valve
30. Pressure differential switch

Fig 3 **Cross Section through Condensamax R9 Series**



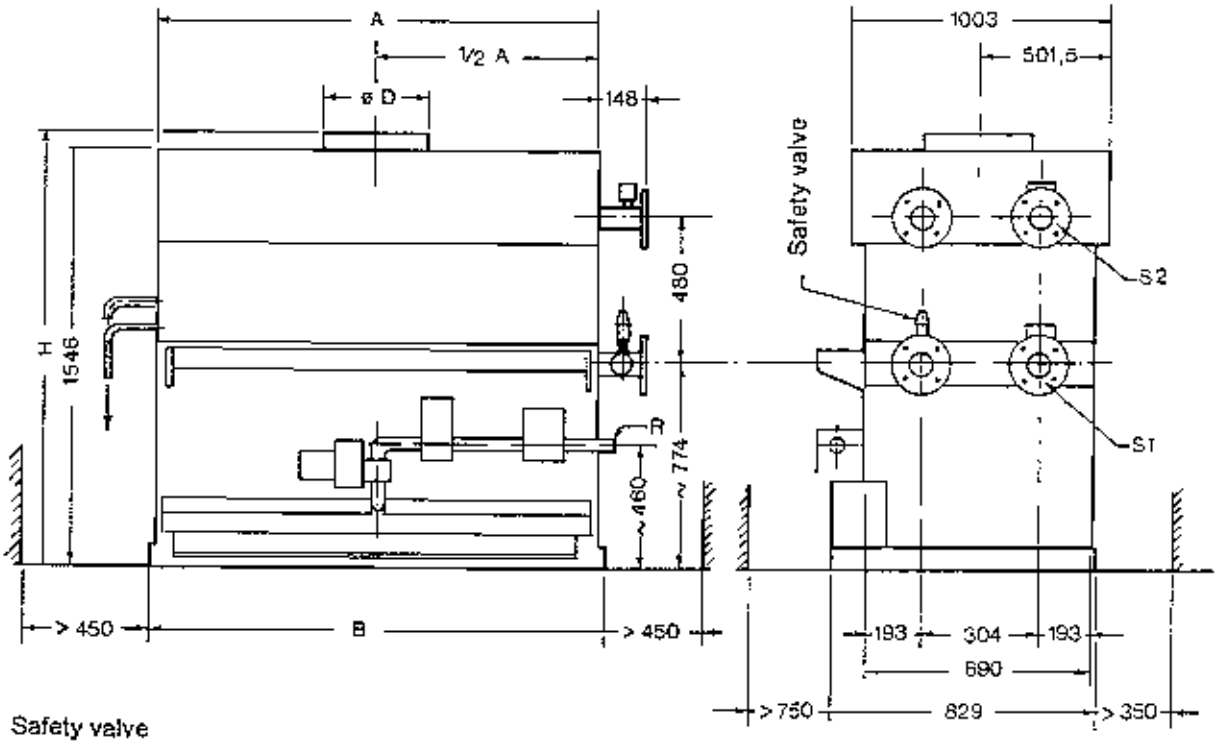
1. Flue Connection
2. Down Draught Diverter
3 Draught Diverter
4. Air Intake
5. Primary Heat Exchanger
6. Electrical connection box
7. Combustion chamber
8. Inspection port
9. Burner bar
10. Servomotor
11. Linkage assembly
12. Modulating Gas Valve
13. Air damper adjustment screw
14. Servomotor Stop Screw
15. Stop Screw
16. Modulating air damper
34. Condensate Drain
35. Secondary Heat Exchanger
36. Flue gas diverter
37. Flue gas deflector
38. Condensate trap
39. Condensate drain
40. Refractory insulation panel
41. Air diffuser

Fig 4 Cross Section through Condensamax R18 Series



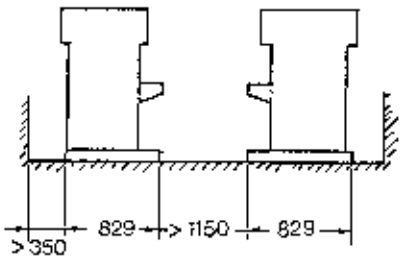
1. Flue Connection
3. Draught Diverter
4. Air Intake
5. Primary Heat Exchanger
6. Electrical connection box
7. Combustion chamber
8. Inspection port
9. Burner bar
10. Servomotor
11. Linkage assembly
12. Modulating Gas Valve
13. Air damper adjustment screw
15. Air damper locking screw
16. Modulating air damper
17. Air damper level adjuster
34. Condensate Drain
35. Secondary Heat Exchanger
36. Flue gas diverter
38. Condensate collector
39. Condensate Drain
40. Refractory insulation panel
41. Air diffuser
53. Exhaust fan
54. Flue gas diverter

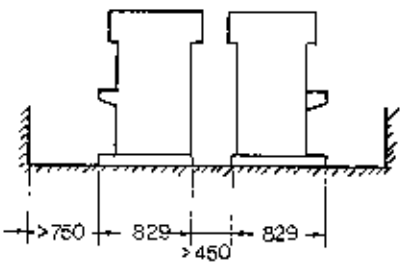
FIG 5 DIMENSIONS AND MINIMUM CLEARANCES R9

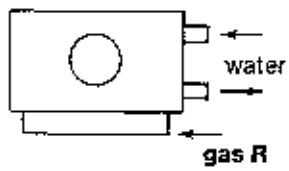
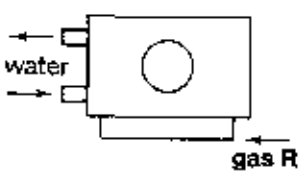


Safety valve

Type 34:	1/2"
Type 41-66:	3/4"
Type 77-105:	1"

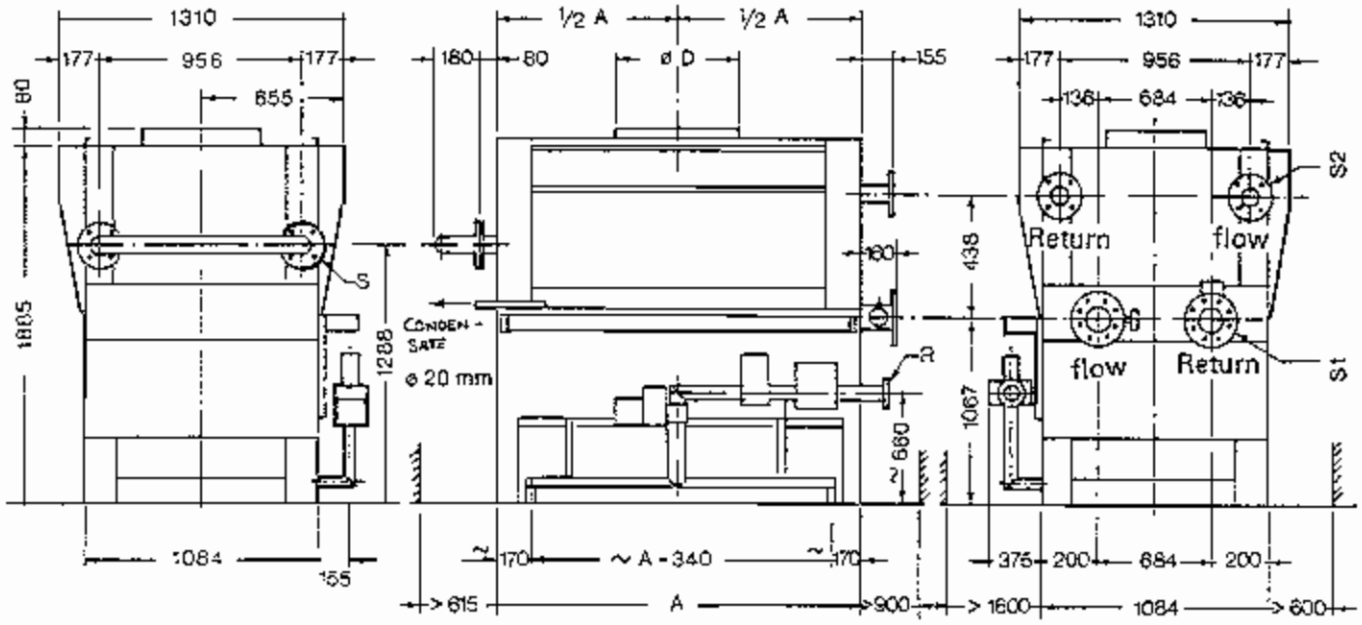




STANDARD	ALTERNATIVE
plan 	plan 

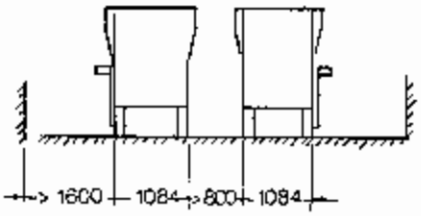
Type	A	1/2 A	B	ø D	H	R BSP	S1+S2	kg
34	957	478,5	1031	300	1606	1"	DN 65 PN 16 DIN 2633	277
41	1067	533,5	1141	300	1606			297
46	1179	589,5	1253	350	1616			320
56	1305	652,5	1379	350	1616	1 1/2"		347
66	1464	732	1538	400	1625			375
77	1639	819,5	1713	450	1636			413
90	1845	922,5	1919	450	1636			451
105	2083	1041,5	2157	500	1646			495

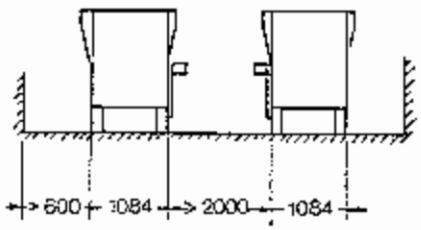
6 DIMENSIONS AND MINIMUM CLEARANCES R18

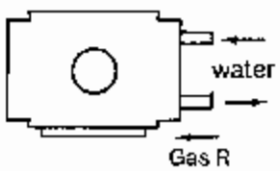
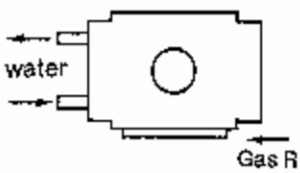


Safety valve

Type 132	: 1"
Type 154-210	: 1¼"
Type 244-280	: 1½"

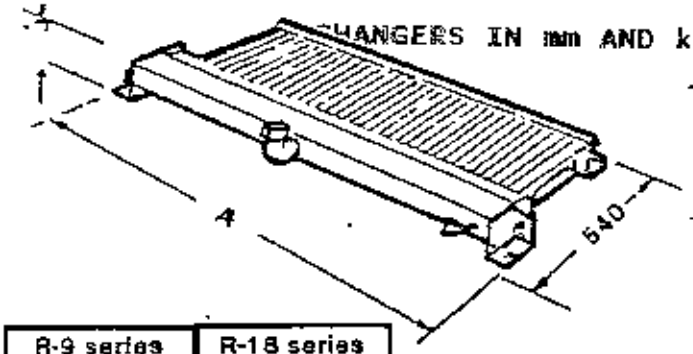




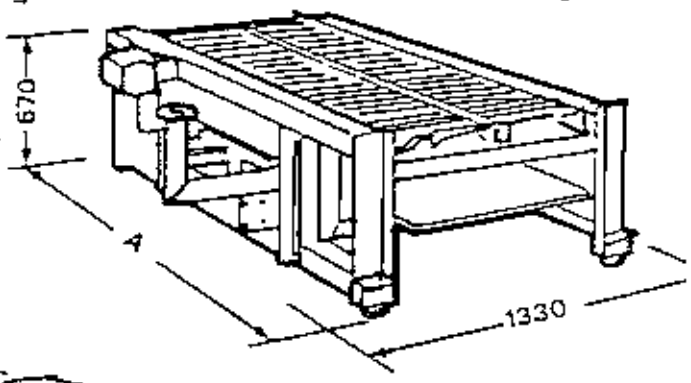
STANDARD	ALTERNATIVE
	

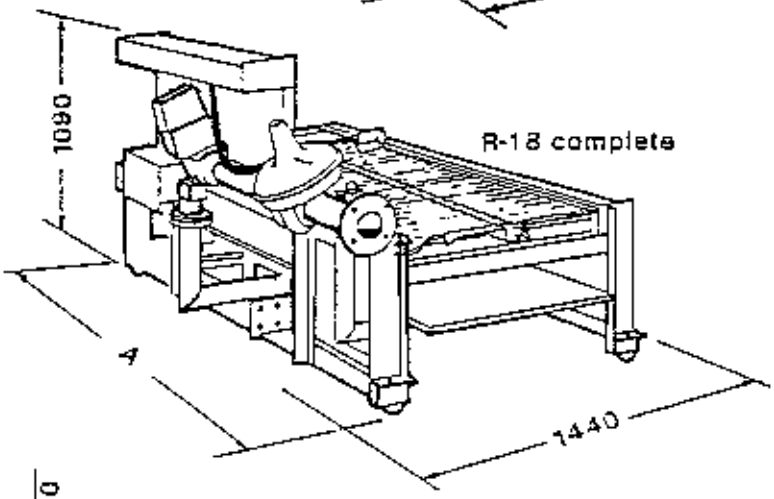
Type	A	½ A	ø D	S1 Flansch	S2 Flansch	R Flansch	Gewicht kg
132	1461	730,5	450	DN 80 PN 16 DIN 2633	DN 65 PN 16 DIN 2633	DN 50 PN 16 DIN 2631	689
154	1636	818					741
180	1842	921					795
210	2080	1040					852
244	2350	1175				DN 65 PN 16 DIN 2631	914
280	2636	1318					981

TABLE 3 DIMENSIONS AND WEIGHTS OF BURNER TRAYS AND HEAT EXCHANGERS IN mm AND kg

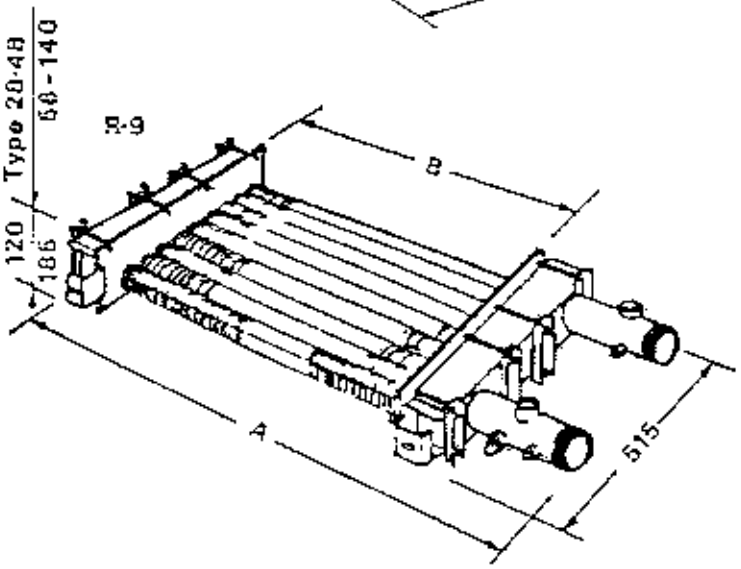


R-18 not included gas train

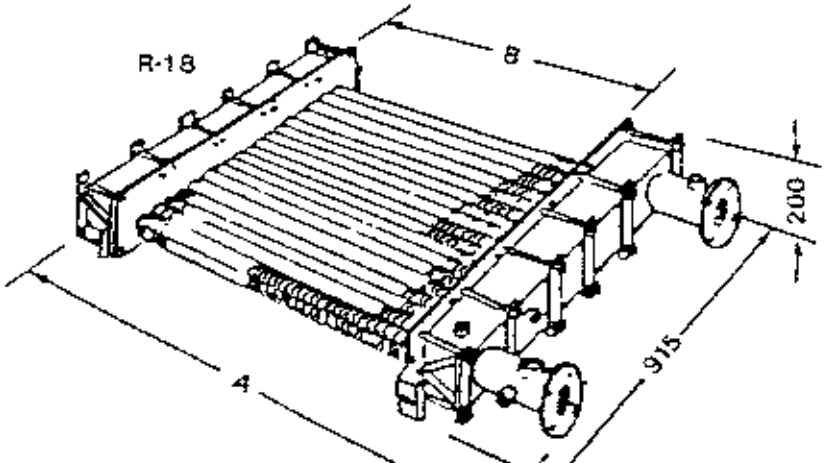




R-9 series		R-18 series	
Type	A	Type	A.
28	535	132	1.244
34	630	154	1.420
41	740	180	1.625
48	851	210	1.863
56	978	244	2.133
66	1.137	280	2.420
77	1.312		
90	1.518		
105	1.756		
122	2.026		
140	2.312		



R-9 series			
Type	A	B	kg.
28	965	560	37
34	1.040	656	42
41	1.150	766	47
48	1.295	878	52
56	1.410	1.004	66
66	1.570	1.163	71
77	1.745	1.338	76
90	1 950	1.544	84
105	2.190	1.782	94
122	2.460	2.052	104
140	2.745	2 338	114



R-18 series			
Type	A	B	kg.
132	1.610	1.163	160
154	1 785	1 338	172
180	1 990	1.544	186
210	2.230	1 782	204
244	2.500	2.052	224
280	2.785	2.338	244

2.11. BOILER CONSTRUCTION

2.12. Primary Heat Exchanger

To ensure an even distribution of the heat from the products of combustion, the copper fin tubes are assembled side by side in a flat configuration. This is assembled in two versions, see figs.7 & 8.

The water enters the boiler by the return connection to the heat exchanger, through five finned copper fin tubes in parallel in the R9 series and through ten fin tubes in the R18 series. It then passes through a header and returns via four copper fin tubes in the R9 series and eight in the R18 series to the system through the flow connector.

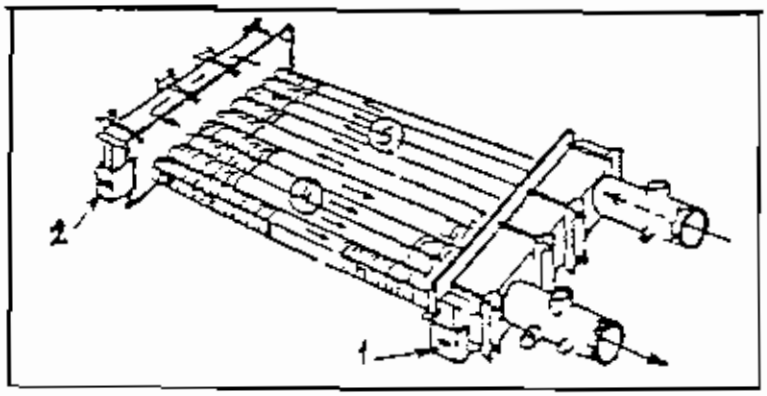


Fig. 7 Return flow heat exchanger R9 series

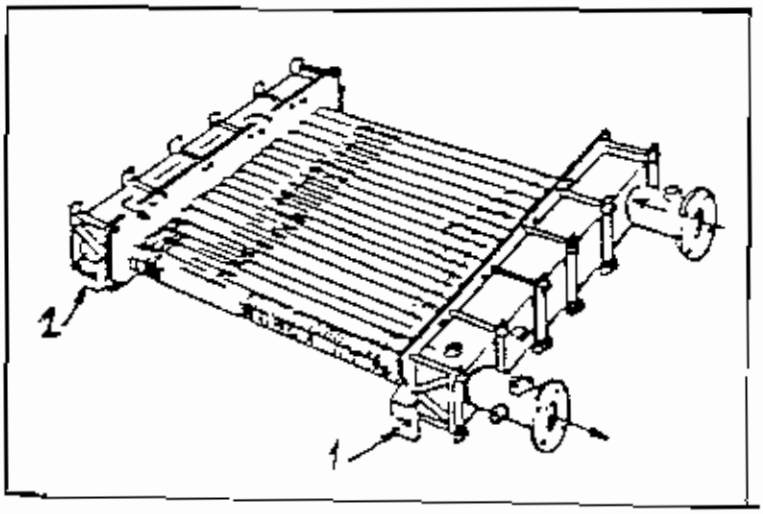


Fig 8 Return flow heat exchanger R18 series

2.13. SECONDARY HEAT EXCHANGER

The secondary heat exchangers are constructed our of extruded aluminium fin tubes. To obtain a maximum efficiency without disturbing the updraught of combustion gases in the compiler, the aluminium fin tubes are assemblec side by side in a flat configuration see figs. 9&10.

The R9 secondary heat exchanger has ten fin tubes grouped in two sections of five placed horizontally above the primary heat exchanger and connected by means of a 2 pass water system to the heater.

The R18 secondary heat exchanger has twenty fin tubes grouped in two sections of ten placed vertically in length with the primary heat exchanger and connected by means of a 2 pass water system to the header.

CROSS SECTION VIEW R9

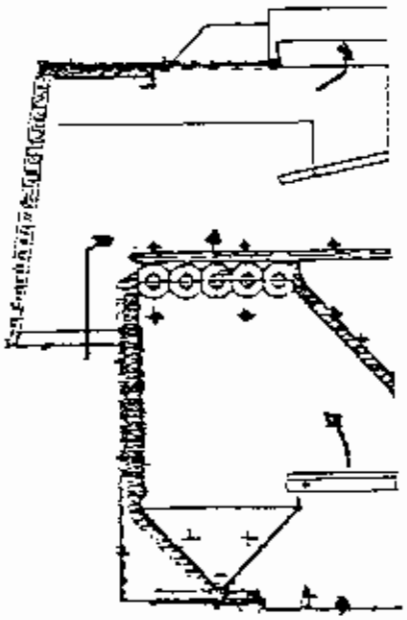


Fig 9 Secondary heat exchanger R9

CROSS SECTION VIEW R18

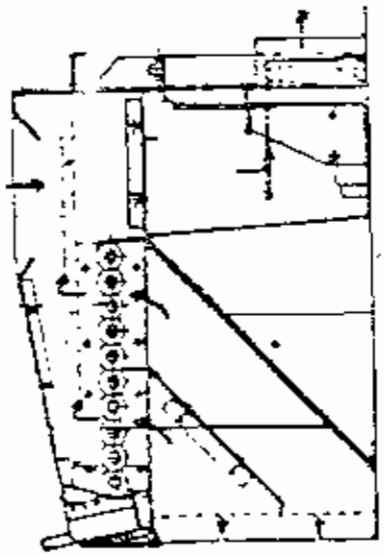


Fig 10 Secondary heat exchanger R18

The interior of the condensating top is made of 3mm aluminium sheet. Two condensate drain pipes are fitted to enable the condensate to be removed.

2.14. BURNER (see fig 3 & 4)

The burner is positioned below the combustion chamber (8) it is built up from a series of burner bars (10). Each bar is fed through its own injector. The number of burner bars fitted is the boiler type number ie R9 77 has 77 burner bars. An air damper (16) is fitted below the burner and is mechanically connected to the gas valve (13).

The primary air for combustion is entrained by the burner injectors but the secondary air is controlled by the modulating damper with a linkage system to the gas butterfly valve, adjusting automatically the gas rate and air ratio to the heat demand.

This results in a extremely high efficiency.

2.15. INSPECTION

An inspection port is provided in the left hand side of the boiler (9) of Fig.3 & 4 and is sealed with a glass spyhole.

2.16. REGULATION (SEE FIG. 3 & 4)

The servomotor (11) drives simultaneously the gas butterfly modulating valve and the modulating air damper. The boiler flow temperature can be arranged to be constant or a function of the outside atmospheric conditions.

2.17. WIRING (SEE FIG 3 & 4)

The electrical control box (7) is fitted to the front of the boiler. This box contains the auxillary relays, the ignition transformer and the solenoid valve for the pilot.

In addition it contains the electrical connection terminal strip (R9 series). The R18 series has a separate electrical connection box (item 9 or 10 Fig. 2)

2.18. WATER FLOW SWITCH (see fig 1 ITEM 10 & fig 10 item 28)

It is essential that a minimum water flow is maintained through the heat exchanger, and to ensure this a water flow switch is fitted so that, in the event of low flow, the boiler will automatically switch off and go to lock out.

2.19. DRAUGHT DIVERTER (*see* fig 3)

The Condensamax is fitted with an integral draught diverter (3) with a socket suitable for metal flue pipes.

The draught diverter is insulated internally to avoid condensation and improve flue pull.

2.20. INTEGRAL CONDENSATING TOP IN WHICH THE DRAUGHT DIVERTER HAS BEEN INCORPORATED

This top consists of two horizontal heat exchangers, two trays to receive condensate water and an integral draught diverter.

2.21. ELECTRICAL AND GAS CONNECTIONS

The gas and electrical connections are shown in the wiring diagrams (available)

2.22. GUARANTEE

Heat exchanger is guaranteed for 3 years. Other items for one year. This guarantee is void unless the installation is carried out in accordance with the manufacturer's instructions and is competently and regularly serviced.

The guarantee period is taken from the date of first firing the boiler or 18 months from date of delivery whichever occurs first.

3. GENERAL INSTALLATION REQUIREMENTS

3.1. INTRODUCTION

The installation of the Condensamax should be carried out by a competent installer such as a registered member of CORGI and should be installed in accordance with any relevant requirements of the Local Gas Region, local authority and the relevant recommendations of the following documents. The installation must also conform to the relevant requirements of the Gas Safety Regulations, Building Regulations, IEE Regulations and the Bye Laws of the local Water Undertaking.

3.2. RELATED DOCUMENTS

British Standard Codes of Practice

CP331 Installation of pipes and meters for town gas part 3. Low pressure installation pipes.

BS6644 Installation of gas fired hot water boilers of rated heat inputs between 60kW to mW (2nd & 3rd family gases)

CP341.300.307 Central Heating by low pressure hot water.

CP342 Centralised hot water supply
Part 1 - Individual dwellings
Part 2 - Buildings other than individual dwellings.

British Gas Publications

Combustion and ventilation air - Guidance notes for boiler installations in excess of 2.000.000 Btu/h (586 kW) output.

R S Stokvis and Sons Ltd are pleased to offer an advisory service on the application and installation of Condensamax boilers and on written request will quote for and provide boiler commissioning.

For any further information you require, please contact

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Telex : 917116
Telefax : 01-941-4136

3.3. LOCATION

The location chosen for the boiler must permit the provision of a satisfactory flue system and an adequate air supply. The location must also provide adequate space for servicing and air circulation around the boiler. These are given in Figs 5 & 6.

The boiler must be installed on a level, non combustible

surface that is capable of adequately supporting the weight of the boiler and any necessary equipment. Any combustible material adjacent to the boiler and flue system must be so placed so as to ensure that its temperature does not exceed 65 Deg C.

R18 Series only

If the boiler is to be sat on a raised plinth, the plinth should be so constructed to include the clearances in Fig 8 page 12, to facilitate the removal of the burner trolley.

Further general details regarding Boiler Location in BS 6644.

4. RECOMMENDATIONS FOR THE WATER CIRCULATION

4.1. WATER CIRCULATION SYSTEM

Recommendations for the water circulation system are given in BS 6644, CP341 and CP342.

The following notes are of particular importance.

In a combined central heating and hot water system the hot water storage vessel must be of the indirect cylinder or calorifier type or alternative a plate heat exchanger.

The hot water storage vessel should be insulated preferably with not less that 75mm (3 in) thick mineral fibre or its thermal equivalent.

Circulating pipework not forming part of the useful heating surface should be insulated to help prevent heat loss and possible freezing, particularly where pipes are run through roof spaces and ventilated cavities. Feed and expansion tanks situated in areas which may be exposed to freezing conditions should also be insulated.

Insulation exposed to the weather should be rendered weatherproof.

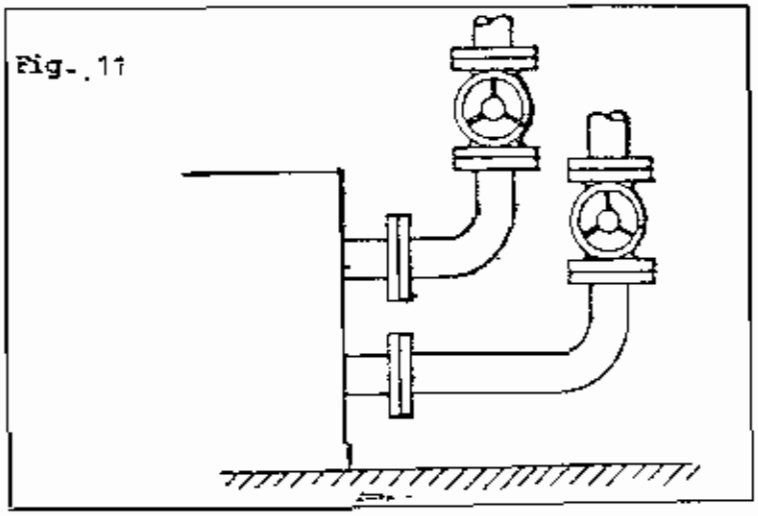
Draining taps must be located in accessible positions which permit the draining of the whole system, including the boiler and hot water storage vessel. Drain taps are provided as shown in Figs. 1 & 2.

Isolating valves are not supplied with the boiler. The Condensamax is normally supplied with the gas and water connection on the right hand side of the boiler. The water connections can be provided on the left hand side of the boiler to special order but the gas connection is always on the left hand side.

5. HEATING CIRCUIT REQUIREMENTS

5.1. Where possible the flow and return connections should be as shown in Fig 11 to allow inspection and servicing of the heat exchanger to be made easier.

Fig. 11



5.2. There is a relationship between the flow temperature, static pressure and pressure drop for this type of boiler, for further details see section 7. In case of high rise dwellings maximum allowable pressure of other components in the system must by considered.

Boiler is suitable for use in situations up to 100 m (330 ft) head as standard appliance supplied with safety valve setting at 30m. Safety valve with higher settings available from the boiler manufacturer's on request.

5.3. Section 9 shows various examples of installations using by pass and mixing valves.

5.4. It is important that the boilers are connected in the correct order. In particular the circuit should be arranged so that the boiler is not starved of water.

5.5. Roof mounted boiler installations - the following must be observed

a. Attention should be given to the variation in pressure between the boiler plant and components in other parts of the dwelling

b. It is important that the pumps are fitted in the return to the boiler. The correct sequence of components should be the expansion vessel or tank, pump then boiler.

c. If the boiler is at the highest point in the system the flow return connections should be taken upwards from the boiler before descending to the system to ensure that the heat exchanger is filled with water.

5.6. POSITION OF PUMP AND EXPANSION VESSEL

It is important to install the pump in the return in the following sequence

Expansion vessel, pump. boiler.

A pump installed in the flow will cause problems, with the boiler operating at high temperatures.

5.7. PUMP SWITCHING SEQUENCE

It is important that the boiler pumps and secondary pumps are initiated before the boiler is fired.

5.8. INFLUENCE OF VALVE REGULATION ON THE TEMPERATURE OF BOILER WATER

It is important that in any system with a Condensamax all regulating valves of the secondary circuit are equipped with slow drive servomotors (120 second)

In this way the temperature control unit of the boiler is allowed sufficient time to respond and prevents a rapid temperature rise in the boiler which could send the overheat cut off device to lock out.

The problem can also occur if all regulating valves close at the same time. Therefore it is recommended that valves are arranged to close in sequence.

If all regulating valves are opened, ie in the early morning it is important that the return temperature to the primary heat exchanger is maintained above 40 Deg C (see 5.2. page 27).

5.9. CONNECTION OF EXPANSION VESSEL

Under all circumstances the expansion vessel has to be installed at the suction side of the primary pump.

5.10. FLUSHING OF THE INSTALLATION

Damage can result from the presence of debris in the system. Therefore it is necessary to flush the installation thoroughly.

5.11. PUMP,COLD FEED AND OPEN VENT CONNECTION

The preferred location for the cold feed and open vent and pump is on the return, the cold feed and open vent entering immediately on the low pressure side of the pump.

It is advantageous to use either a purpose made low velocity point or to form a low velocity point in the pipework see fig. 12

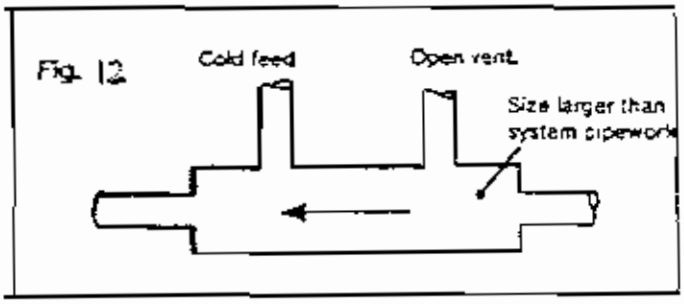


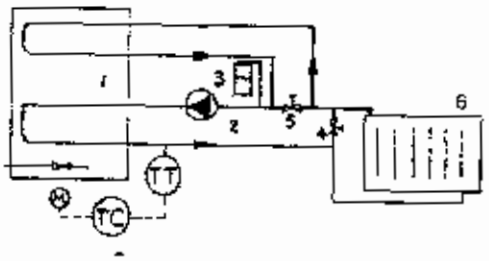
TABLE 5 : Open Feed Pipe Sizes

RATED OUTPUT kW		MINIMUM BORE	NOMINAL BORE
over	up to	(mm)	(in)
	60	25	1
60	150	32	1 1/4
150	300	38	1 1/2
300	600	50	2
600		63	2 1/2

5.12. HYDRAULIC CIRCUITS

For correct operation it is essential that the closing of radiator valves, thermostatic valves etc. does not reduce the water flow through the boiler. Otherwise the electrical flow switch will turn the boiler off to lock out. To overcome this situation it is necessary to incorporate a bypass as shown in fig. 13. This should be adjusted during the commissioning of the system after which it should not be re-set.

Fig 13



1. Boiler
2. Pump
3. Expansion vessel
4. Primary by pass valve
5. Secondary by pass valve
6. System

M Servomotor
TC Temperature controller
TT Temperature transmitter

5.13. DRAINING THE SYSTEM

The drain tap should be positioned at the lowest point on the installation to enable both the boiler and system to be drained effectively.

6. RELATIONSHIP BETWEEN WATERFLOW, WORKING PRESSURE, AND FLOW TEMPERATURE (QPT 5,6,7,8)

6.1. MAXIMUM FLOW TEMPERATURE

The standard models are fitted with overheat cut off device set to 110 Deg C but can be adjusted to 115 Deg C above normal operation temperatures. The operation of the device will automatically send the boiler to lock out and needs manual resetting on reduction of temperature. The lockout light indicating high temperature or lack of water flow is situated on the flame safeguard control.

The system may be designed for a maximum flow temperature up to 90 Deg C at full output. There may be, due to the inertia of the controls, a difference between the actual flow temperature and the setting.

6.2. MINIMUM RETURN WATER TEMPERATURE

The copper heat exchanger is tolerant to thermal shock it is however important to design for minimum water temperature in order to avoid the risk of condensation in the primary heat exchanger.

The return temperature should not be allowed to fall below 40 Deg C at 100% output.

The preferred layout would have a primary circuit ie boiler pump and manifold and a secondary system to which the different heating groups are connected.

A minimum primary water content of 100 litres per 100 kW of plant output is recommended.

The sequence of operation would require that the primary circuit is started and when the return temperature reaches 40 Deg C the other circuits can be gradually added regulated by thermostats in the circuit returns. The closing sequence would require the boilers to be switched, followed by pumps on a time delay, followed by circuit pumps.

When using optimisation/compensation the system design could, on night depression or over a weekend fall below 40 Deg C. If compensation is used then the three way valve should be connected to hold off from heating circuits, until the primary circuit has been passed through 40 Deg C and then pulse open over a period based on water volume.

6.3. RELATIONSHIP BETWEEN STATIC PRESSURE AND WATER FLOW

(Primary heat exchanger) .

There is a relationship between the maximum flow temperature

T and the water flow rate through the boiler Q which is effected by the static pressure P. If the static pressure is too low then there is a possibility of local boiling taking place. It is important that the system is designed within the parameters laid down in paragraph 7.

Local boiling can also take place if at a given pressure the water velocity is too low.

7. QPT GRAPH

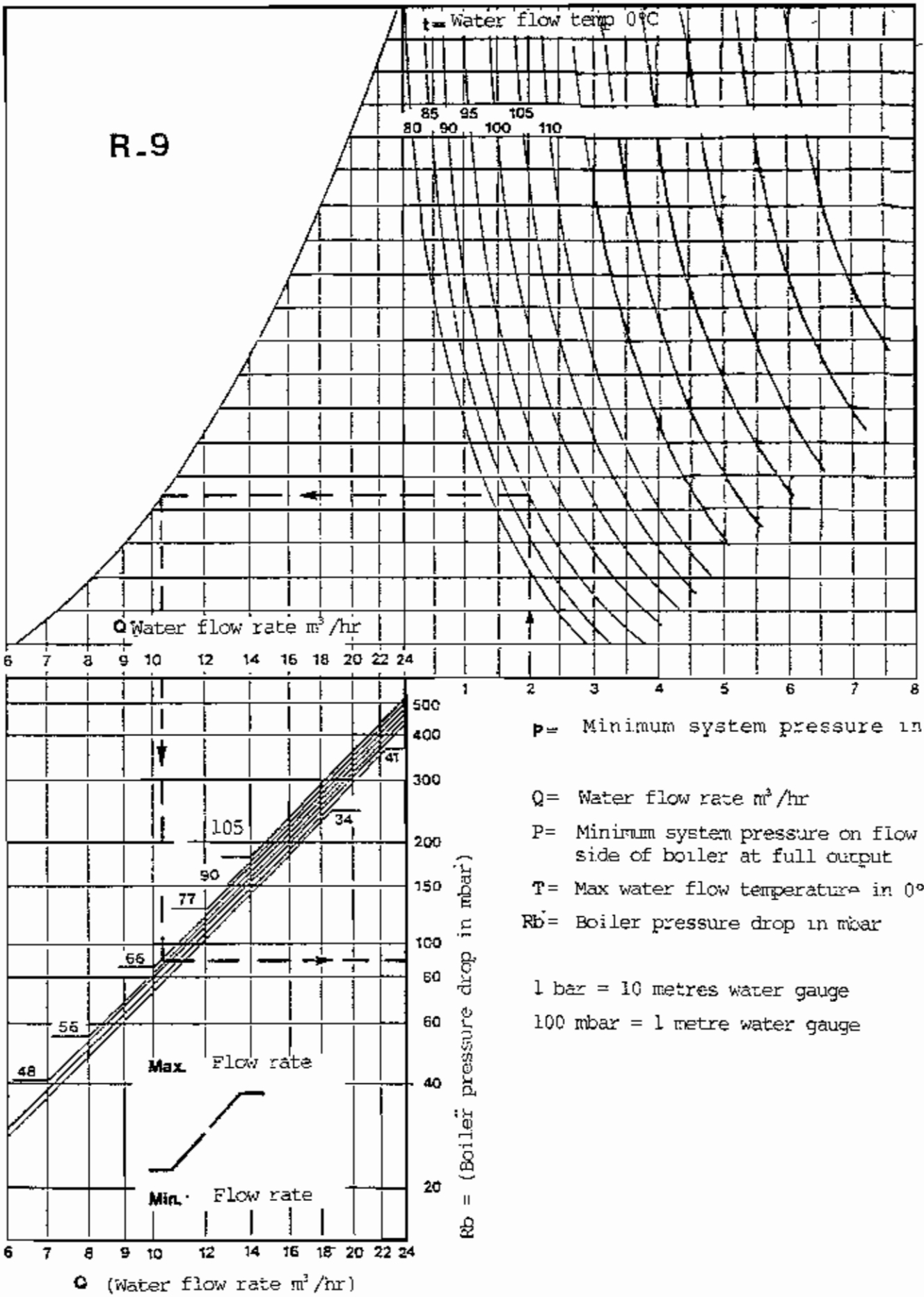
7.1. MINIMUM WATER FLOW RATE

The relationship between the minimum water flow rate, the flow temperature and the static pressure is shown on the following graph, pages 30,34.

In this graph (QPT diagram) the boiler pressure drop Rb1 refers to the primary heat exchanger only. All functions Q, p and t are always in relationship to the full rate of the boiler.

P is the minimum system working pressure on the flow side at full output which can be the sum of static head and available pump head at the outlet side of the boiler.

7.2. If the secondary heat exchanger (condensating heat exchanger) is in series with the primary the pressure drop Rb 2 has to oe added to the boiler pressure drop Rb1.



P = Minimum system pressure in bar

Q = Water flow rate m³/hr

P = Minimum system pressure on flow side of boiler at full output

T = Max water flow temperature in 0°C

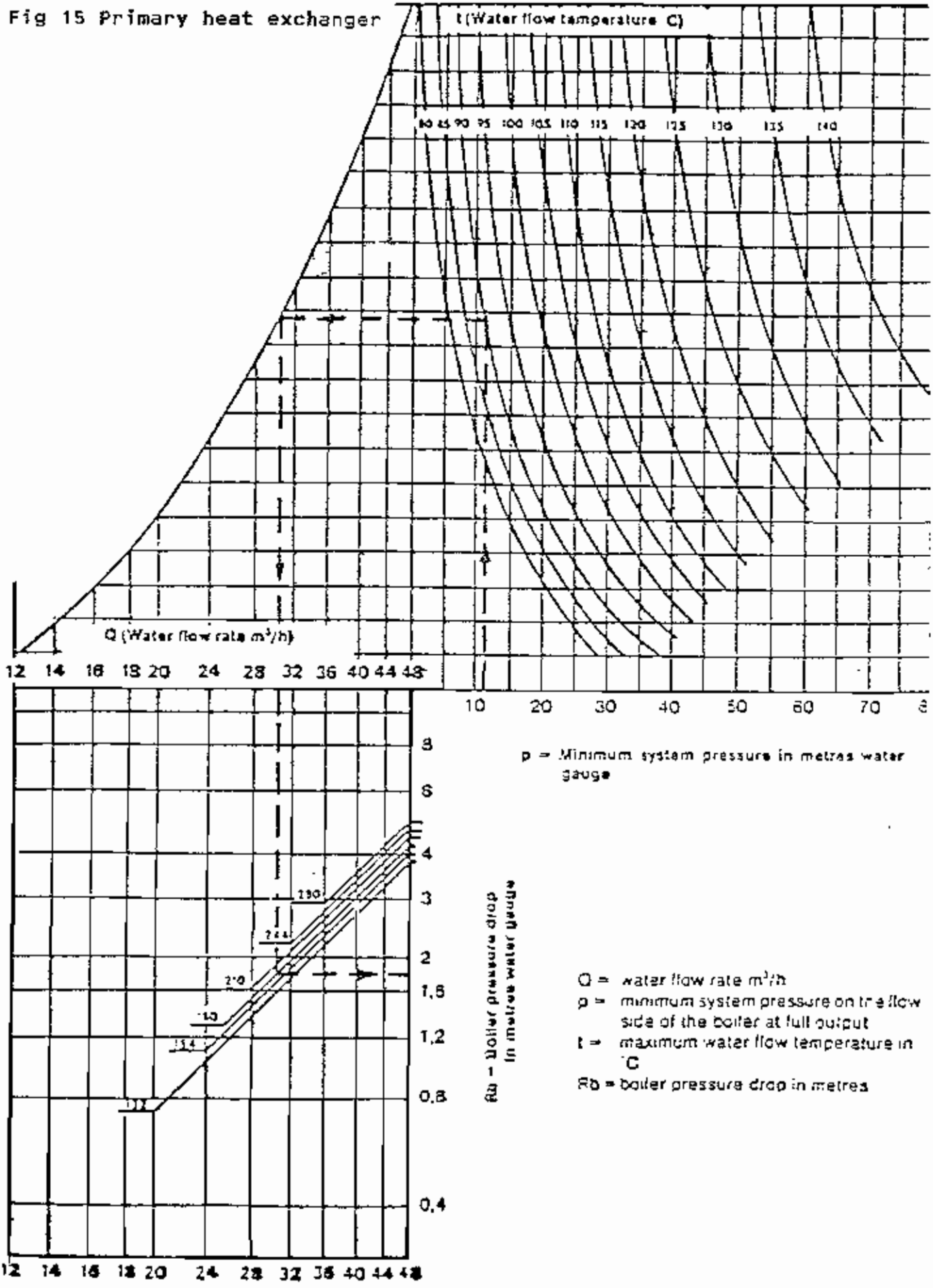
Rb = Boiler pressure drop in mbar

1 bar = 10 metres water gauge

100 mbar = 1 metre water gauge

7.4. Qpt DIAGRAM R18 SERIES

Fig 15 Primary heat exchanger

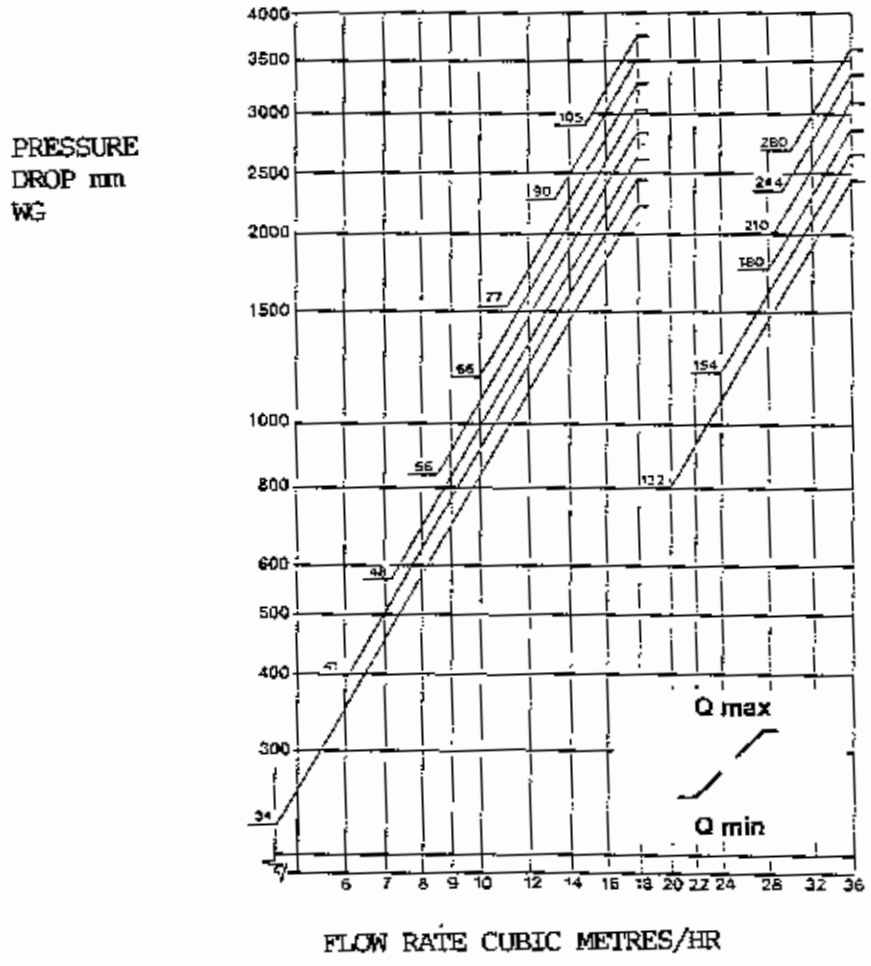


QPT - PRESSURE DROP DIAGRAM

SECONDARY HEAT EXCHANGER

The minimum and maximum water flow rates in the secondary heat exchanger are limited. If the flow rate is too high erosion can occur, if the flow rate is too low efficiency will drop.

Fig 16



8. EFFECT OF WATER QUALITY

The effect of erosion and scaling by calcium deposits are minimised with the use of sealed systems providing the working conditions of the boiler are within the parameters of the Qpt graph.

8.1. WATER TREATMENT

It is necessary to know the water hardness in the installations and its characteristics at elevated temperatures.

Treatment may be necessary where :-

a. The hardness exceeds 60 ppm at 60 Deg C

b. There is a frequent water change

c. If the installation is regularly drained, for example, during the initial construction.

d. The installation has a very high water volume and is heated by a single boiler.

Each system that the boilers are connected to should be investigate and assistance can be obtained from R S Stokvis and Sons Ltd as to recommended water treatment.

8.2. HEAT EXCHANGER TREATMENT

The heat exchanger tubes do not need to be removed.

Descaling does not pose any problems. It may be descaled easily, in situ by chemical means.

9. TYPICAL CENTRAL HEATING INSTALLATION

9.1. THE FIGS 17 to 23 SHOW EXAMPLES OF RECOMMENDED SYSTEMS USING CONDENSAMAX BOILERS

It is essential that in Condensamax systems the primary system (consisting of the primary heat exchanger and boiler pump in series) is hydraulically separated from the secondary systems (heating groups) using a manifold system.

The minimum return water temperature of the primary heat exchanger should not drop below 40 Deg C.

In an optimised system it is necessary to build in a temperature control which ensures that the return water temperature is maintained.

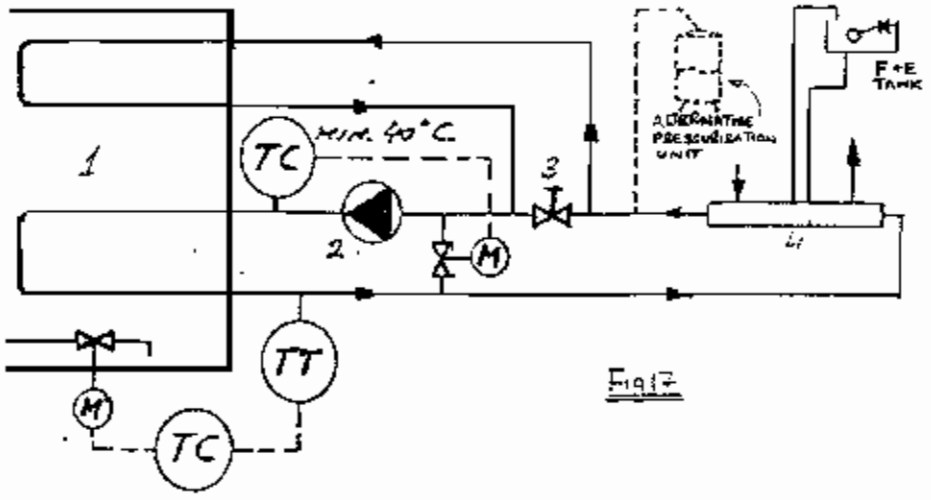


Fig 17

1. Condensamax boiler
2. Boiler circuit pump
3. Regulating valve
4. Low velocity header

M Servomotor
tc Temperature controller
tt Temperature transmitter

Fig 17 shows a standard system with one boiler built in a constant flow temperature mode. The system is recommended where the secondary system requires a low flow temperature ie floor heating or in a well insulated building. As an alternative the boiler can be equipped with a weather compensating control box modulating the flow temperature.

Fig 18 TWO CONDENSAMAX BOILERS IN SEQUENCE

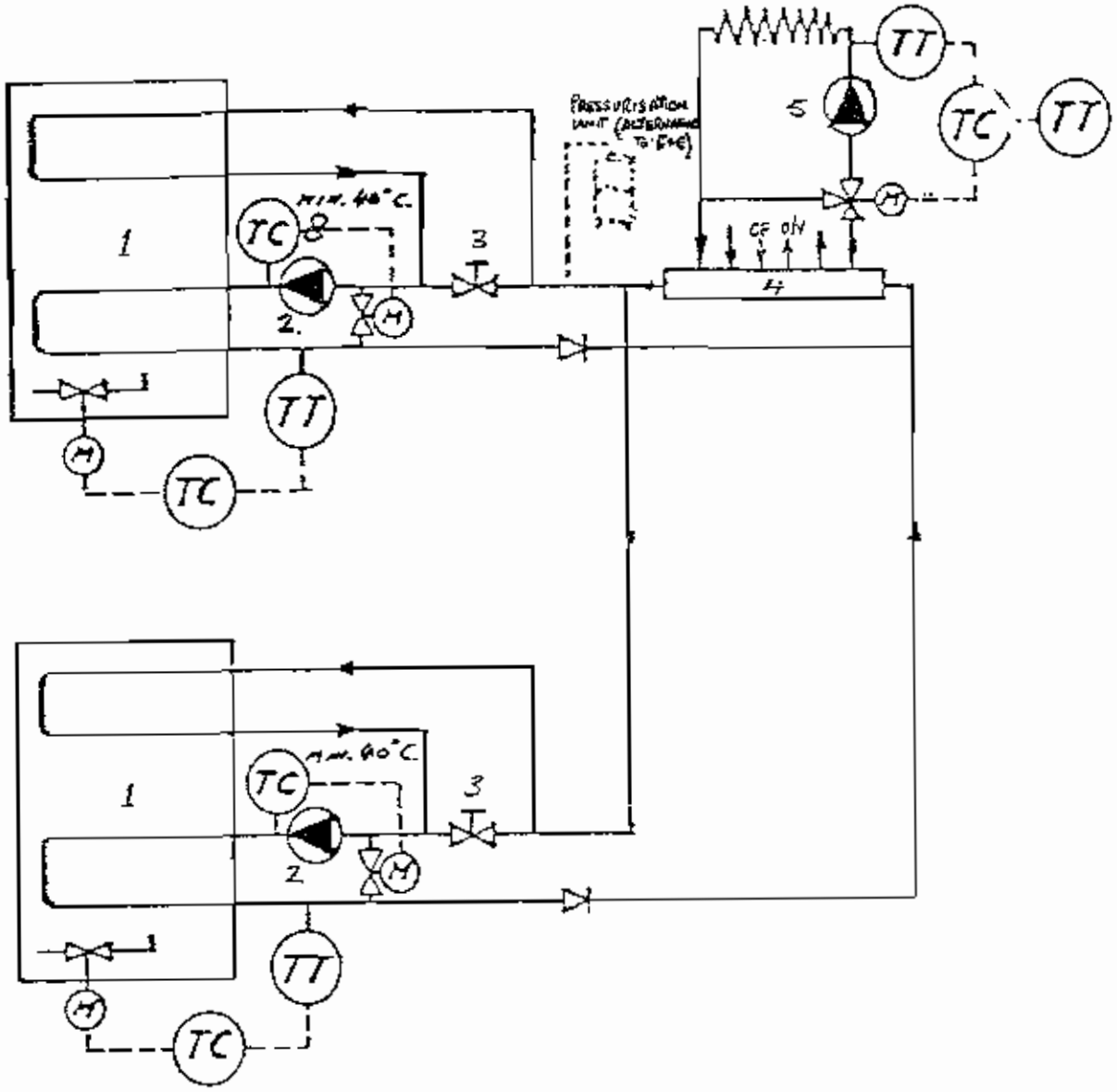


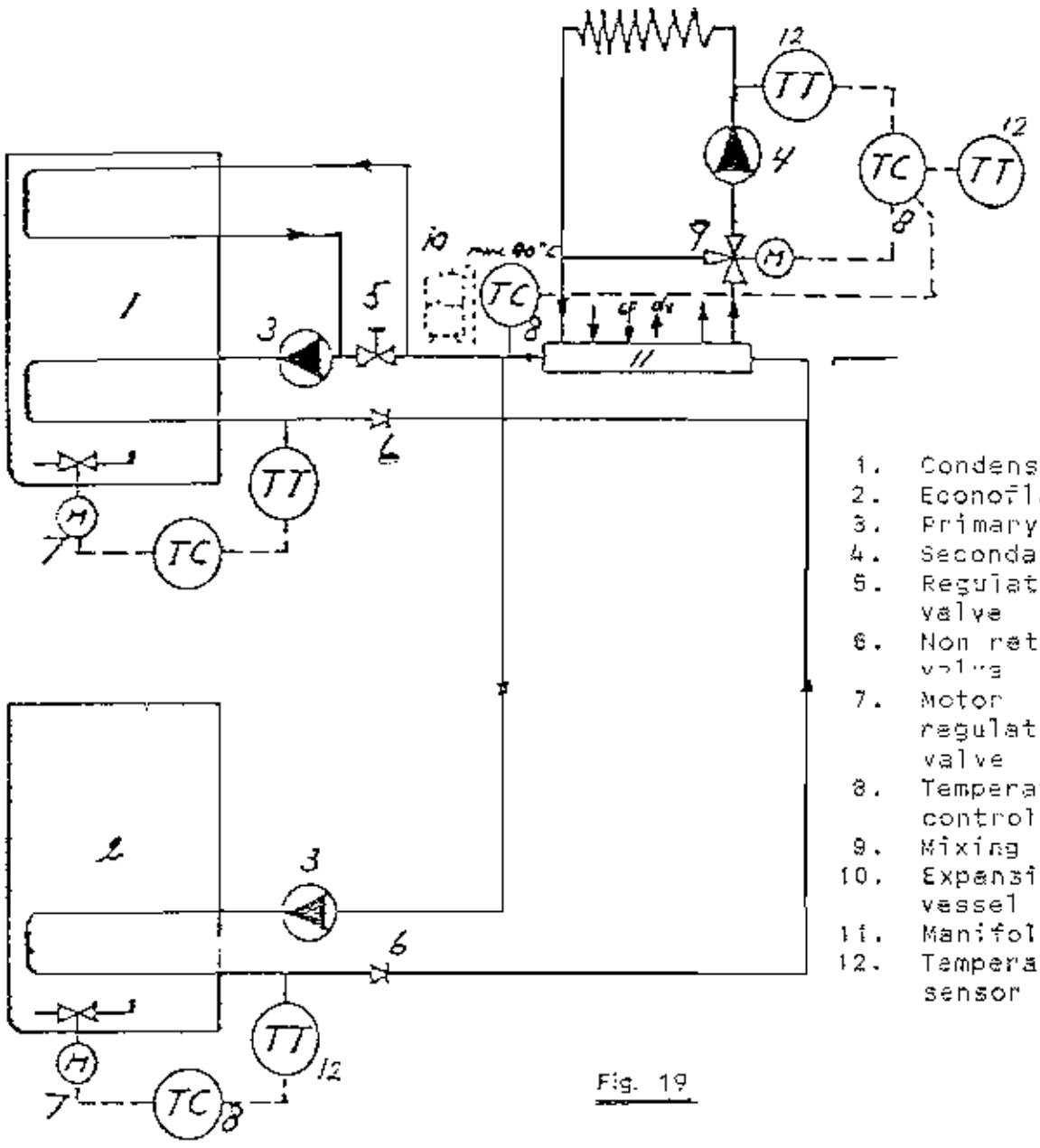
Fig 18 Two condensing boilers in sequence either with direct constant waterflow temperature or with weather compensation.

This system is utilised if during the greater part of the heating season the return water temperature drops below 55 Deg C. Both boilers must then be utilised during more or less the same amount of heating hours.

1. Condensamax boiler
2. Boiler circulating pumps
3. Regulating valve
4. Low velocity header
5. Heating system pump

M Servomotor
TC Temperature controller
TT Temperature transmitter
CF Cold feed
OV Open vent

Fig 19 CONDENSAMAX AND ECONOFLAME IN SEQUENCE WITH CONSTANT WATER FLOW TEMPERATURE OR WITH WEATHER COMPENSATION



1. Condensamax
2. Econoflame
3. Primary pump
4. Secondary pump
5. Regulating valve
6. Non return valve
7. Motor regulating valve
8. Temperature control
9. Mixing valve
10. Expansion vessel
11. Manifold
12. Temperature sensor

Fig. 19

Fig 19 is identical to fig 18. However, instead of one boiler, fig 19 shows two boilers in sequence, one Condensamax and one Econoflame.

The system is able to operate on a constant water flow temperature base with weather compensation. The leading boiler is the Condensamax, while the Econoflame comes into operation only as a standby or at peak periods.

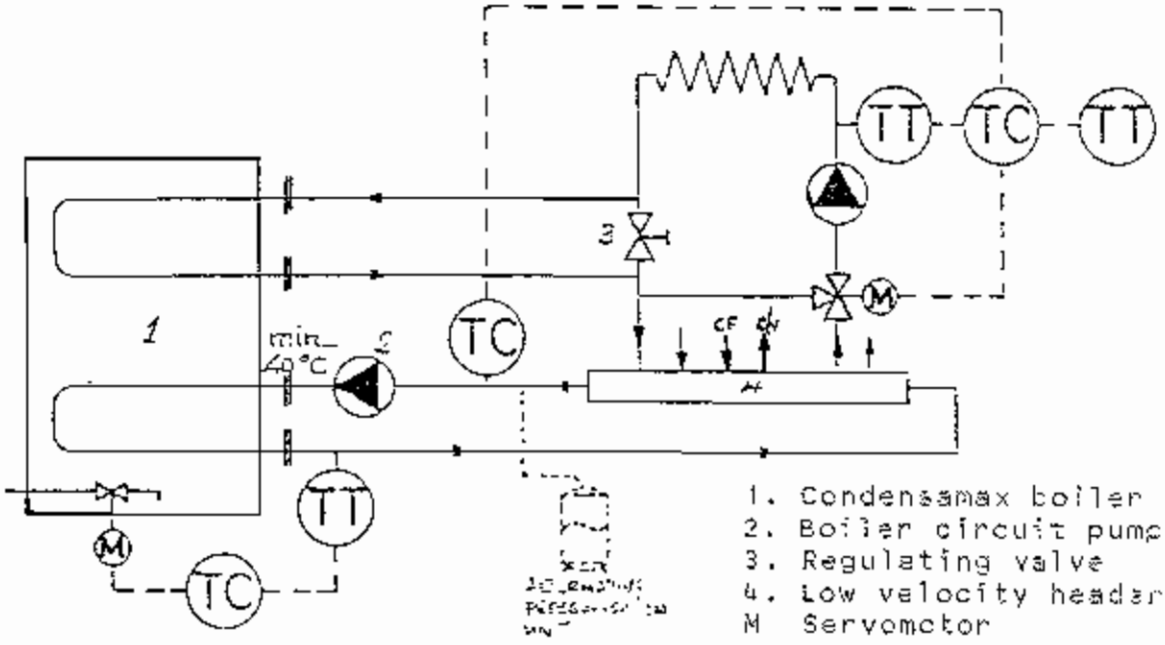
9.4. SPLIT SYSTEM

The previous examples of Condensamax boiler applications are based on systems using low temperatures, such as floor and ceiling heating.

An alternative application is the use of a split system meaning : that the primary heat exchanger is split from the secondary heat exchanger circuit and not connected in series as indicated in our previous examples.

The advantage of a split system, is that you may keep medium temperatures for domestic hot water, convection heating and heater batteries.

Identify the low temperature circuits ie weather compensated, under floor coils etc and connect the secondary heat exchanger into the low temperature system return pipework.



1. Condensamax boiler
2. Boiler circuit pump
3. Regulating valve
4. Low velocity header

M Servomotor
TC Temperature controller
TT Temperature transmitter

NOTE :-

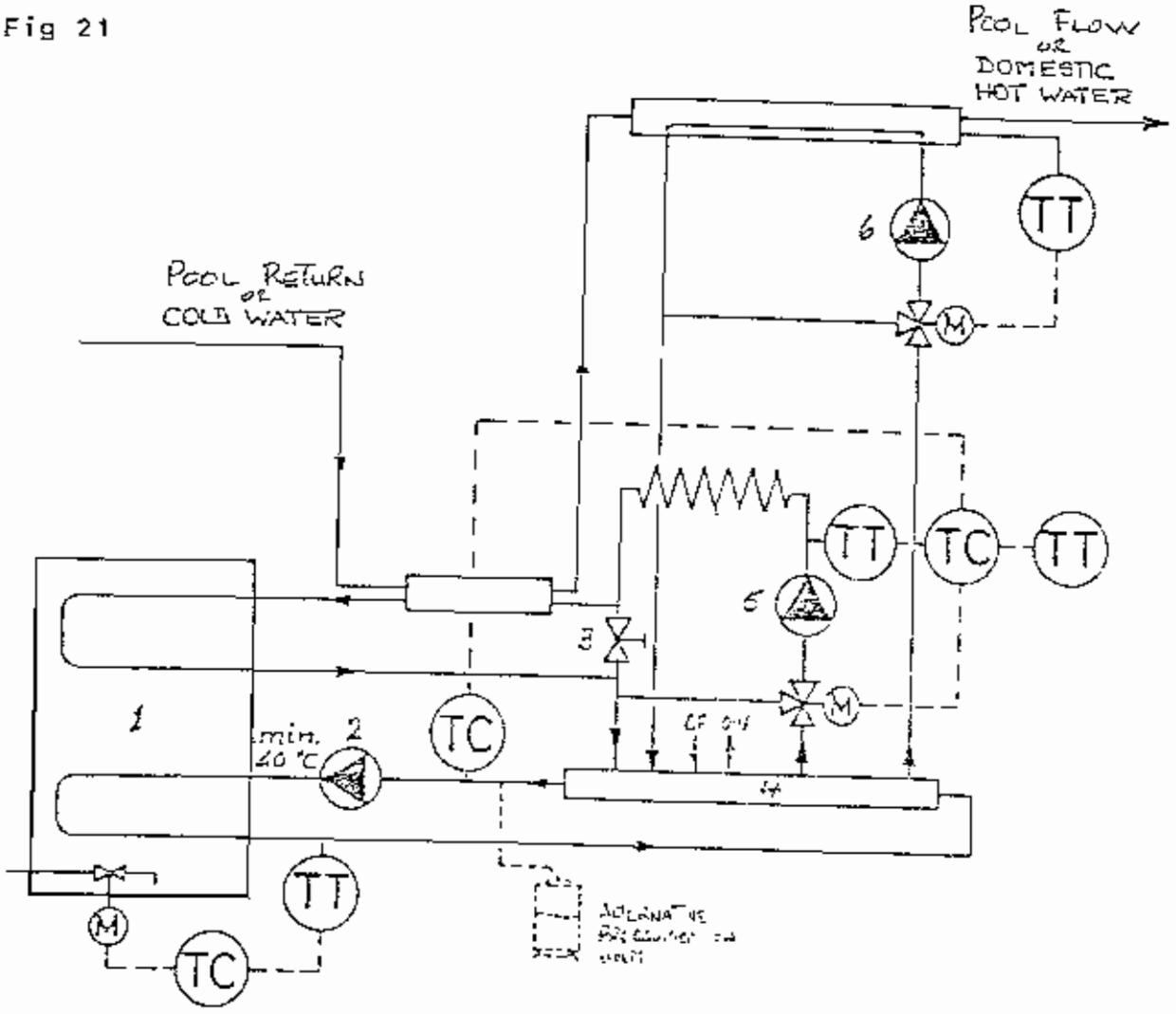
When using a split system it is important that the load on the secondary section is always greater than 30% of the installed load.

EXAMPLE :- Installed 100 kW

Secondary heat exchanger connected to 30 kW floor heating using a return temperature lower than 35 Deg C. Secondary pump overrun is required when the medium temperature circuits are in operation to prevent high temperature in the secondary heat exchanger.

This type of system can be utilised where domestic hot water or swimmingpool heating is used by pre-heating the water using a heat exchanger in the return of the secondary circuit thereby under cooling the combustion gases and obtaining higher efficiencies.

Fig 21



1. Condensamax boiler
2. Boiler circuit pump
3. Regulating valve
4. Low velocity header
5. Heating circuit pump
6. Heat exchanger circuit pump

M Servomotor
TC Temperature controller
TT Temperature transmitter
CF Cold water feed
OV Open vent

TWO CONDENSAMAX BOILERS CASCADE CONTROLLED IN A SPLIT SYSTEM

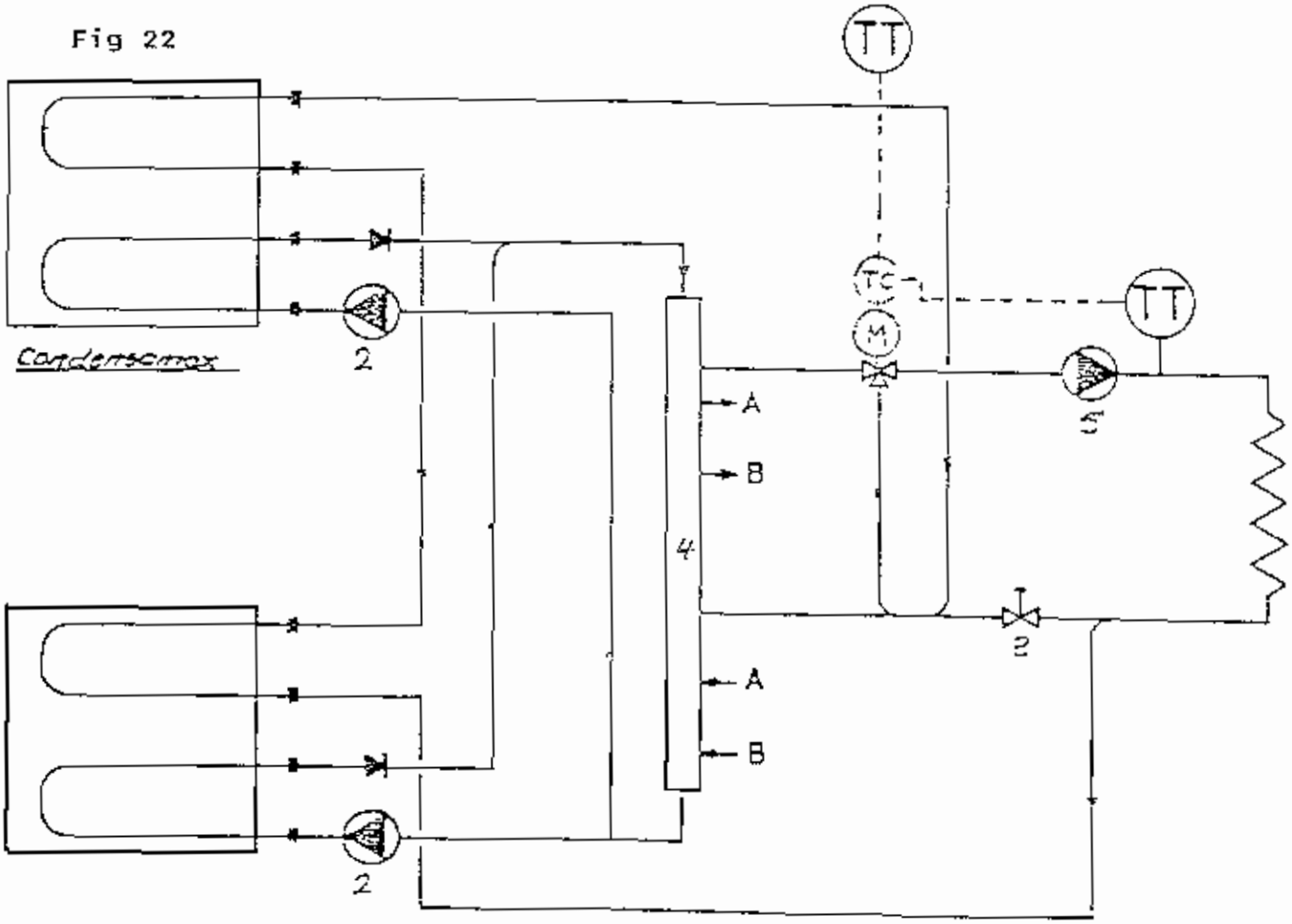
Because of the low standby losses of the Condensamax boilers the secondary heat exchanger can be connected in series, thereby simplifying the system.

This particular scheme is applicable where operating continuously with low return temperatures.

Non return valves are used in the primary circuit of the boilers to prevent circulation of water through the standby boiler.

A balancing valve in parallel with the secondary heat exchanger is used to set the optimum water for exceeding the flow rate through heat exchanger.

Fig 22



1. Condensamax boiler
2. Boiler circuit pump
3. Regulating valve
4. Low velocity header

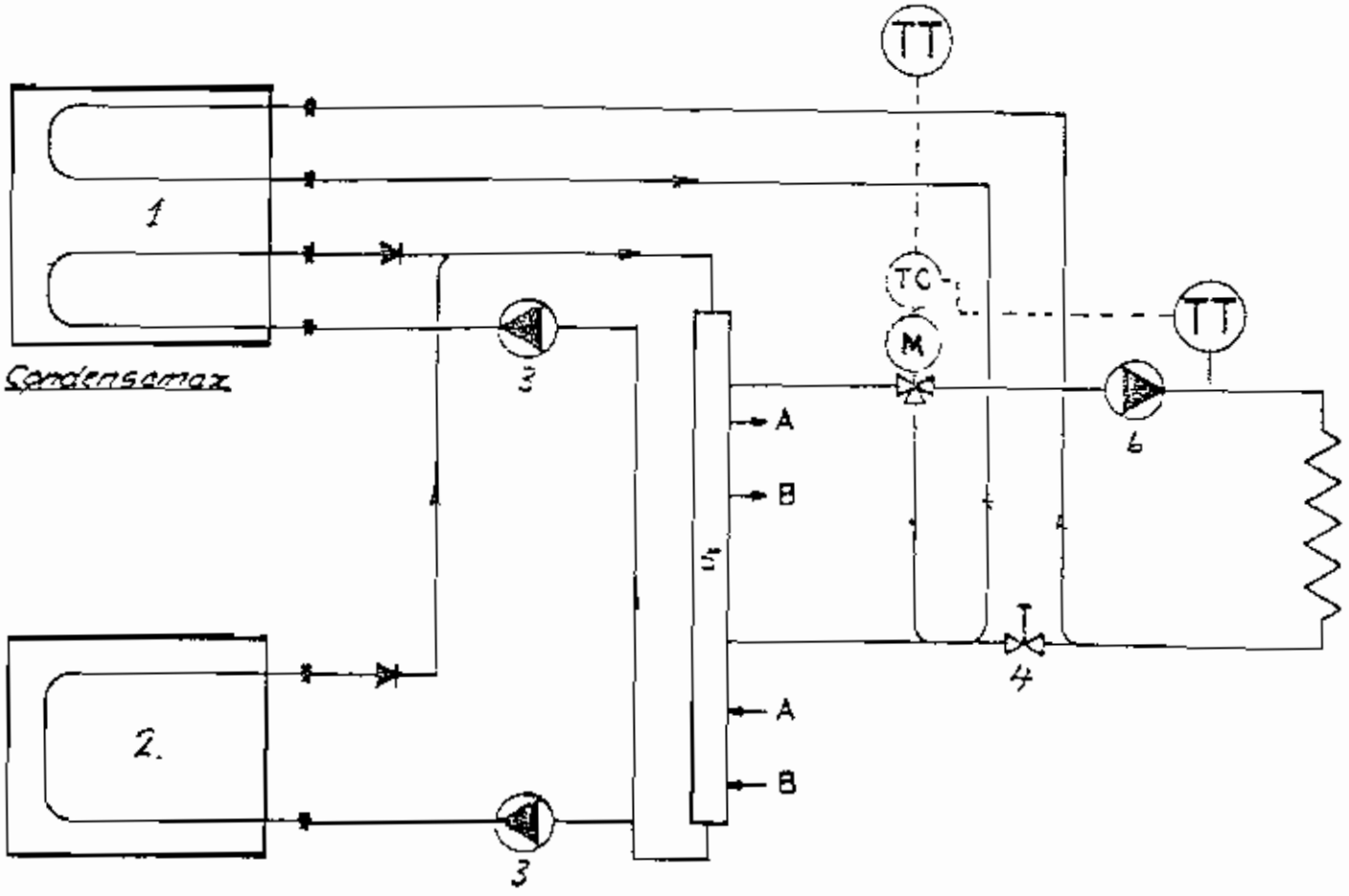
M Servomotor
TC Temperature controller
TT Temperature transmitter
5. Heating circuit pumps

CONDENSAMAX AND ECONOFLAME IN CASCADE CONTROL

This systems is applicable where the boilers are operating in cascade as a function of a weather compensated control system

The Condensamax boiler is always the lead boiler while the Econoflame boiler is switched on when higher flow temperatures are required as a function of the outdoor temperatures.

Fig 23



1. Condensamax boiler
2. Econoflame boiler
3. Boiler circuit pump
4. Regulating valve
5. Low velocity header
6. Heating circuit pump

M Servomotor
TC Temperature controller
TT Temperature transmitter

10. AIR SUPPLY

Boiler installations of rated input 60kW to 586kW, as below

Detailed recommendations for air supply are given in BS6644 British Standard specification for installation of gas fired hot water boilers of rated heat inputs between 60 kW to 2 mW. (2nd and 3rd family gases).

10.1. AIR SUPPLY BY NATURAL VENTILATION

Where natural ventilation is used suitable 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 :-

Low level inlet : 540sq.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.

Grilles shall be designed to minimum high velocity airstreams in the boiler house. For exposed, ie free-standing, boiler houses, ventilation openings shall be provided on at least two sides and preferably on all four sides.

For natural draught boilers installed in boilerhouses where communication with the outside air is possible only be means of high level openings eg underground or basement installations, the inlet air shall be conducted to low level by means of appropriately sized ducting.

10.2. AIR SUPPLY BY MECHANICAL VENTILATION

The minimum of air required for combustion and boiler house ventilation shall be supplied in accordance with table by means of a suitable sized fan.

Where the associated ventilation extract is also by means of a fan then the minimum flow rates of air supplied and extracted shall be in accordance with table 6, Any fan installed for extract purposes shall be selected so as not to cause a negative pressure, relative to the outside atmosphere to develop in the boilerhouse.

The inlet fan capacity shall be such as to provide the minimum air flow specified for combustion, and for ventilation. The extract fan capacity shall be such as to provide the minimum ventilation rate specified.

Where the associated ventilation discharge is provided by means of simple openings relying on thermal effect, the minimum free areas of the openings and any associated grilles shall be as specified for natural ventilation. Such openings shall be at high level with the inlet air supplied at low level.

All air inlet and extract fans shall be fitted with automatic controls which will cause safety shut down or lock out of the boiler(s) in the event of failure of the inlet or extract air flow.

Table : Mechanical Ventilation Flow Rates

Flow rate in cubic metres per second per 1000kW total rated input	
	Natural draught boilers
Inlet air (combustion, ventilation)	1.10
Extract air (ventilation)	0.45

11. FLUES

11.1. GENERAL

Reference should be made to "Technical Notes on the Design of Flues for Commercial and Industrial gas fired boilers and air heaters" published by British Gas BS 6644 and BS 5854 where applicable. The flue should be constructed of non combustible materials of such nature, quality and thickness as not to be unduly effected by heat condensation and the products of combustion.

No flue should be nearer than 50 mm to any combustible material and where passing through a ceiling or roof must be provided with an annular space of at least 25mm,

The Condensamax boiler is supplied with an integral draught diverter and may be used with individual flues or, if a multi boiler installation, a common flue system may be used, This range of boilers is also suitable for connection to a fan dilution system.

Prevention of high temperature loss within the flue should be a factor in the design of flue system. In order to minimise temperature loss the use of double walled flue pipe or insulation is recommended. If double walled flue pipe is used it should be of a type acceptable to British Gas. Where condensation in the flue is unavoidable provision should be made for condensate to flow freely to a point at which it can be released, preferably into a gully. The condensate pipe from the flue to the disposal point should be non-corrodible material of not less than 22 mm (3/4 in) size.

Provision should be made for disconnecting the flue pipe(s) from the boiler(s) for inspection and servicing purposes.

Bends with removable covers should ensure safe and efficient operation of the boiler(s) to which it is attached. Protect the combustion process from wind effects and disperses the products of the combustion to the external air.

The flue should terminate in a freely exposed position and must be so situated as to prevent the products of combustion entering any opening in a building in such concentration as to be prejudicial to health, or a nuisance. It is recommended that consideration be given to the fitting of a terminal at the flue outlet.

FLUE CONNECTION

The Condensamax boiler in standard form has a flue spigot suitable for metal flues.

FLUE CONDENSATION

The exhaust gases dissipate their heat thought the flue. The efficiency of the Condensamax is very high over the whole modulating range which results in a very low exhaust gas temperature.

The large size draught diverter adds extra air to the exhaust gases, lowering the dewpoint.

Because flue condensate can be expected the flue must have a corrosion resistive lining.

Due to condensate forming in the flue, the condensate water can be drained through the opening of the flue condensate draining ring.

The flue connection must fit against the inner side of the outer ring in such a way that the inner ring stays clear.

RG 1. Exhaust gas opening
2. Outer ring
3. Inner ring
4. Condensate drainage

R18

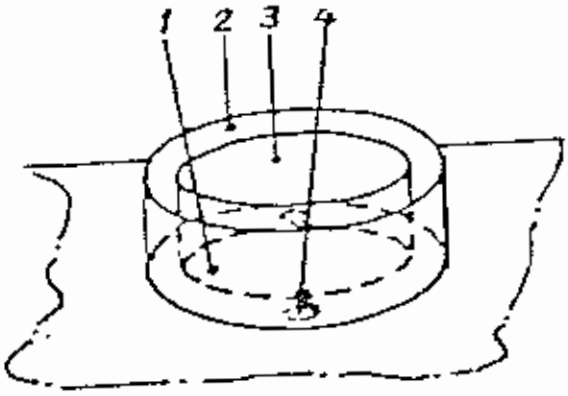


Fig 24

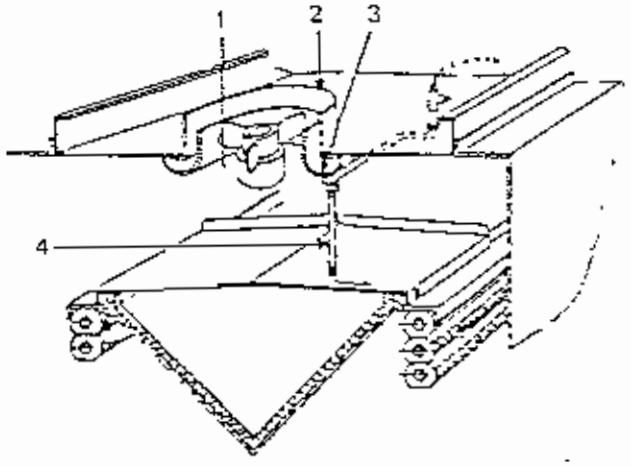


Fig 25

11.4. FLUE DESIGN

Modern boilers require modern flue designs and this is appropriate for high efficiency boilers operating with flue gases under 120 Deg C.

The flue diameter must always be adapted to the combustion gas volume of the boiler. Corrosion resistive materials must always be applied to combat the aggressive condensation deposits (stainless steel - or aluminium piping).

Heat loss of the combustion gases must be kept to a minimum to prevent combustion gas stagnation in the flue.

Good insulation practice is required.

11.5. POINTS TO CONSIDER

The flue dimension must be based in a combustion volume by maximum capacity with the appropriate operating temperatures. with a condensing boiler operating with a water temperature 35-55 Deg C the flue temperature an drop to 40 Deg C, Problem free operation is required (see table 7)

Because of the possible forming of condensation during operation it is important to use corrosion resistive materials (ph 3,8 - 4,5) Condensate must be removed by means of a drain with a water lock to prevent combustion gas see page. (See fig 26)

To keep the pressure drop in the horizontal flue connection section to a minimum, adhere to the diameter of the boiler flue section.

The use of flue dampers is not required.

11.6. COMBUSTION GAS VOLUME

To size the flue diameter as a function of its length, combustion gas volume must be known.

The following calculation can be applied.

$Q = 1.33 n + 0.1) Pu$

Q = Combustion gas volume in kg/hr

Pu = Total input power connected into a flue expressed in kW

TABLE 8 FLUE HEIGHT / R9 CONDENSAMAX BOILERS

Flue height m	5	10	15	20	25	30
TYPE	flue diameter in mm					
34	300	250	250	250	250	225
41	300	300	250	250	250	250
48	350	300	300	300	300	250
56	350	350	300	300	300	300
65	400	350	350	350	350	300
77	400	400	350	350	350	350
90	450	400	400	400	400	350

The R18 Condensamax boiler is fitted with a flue gas extraction fan and the flue pipe diameter is to be sized to pass the volume of flue gases indicated in table.

TABLE 9

For the R18 Condensamax boiler combustion volume

Type	Flue connection to boiler in mm	Volume m3/hr
132	450	1151
154	450	1343
180	450	1570
210	450	1830
244	450	2128
280	450	2442

$$n = \text{Air factor } (n = 1 + \frac{\text{excess air in \%}}{100})$$

In case the excess air factor is unknown, the factor n = 2 can be applied with boilers using a built in draught diverter.

(n = 2 means a total excess air of 100%.)

Table 7

Type	Flue connection diameter in mm	Combustion gas volume at 100% output with a flue temp of 51 Deg C in kg/hr
34	300	365
41	300	440
48	350	516
56	350	603
66	400	712
77	450	829
90	450	969

11.7. FLUE SIZING

Correct sizing of flues, is important.

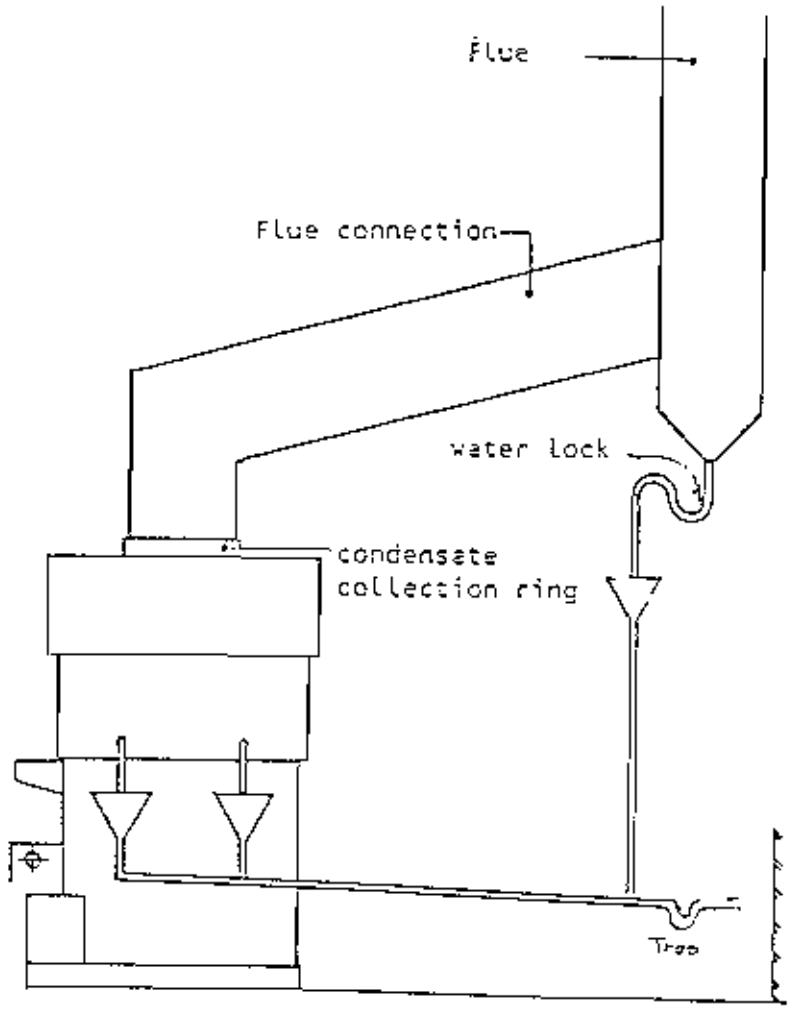
The combustion flow is created by natural convection and is based on a differential temperatures between the flue gas temperature and outside temperature.

The following table is applicable to central heating boilers and operating with a maximum outside temperature of + (plus) 18 Deg C.

For higher temperature consult R S Stokvis & Sons Ltd.

The pressure drop of the horizontal flue connection section and the use of elbows is not taken into account.

Fig 26



IMPORTANT

The flue connection should be connected at such an angle as to allow condensate to drain back into the collection ring.

12. DRAINAGE OF CONDENSATE

The condensate drainage pipes must not be altered or obstructed. A tap must be fitted to the common condensate pipework before discharging into waste stack or gulley (See fig 28).

Corrosion resistant materials should be used ie PVC

To protect against frost damage the condensate drainage pipes must be insulated, they should not pass in front of the ventilation inlets.

Fig 27 (R9)

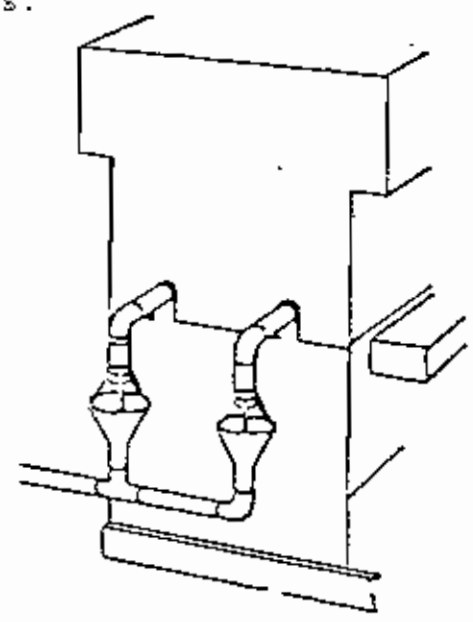
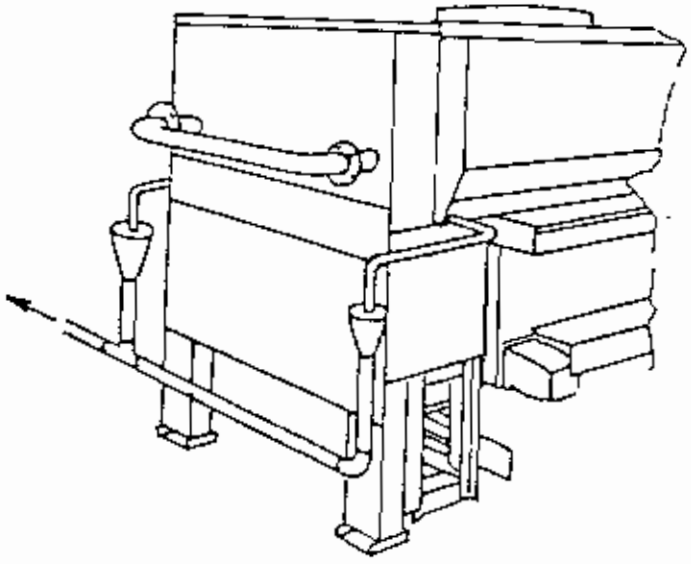


Fig 28 (R18)



13. ELECTRICAL INSTRUCTIONS

(See drawing and also diagrams attached to the appliance in the wiring tray, pages 7 & 8).

13.1. GENERAL

Before any electrical connections are made the lifting plate below the boiler should be removed (R9 only).

Any movement of the servomotor and air damper can cause damage with this plate left in position.

Wiring external to the boiler must be installed in accordance with the IEE Regulations and any local regulations which apply.

The method of connection to mains supply should facilitate complete electrical isolation of the boiler and the supply should serve only the boiler. The method of connection should be provided adjacent to the boiler in a readily accessible position.

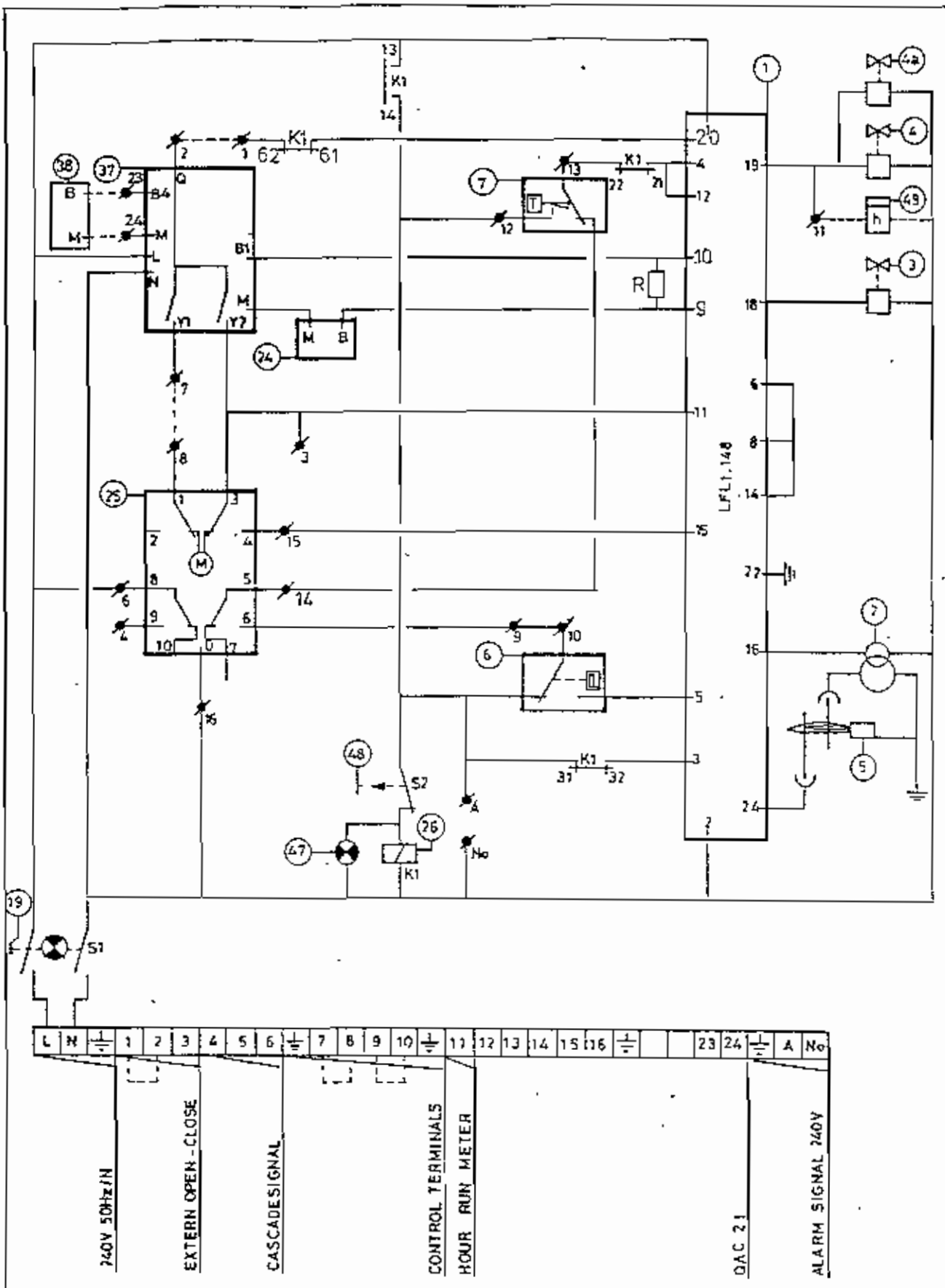
13.2. ELECTRICAL CONNECTIONS

THIS APPLIANCE MUST BE EARTHED.

The boilers supplied for 240V single phase 50 HZ supply. The supply to the boiler should be protected by a 5 amp fuse. It is important that the line supply is connected to the line terminal and also that the appliance is effectively earthed. failure to do this can result in false readings occurring with the flame retardation circuit.

The electrical circuit on the series R9 range of boilers can be found by removing the wiring tray cover.

This is shown in Fig 1, use the cable gland on the left hand side of the cable tray and enter a 0.75 sq.mm three core cable and connect to the input terminal strip. Ensure that the cables securely clamped by the cable glands provided. The terminals A, No are for use with a remote indicator to show that the boiler has gone to lock out.



Electr. schematic standard boiler R-9 with temp. regulator RWF 32 and control terminals.

CONDENSAMAX.

Type 34 - 77

RENDAMAX Nederland

Dat. 4 - 9 - '90

Get.

Gec.

GB-U9L2-021-052

EL/W/Sch

The electrical connections on the series R18 range of boilers can be found by removing the cover of the electrical connection box number (fig 2 page 8).

Enter a 0.75mm three core cable and connect to the input terminal strip. Ensure that the cable is securely clamped by the cable gland provided.

The length of the conductors between the cord anchorage and the terminals must be such that the current carrying conductors become taut before earthing conductor, if the cable cord slips out of the cord anchorage.

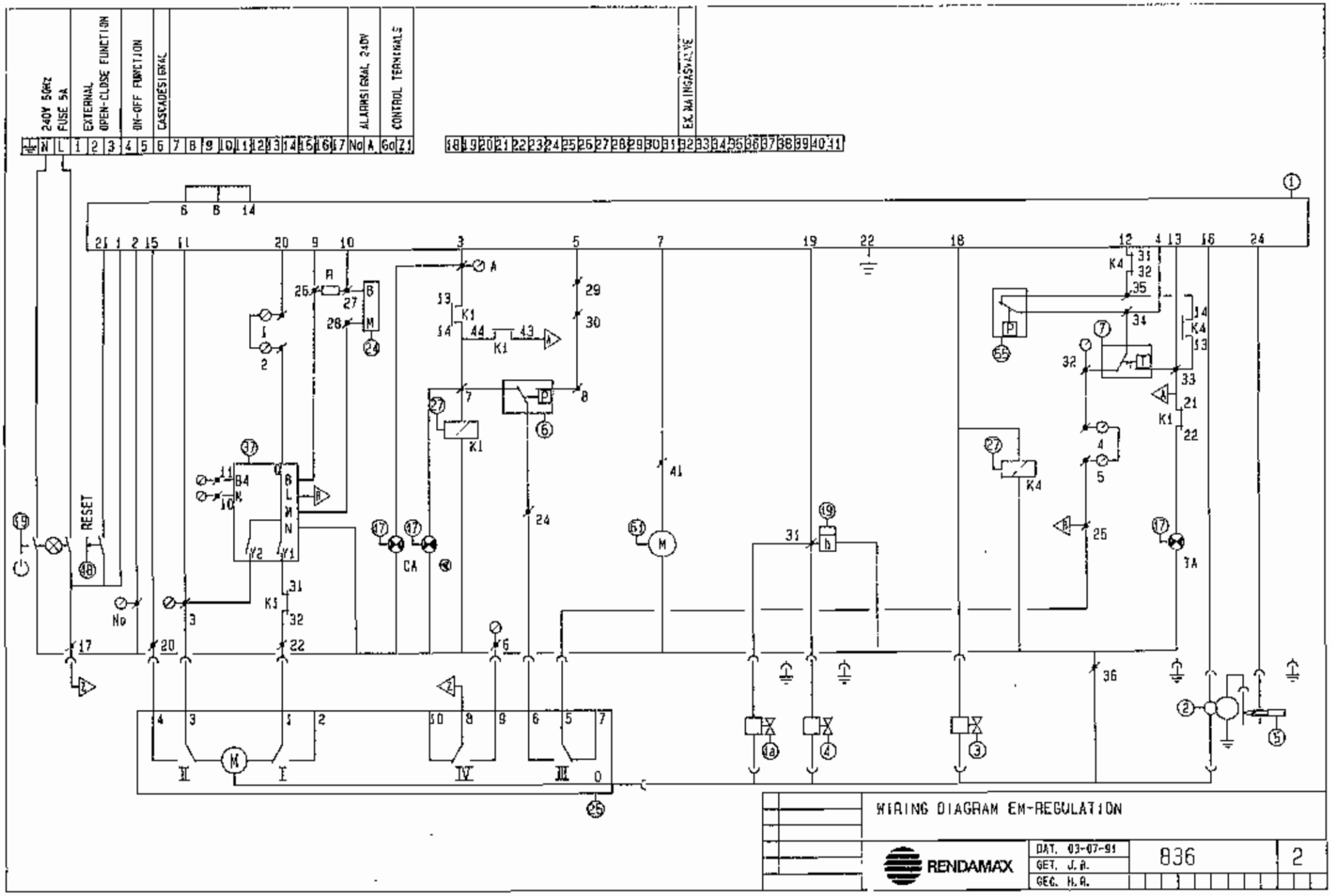
13.3. TEMPERATURE CONTROL UNIT

The instructions from the manufacturer of the temperature control unit are enclosed in he connection box.

All standard boilers are equipped with the Landis & Gyr RWF 31.

13.4. WIRING DIAGRAMS

Drawing Nos. GB-0-35 to GB-0-39 show the internal wiring for R9 and R18 Condensamax boilers together with corresponding parts lists.


240V 50Hz
FUSE 5A
EXTERNAL
OPEN-CLOSE FUNCTION
ON-OFF FUNCTION
CASCADESIGNAL
ALARMSIGNAL 240V
CONTROL TERMINALS
EXTRA AANSLUITING
RESET
WIRING DIAGRAM EM-REGULATION
RENDAMAX
DAT. 03-07-91
GET. J.A.
GEC. H.A.
836
2

14. INSTRUCTION FOR TRANSPORT AND LOCATION

14.1. DELIVERY

Normally the boilers are delivered completely assembled wired and tested.

In the case of restricted access to the boiler room the Condesamax can be dismantled.

Contact R S Stokvis & Sons for details.

14.2. MOVING THE BOILER - SERIES R9 TYPES 34-105

The crate should be removed before attempting to slings the boiler since the slinging points are used to attach the crate.

Fig 29

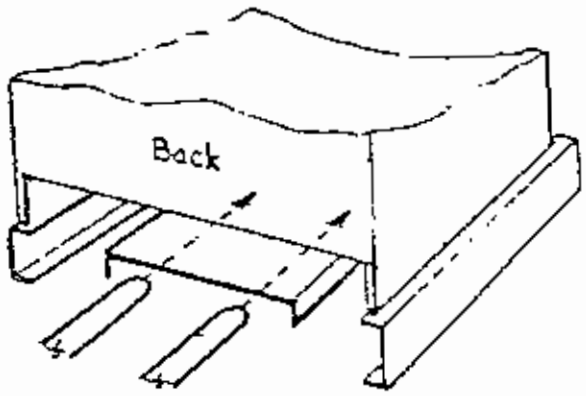
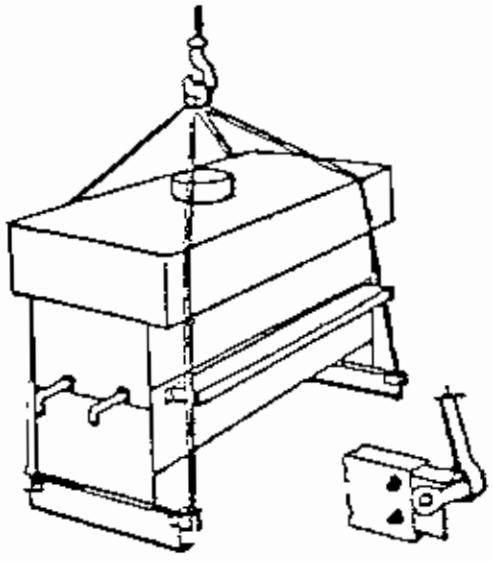


Fig 30



To move the boiler horizontally a fork lift or similar can be used underneath the protecting plate and should enter from the back of the boiler. (See fig 29).

14.5
Moving the R18 series type 132.280

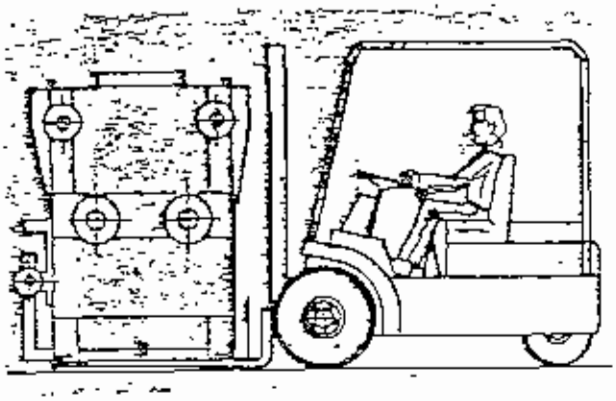


Fig 33

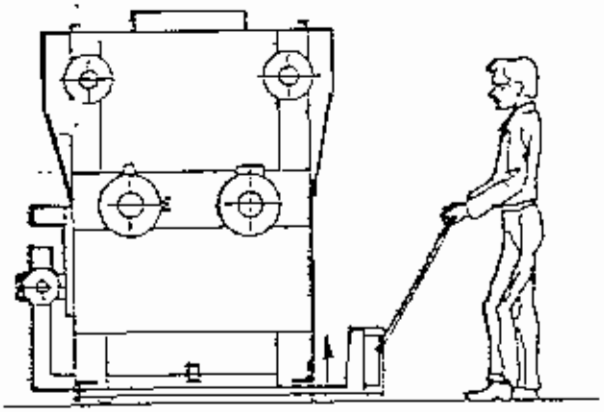


Fig 34

The R18 series can be moved with the aid of a palette truck or fork lift. This must be done from the back of the boiler and positioned as shown in figures 33 and 34

14.6
Lifting the boiler R18 series
Lifting points ate provided on the chasis as shown in Fig 35.

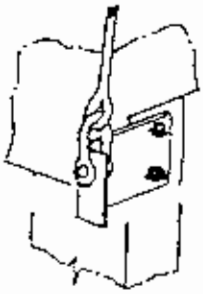


Fig 35

14.7 Positioning

Position the boiler preferably as close as possible to the flue. The boiler does not need a concrete plinth. If the R18 boiler does have a plynth the burner trolley still can be taken out with the help of two pieces of timber see Fig 36

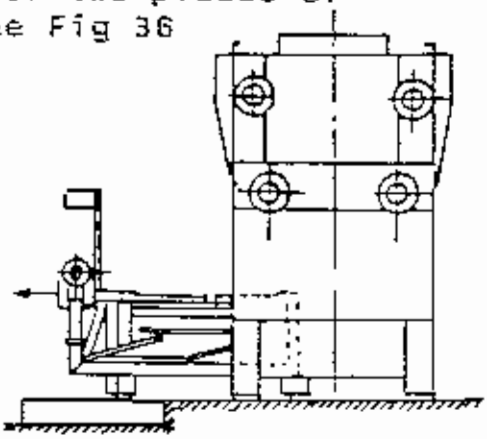


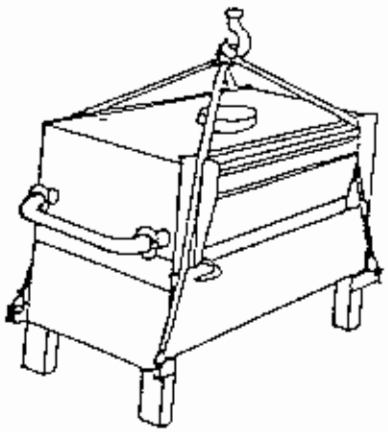
Fig 36

The minimum distances between the adjacent boilers and a boiler and a wall is shown in the drawings figs 5 & 6.

Be aware of the room required for piping, expansion vessels, switchpanels, pumps etc. and the necessity to service all equipment.

Minimum distances all around could mean a boiler-room which is too small.

Recommended dimensions of boiler rooms are shown in CP332.3.



15.1. GAS CONNECTION

A gas service cock (not supplied with the boiler) should be fitted as close as possible to the inlet connection. Recommended British Gas approved cocks are available from R S Stokvis and Sons Ltd or the following suppliers :-

Sperryn & Co
Delta Road
St Helens
WA9 2ED
0744 32421/26393
Telex 629407
Model 1202/3

Standard Gas Fittings
St Stephens Street
Birmingham B6 4RJ
021 359 2874/2161
Model 160/00

The gas connections sizes are given in the following tables

TABLE 10

R8 Type	Gas Connection	R18 Type	Gas Connection
34	R 1	132	50 PN 6/2 BS 4504
41		154	
48		180	
		210	
56	R 1 1/2	244	PN 65 6/2 BS 4504
66		280	
77			
90			
105			

15.2. FACTORY SETTINGS

Appliances are factory set for natural gas to the settings given in Table 1 and section 15.4.

During initial lighting the main burner pressure and pilot burner pressure should be checked. Also the ionisation current.

The local gas region should be consulted at the installation/planning stage in order to establish the availability of an adequste supply of gas.

An existing service pipe must not be used without prior consultation with the local gas region.

A gas meter is connected to the service pipe by the local gas region, or a local gas region contractor.

15.4. MAIN BURNER ADJUSTMENT

The main burner pressure is adjusted by the gas governor. To carry out this adjustment remove the sealing cap and screw in the plug to increase the pressure, and outwards to decrease. he main burner pressure is measured with a manometer connected tc the pressure test point situated on the front of the burner manifold.

The boiler should be set to maximum output by increasing tne boiler thermostat setting or with the external controls. Adjust this setting if necessary after the boiler has been operating for 10 minutes. Adjustment should only be attempted if the inlet pressure, when running, is 20 mbar (8 in WG) for setting pressure see table 11.

TABLE 11 TABLE OF INJECTOR SIZES AND BURNER PRESSURES

	R9		R18	
	mbar	in WG	mbar	in WG
Main burner pressure at 100% output	7.3	2.9	8.3	3.3
Main burner pressure at 30% output	1.0	0.4	1.3	0.5
Pilot burner pressure	3	1.2	3	1.2
Injector diameter 1.85 mm.				

16. COMMISSIONING

- Fill and vent system, check water pressure on sealed systems.

- Start pumps and check rotation

- Check water pressure indicated by the gauge situated on the outlet connection of the boiler in accordance with installation specification.

- Open gas service cock

- Purge gas line by opening pressure test screw on inlet to boiler. Ensure that the boilerhouse is well ventilated.

- Check electrical supply for correct polarity and earthing continuity

- Select a boiler flow temperature of 50 Deg C. Initially

  In case of a secondary circuit it is essential that the motorised valves open slowly (120 second time cycle) minimum, such that the return of the primary heat exchanger never drops below 40 Deg C.

- Switch the boiler on, using the switch situated on the front panel. This switch should now illuminate. Check for gas soundness.

17. MAINTENANCE INSTRUCTIONS

17.1. GENERAL

The Condensamax is relatively simple in construction and operation and the requirements for maintenance are minimal. However to ensure continuous and safe performance of the Condensamax boiler, regular annual maintenance and inspection is recommended.

Any maintenance work should only be carried out by competent qualified personnel.

WARNING

Any replacement components used, particularly electrical of the plug in base type should be identical to the original as inadvertent substitution or "similar" replacements could cause a hazard.

17.2. ACCESSIBILITY OF CONDENSAMAX R9 & R18

By withdrawing the burner tray of the R9 boiler or rolling out the burner trolley of the R18 boiler, inspection of the inside of the boiler is made simple. (Figs 39 & 40).

17.3. VIEWING WINDOW

On the left hand side of all Condensamax boilers, an inspection window is provided (Figs 3 & 4).

When the boiler is operating it is possible to view

- The spark of the ignition electrode during burner start up
- The flame of the start gas burner
- The combustion of the main gas burner

17.4. SAFETY

Before carrying out any of the following maintenance tasks ensure that the electrical and gas supplies are isolated from the boiler, and the flow and return water connections are isolated from the heating system.

- Switch the boiler off and connect the manometer to the main burner and pilot supplies figs 1 & 2.

- Re light the boiler, check and adjust if necessary the pilot pressure in accordance with table 11.

- Slowly increase the boiler temperature selector to the designed flow temperature. When the indicator on the end of the servomotor (Figs 1 & 2) is at 100% check and adjust if necessary the main burner pressure is in accordance with table 11 page 67.

- Reduce the setting of the boiler temperature selector slowly allowing the boiler to modulate to the 30% position. Note the main burner gas pressure. Allow the boiler to relight again. Note the burner pressure. These pressure should be in accordance with table 11. If not contact the manufacturers.

- Check the operation of the overheat cut off device by setting the boiler temperature selector to exit. (Where applicable)

  The device should operate at approximately 110 Deg C by causing the boiler to go to lockout. (Check systems is capable prior to test - to avoid damage)

- Check the operation of the water flow switch by closing one of the boiler isolating valves; again the boiler should go to lockout. With boiler operation at full output and all doors and windows closed check draught diverter for spillage of products. Test detailed in BS 5440 Pt.1 Flues.

- On completion of the commissioning of the boiler hand the Instructions for Use to the client and instruct operator in the use of the boiler stressing the need to maintain boiler house free of combustion materials and not to restrict purpose made ventilation openings.

An existing meter should be checked, preferably with the gas region, to ensure that the meter is adequate to deal with the rate of gas supply required.

Installation pipes should be fitted in accordance with CP 331.3.

Pipework from the meter to the boiler must be of adequate size. Do not use pipes of smaller size than the boiler gas connection.

The complete installation must be tested for soundness as described in the above code.

Where it is necessary to employ a gas pressure booster the controls must include a low pressure cut off switch at the booster inlet.

The local gas region must be consulted before a gas pressure booster is fitted.

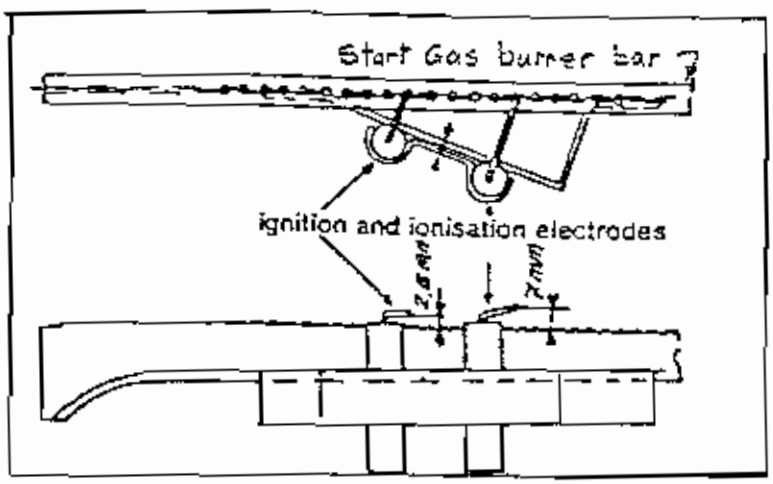
15.3. PILOT BURNER ADJUSTMENT

The pilot burner pressure is adjusted at the pressure regulator. Remove the cap and screw in the adjustor to increase the pressure, and out to decrease.

This should be carried out with an inlet pressure of 20 mbar. 8 in WG) To measure the pilot pressure a manometer should be connected to the pressure test point in the gas line between the pilot governor and the pilot burner.

For setting pressure see table 11.

FIG 37



- The boiler will now fire. In the event of the boiler going to lock out press reset button on flame safeguard control box Figs 1 & 2. It may be necessary to repeat this action a few times at 1 minute intervals. If the boiler will not start consult the fault finding table.

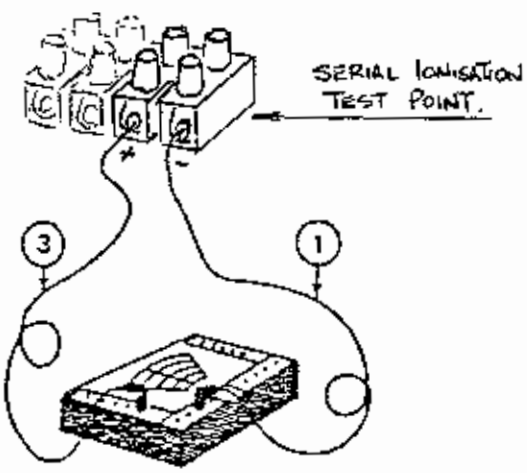
- During initial firing, condensation will be produced as a result of the refractory panels drying out. This is normal and may last as long as one hour.

- During initial firing, condensation will be produced as a of the ionisation electrode it is necessary to measure the ionisation current (Fig 38). To do so, turn off the boiler and connect a micro amp meter (0.50 A) in series with the ionisation circuit.

A serial ionisation test point is provided in the boiler electrical wiring tray (7) Figs 3 and 4. Remove the link between (+) and (-) terminals of the test point. Connect the black wire (1) of the ammeter to the ionisation test point connector black (-) and the red wire to the (+) connector. Switch on the boiler and note the reading. The minimum ionisation current on the pilot burner must read Honeywell 4412 flame safeguard 2 A, Landis & Gyr LFL flame safeguard 6 A.

Fig 38

Serial ionisation test point



17.5. REMOVING THE BURNER TRAY R9 SERIES (See fig 39)

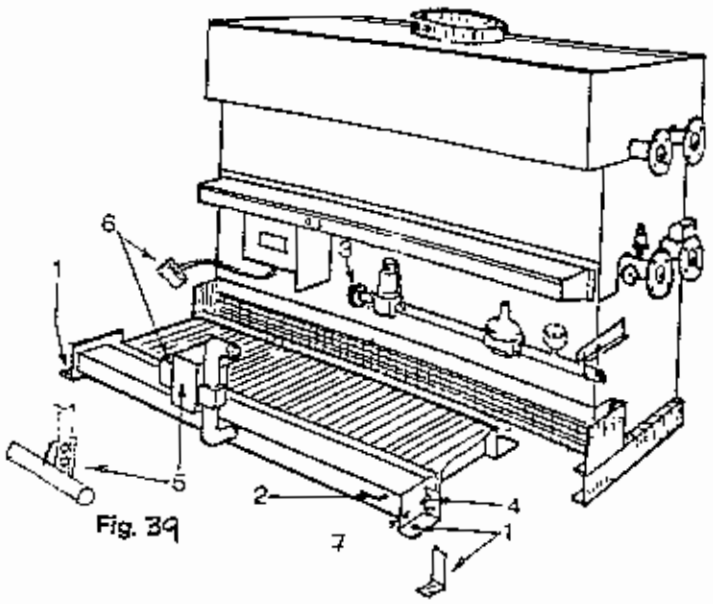


Fig. 39

- Release nut securing pilot tube to main burner (2)
- Remove the burner locking bolts from each side of burner tray and the ignition and ionisation caps protection bracket (1)
- Disconnect the ionisation earth wire from the burner tray terminal bolt (7)
- Pull of the caps from the ignition and ionisation feed through electrodes (4)
- Support the gas train
- Disconnect gas supply at the union (3)
- Disconnect the damper linkage by removing the 2 nuts and bolts on the lower arm connection to the horizontal bar bracket (5)
- Remove electrical plug from servomotor
- Withdraw burner tray by pulling forward. To make withdrawal easier, lower the front of the burner tray before the complete tray is pulled clear of the boiler.
- Clean burner with wire brush
- Clean and check position of ignition and ionisation electrodes (see fig 37). Replace if not correct.
- Replace burner tray in reverse order.

panel (3), inspection is possible of both heat exchangers.

Fig 41

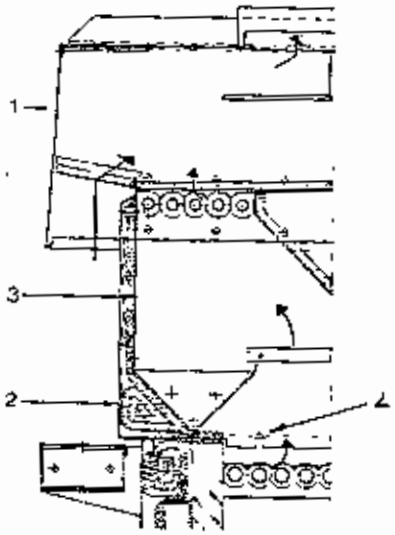


Fig. 41

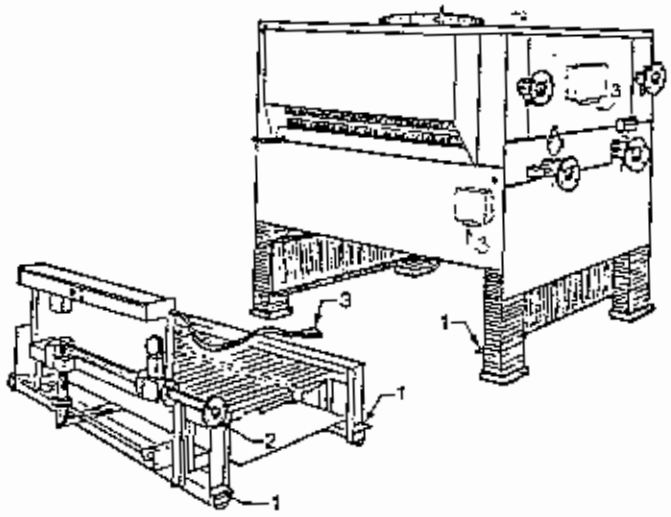
Both heat exchangers have to be kept clean.

It is important that both condensate trays are kept clean of any residue or deposits.

Small deposits on the heat exchanger can be removed by brushing.

17.6. ROLLING OUT THE BURNER TROLLEY OF THE R18 SERIES (See Fig 40)

Fig 40



- Disconnect the gas train at the flange coupling (2)
- Remove the four locking bolts - 2 front, 2 rear (1)
- Disconnect the electrical plug from the electrical connection box (3).
- Roll burner trolley forward
- Clean burner with wire brush
- Clean and check position of ignition and ionisation electrodes (see Fig 37). Replace if not correct
- Clean secondary air damper tray with vacuum cleaner
- Replace trolley in reverse order

17.7. INSPECTION OF THE INTERIOR OF THE DRAUGHT DIVERTER (see Fig 41)

Primary and secondary heat exchangers R9 series.

The top front panel can be dismantled, so that the interior is visible for inspection.

External inspection of primary and secondary heat exchangers.

By removing the top panel (1), the outer casing (2) and inner

17.8. INSPECTION OF THE INTERIOR OF THE DRAUGHT DIVERTER

Primary and secondary heat exchanger R18 series.

The draught diverter cover (4) is removable by lifting it up and drawing outwards.

This allows access to the flue gas extraction fan.

The top front panel (1) is removable, to inspect and clean (by brushing) heat exchanger. To clean the rear of the secondary heat exchangers and the top of the primary heat exchanger, remove the access panels (5) from the end panels. The flue gas deflectors (8) can be removed by unbolting from the end panels and withdrawing through the access hole. The exchangers can then be cleaned by brushing. The underside of the heat exchanger can be inspected and cleaned when the burner trolley is removed.

It is very important that both condensate trays (3) are kept clean of any residue or deposits.

Fig 42

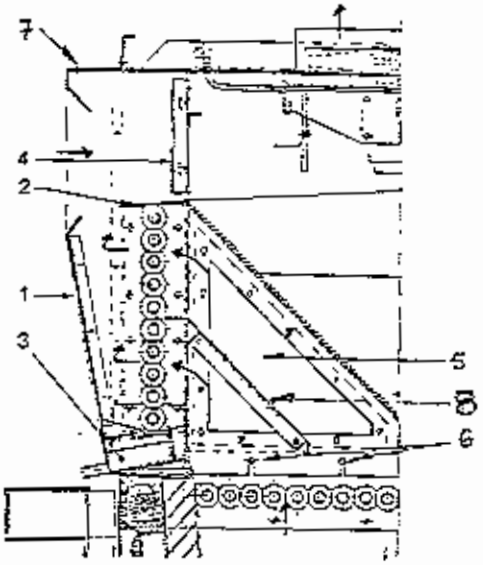
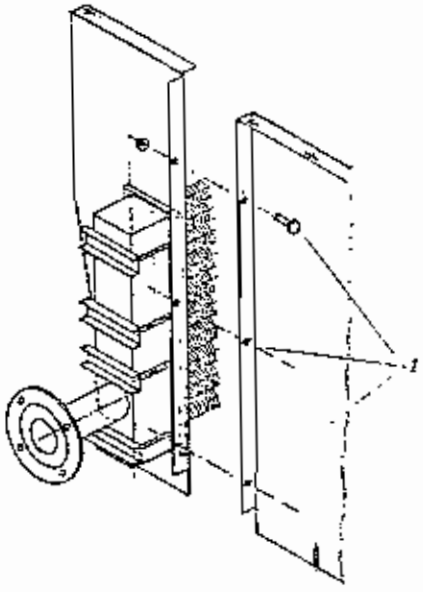


Fig 42a



17.9. INSPECTION OF THE HEAT EXCHANGERS (see figs 43 & 44)

By the removal of the primary and secondary heat exchanger return manifolds (1) the heat exchanger tube internals can be inspected and if found to be dirty or encrusted with deposits these should be removed by chemical cleaning. A specialist contractor should be used for this work. R S Stokvis and Sons Ltd would be pleased to advise a recommended contractor local to the boiler installation.

Fig 43 R9 Condensamax

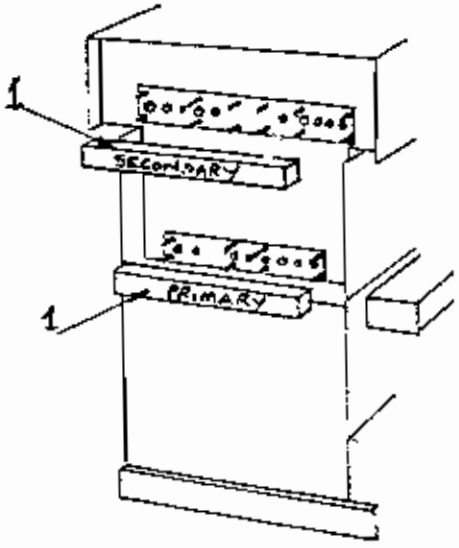
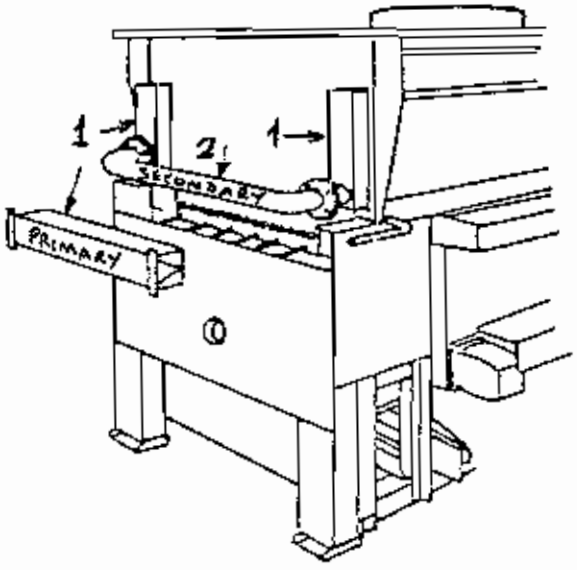


Fig 44 R18 Condensamax



TO REMOVE THE RETURN MANIFOLD ON THE R9 & R18 PRIMARY AND SECONDARY HEAT EXCHANGERS

On the R18 Condensamax only, firstly remove outer casing and insulation and then the header pipe from the two return manifolds (2) Fig 44.

The return manifolds can easily be removed (Fig 45) by removing the nuts (1) ensuring that the studs (2) do not unscrew from the backplate (3). By removing the brackets (4) it will allow the manifold (5) to be withdrawn from the heat exchanger tubes (6).

Care should be taken when removing the manifold, not to damage the 'O' rings (4) Fig 46. It is recommended that the O rings are renewed whenever the manifold is removed.

Fig 45

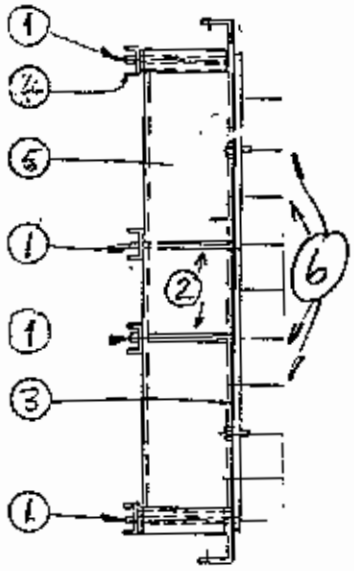
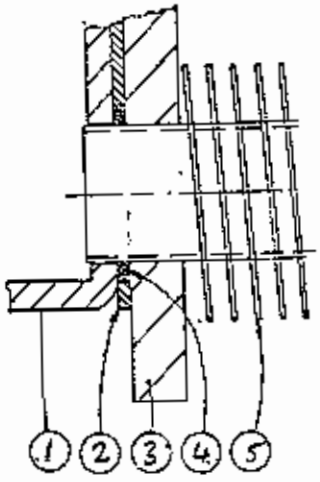


Fig 46



17.10. DECSALING

The de-scaling or flushing of the heat exchanger can be carried out with the manifolds replaced and connecting the acid descaling tubes to the drain taps fitted to the flow and return headers on both primary and secondary hat exchangers.

Re-assembly of the manifolds should follow the order of O rings (4) fitted to each tube end (5) tight to the tube plate (3). The spacer plate (2) and manifold (1) are then placed in position Fig 46.

After de-scaling or flushing the heat exchanger drain taps can be used for connecting a mercury manometer or pressure differential gauge to measure the flow rate through the heat exchangers. The resultant flow should be compared to the original commissioning data and or the QPT graphs in Section 7 for optimum performance.

17.11. REMOVAL OF PRIMARY AND SECONDARY HEAT EXCHANGERS

Should it be considered necessary to remove the heat exchangers it is recommended that the work be undertaken by R S Stokvis or an approved service contractor.

- Isolate gas and electrical supply and remove burner tray (See sections 17.5, 17.6)

- Close boiler isolating valves

- Drain heat exchangers by opening drain test cocks on flow and return connections. (Draining of the boiler will take

approximately 15 minutes, depending on type)

- Disconnect the system pipework from the four boiler connections

CONDENSAMAX R9

- Remove flue connection
- Remove top front panels (1) Fig 41
- Remove outer casing (2) Fig 41
- Remove inner panels (3) Fig 41
- Remove securing nuts (4) Fig 41
- Remove side panels by unscrewing retaining screws
- Disconnect chains from counterweight by removing screws
- Disconnect wiring from flow switch, remove the overheat cut off device and regulating thermostat
- Remove condensing chamber and secondary heat exchangers by lifting upward and off.

CONDENSAMAX R18

- Remove flue connections
- Remove secondary heat exchanger header pipe (see section 17.9 and Fig 44)
- Remove draught diverter panels (4) Fig 42
- Remove control box on models 132-154 (9) Fig 2
- Remove top front panels (1) Fig 42
- Remove fascia panel (7) Fig 42
- Remove side panels by unscrewing retaining screws
- Disconnect air pressure switch
- Remove securing bolts (1) Fig 42a. The secondary heat exchangers can be removed from the side of the condensing chamber, and cleared by brushing and/or vacuum cleaning
- Remove securing bolts (6) Fig 42
- Disconnect main input cable at main box

- Disconnect the wiring from flow switch

- Remove overheat cut off device and regulating thermostat
- Disconnect wiring from flue gas extraction fan

- Remove condensing chamber by lifting upward and off.

CONDENSAMAX R9 AND R18

- Remove the securing nuts and bolts on the four corners of the primary heat exchanger (1)(2) Figs 7 & 8 (Note on re-assembly the bolts ate the header connection end (1) Figs 7 & 8 should be tight, the bolts ate the manifold end (2) Figs 7 & 8 should be hand tight only with locking nuts).

- The primary heat exchanger can be removed by lifting upward. Care should be taken when lifting to prevent damage to the refractory panels

- Replace in reverse order

17.12. CONTROL CONPONENTS

a) Temperature controller

Landis & Gyr RWF 31.C0 with 0-100 Deg C range insert and QAE 21 temperature detector.

The controller is factory set and final adjustments made during on site commissioning. It should not be necessary to adjust the controller settings from the commissioning report, but if found necessary it should be carried out by qualified personnel in accordance with the procedures detailed below. No repair to the controller should be attempted but returned to Stokvis for repair or replacement.

DESIGN FEATURES OF THE RWF 31 CONTROLLER

The electronic controller is designed in the form of a plug in insert with a European standard printed circuit board (100x160mm) and a 32 pole DIN plug, design D. Available with or without transparent front cover and 32 pole screw terminal base for panel of flush panel mounting. Several casings can be attached to one another to form a 19" subassembly (rack). he front plate of the controller which carries the setting controls, signal lamps etc. is rigidly connected to the printed circuit board. All controls with the exception of the setting unit are protected by a clip on plate to prevent unauthorised settings.

The front cover of the unit is protected by a hinged

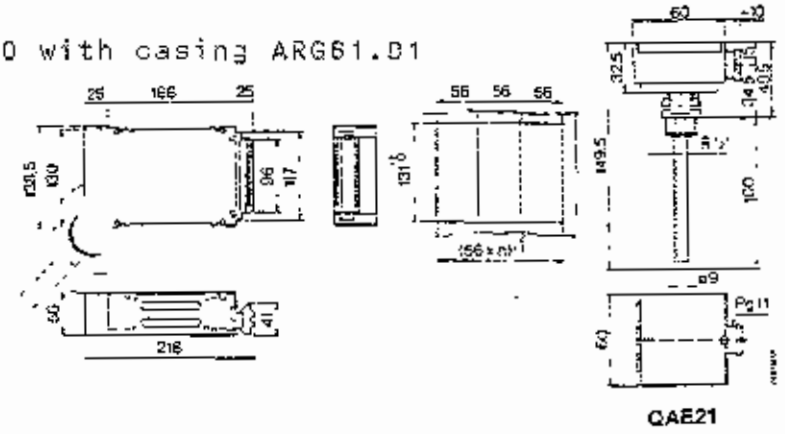
transparent cover and terminal base forms the rear of the controller.

The control output of the controller is a cotential free three position switch used for the controls of reversible motors. The controls signals OPEN (Y1) and CLOSED (Y2) are indicated by light emitting diodes.

The adaption of the controller to the controlled value and the corresponding range is achieved by inserting the so called SETTING RANGE INSERT which is the detector's part of the measuring bridge of the controller. This insert also carries the scale with the setting range. The setting unit itself is part of the controller and can be switched to a remote setting unit.

DIMENSIONS

RWF 31.000, RZF61.10 with casing ARG61.01



TECHNICAL DATA OF THE RWF 31 CONTROLLER

Operating voltage	220V a.c. -15%...240V a.c. +10% can be internally switched over to 24V a.c. ± 20%
Frequency	50...60Hz
Power Consumption	3 VA
Permissable load at the control outputs	Y1, Y2, 4(3)A, 24...250V a.c. F2, F3 see submodule AZYS1.31
Proportional band Xp	Adjustable from 0...20%
Required potentiometer in the actuator with P- and slave control	1000 ohms
Integral action time tn with P1 & PID control	Adjustable from 17...140 s
D-part <a> with PID control (a has no value)	Adjustable from 0...5
Neurtal zone	0.7%
Switching differential of control contacts Y1 & Y2	0.2%
Recommended running time of motor	40...50 s, min 20 s
Ambient conditions for	

storage & operation	
- Permissable temperature	-10...+50 Deg C
- Permissable humidity	class F conforming to DIN 40040
Permissable temperature for transport	-25...+65 Deg C
Protection standard of housing	
- Housing	IP42
- Terminal base	IP10 conforming to DIN 40050
Mounting position	Optional
Radio interference protection	N conforming to VDE 0875
Connecting terminals for	2 x 1.5 sq.mm or 1 x 2.5sq.mm
Weight	
- With housing	Approx 0.60 Kg
- Without housing	Approx 0.25 Kg

ADJUSTMENT OF THE CONTROLLER

With most installations, the guide value according to the table shown below normally give good results, which must then be minimised by slightly correcting the control parameters.

With the very fast controlled systems as well as fast motors used for the control of burner output, however, a sound knowledge of control engineering is a prerequisite for the correct adjustment of the control parameters.

The commissioning of the installation can be considerably simplified, if, while the adjustments are made, the load conditions are kept nearly constant, so that the reaction of the controlled system to load or setpoint changes can be easily seen.

For every correction the following points must be observed:

Make a note of the previous settings

Change only one parameter at a time (ie do not change Xp, D and tn at the same time).

Change adjustments in small steps only

Make a further correction only if the result of the previous correction is clearly noticeable.

If the parameter Xp is increased the controlled system tends to have more stability. At the same times, however, the corrective action after a load or setpoint change takes more time.

If Xp is decreased the controller reacts more quickly when a disturbance occurs. At the same time, however the controlled

system tends to become unstable. **MEASURES TO BE TAKEN WHEN THE CONTROLLED SYSTEM REACTS TOO SLOWLY**

If the setpoint or the load changes, and the desired value is reached too slowly or not at all, the following corrective measures must be take :

* Decrease Xp in steps of max 5% (speeding up correcting actions)

* If Xp = 5% does not give the expected result, Xp must not be decreased further, but D-part a is to be achieved by slowly adapting Xp.

* Decrease integral action time tn is steps of 10 s only when a =). Fine adjustment is again achieved by slowly adapting Xp.

MEASURES TO BE TAKEN WHEN THE CONTROLLED SYSTEM REACTS TOO SLOWLY

If the setpoint or the load changes and the controlled system does not settle (oscillations), the following corrective measures must be taken.

* Increase Xp in steps of max 5% (towards stability)

* If Xp = 100% does not give the expected result, D-part a is to be increased in steps of 0.5. Optimum control is achieved by slowly adapting Xp.

* If the D-part value is 5 and the controlled system is still unstable, the integral action time tn is to be increased in steps of approx 10 s. Fine adjustment is again achieved by slowly adapting Xp.

Guide Values for the Adjustment of the Control Parameters

TYPE OF INSTALLATION LOW, MEDIUM, OR HIGH PRESSURE HOT WATER

Speed of Change	Control Type	Xp%	Guide Value	Tn
Fast +/- 1Deg C	P1	25	0	60
Slow +/- 2Deg C	P1	50	0	90
Very slow +/- 4Deg C	P1	100	0	120

SERVICE TESTER AZW61.8

The service tester is a useful tool for commissioning and service. It is a measuring amplifier by means of which actual values, control deviations and other important control parameters can be measured or recorded without interfering with the controlled system.

For detailed information on the AZW61.8 refer to the manual supplied with the unit and to "L" of the legend below.

A - Setpoint adjustment. When a remote setting unit type FZA.. is used the red slider must be set to position "ext".

B - Potentiometer "Xp" accessible after the front plate has been removed

C - Button for the removal of the front plate

D - Selector switch P1/P

E - Potentiometer tn for the adjustment of the integral action time with PI or PID control

F - Potentiometer a for the adjustment of the D-part with PID control

G - Prefuse and spare fuse TA4 250E for control switches Y1 (OPEN) Y2 (CLOSED)

H - Selector plug for operating voltage for 220...240V a.c. operation the plug must be set to "24" int

I - Spare fuse T160mA

K - Unit fuse 0.16A slow (T150mA)

L - Sockets for the AZW61.8 service tester
With the RWF31 the following parameters can be measured or recorded by means of the AZW61.8 service tester (without influencing the controlled systems)

Socket M	System neurtal (basis)
Socket Y/Z1	o..10V d.c. corresponding to 0...100% position provided that a potentiometer 1000 ohm for the corresponding range of o...100% is fitted in the motor without potentiometer the voltage at this socket will be approx 14V d.c.
Socket Y/Z2	With the controller RWF31 : measuring point for test operations during fabrication,
Socket X	Actual value, expressed in 0...10V d.c.; for

conversion refer to the manual supplied with the service tester.

Socket Z — Control deviation ie difference between (shifted) desired value and actual value, expressed in 0...10V d.c. for conversion refer to the manual supplied with the service tester.

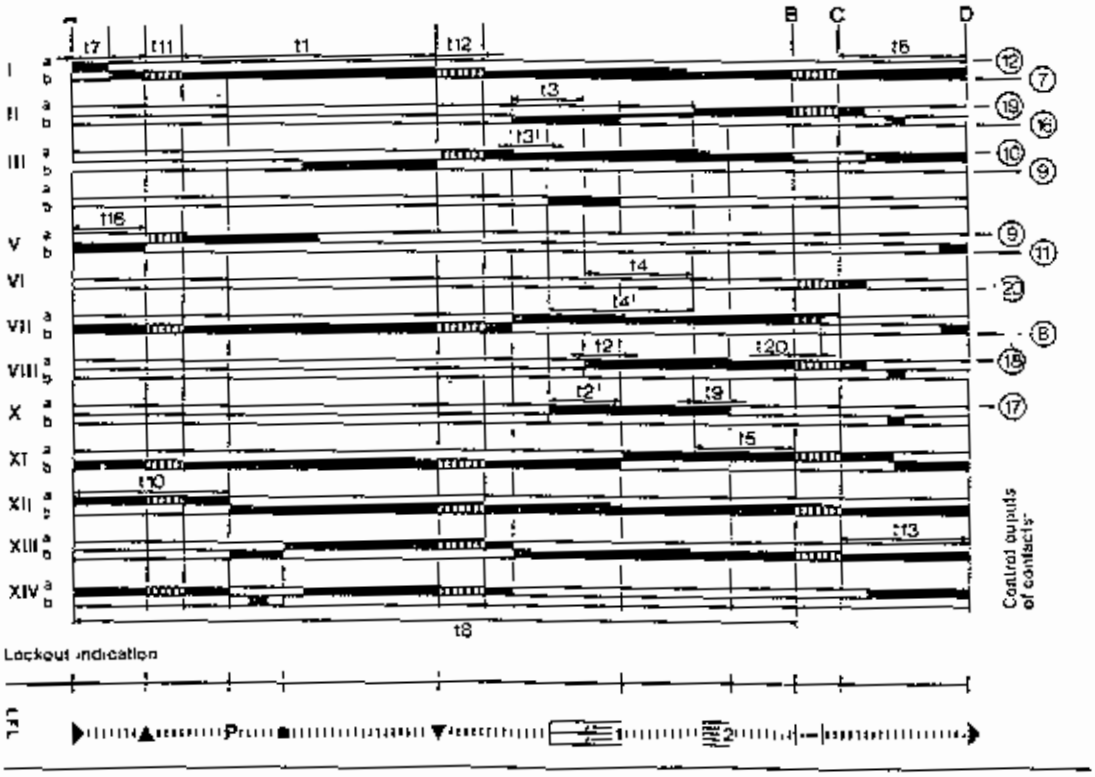
Switching time in seconds in the sequence of the burner start up valid for frequency of 50 Hz. for 60 Hz frequency switching times are reduced by approximately 20%.

LFL1.638 Series 01

Figures in **bold type** (rounded up) = digits of unit type reference

		Large natural draught burners
t7	Start up time for fan motor G2	2.5
t16	Interval from start up to OPEN command for air damper	5
t11	Running time for air damper to OPEN position	
t10	Interval from start up to start of air pressure check	10
t1	Pre-purge time with air damper open	67,5
t12	Running time for air damper to MIN position	
t3,t3'	Pre-ignition time	t3: 5
t2,t2'	Safety time or 1st safety time with burners using pilot burners	t2: **2,5** t2': 5
t4,t4'	Interval between start of t2 resp. t2' and release of valve at terminal 19	t4: 12.5 t4': 15
t9	2nd safety time with burners using pilot burners	**7.5**
t5	Interval between end of t4 and release of load controller or valve at terminal 20	12.5
t20	Interval up to the self shutdown of the sequence switch after burner start up	-

-	Duration of start up (without t11 & t12)	105
t6	Post purge time	15
t13	Permissable after burn time	15
-	Response time to loss of flame	<1



CONTROL PROGRAMME OF THE SEQUENCE SWITCH

t1 Pre purge time
t2 Safety time
t2 * 1st safety time
t3 Pre ignition time
t3' * Pre ignition time
t4 Interval between tension on terminals 18 & 19
t4' *Internal between tension on terminals 17 & 19
t5 Interval between tension on terminals 19 & 20
t6 Post purge time
t7 Interval from start up to tension on terminal 7
t8 Duration of start up sequence

Interruption of the start up sequence because the position signal for low flame position has not been supplied to terminal 8 by the auxillary switch "M".

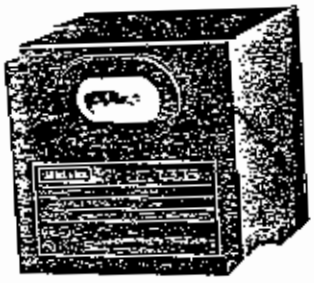
1. **Lockout** because no flame signal has been received on completion of the 1st safety time

2. **Lockout** because the flame signal has been received on completion of the 2nd safety time (flame signal of the main flame with interrupted pilot burners).

   Lockout because the flame signal has been lost during burner operation or air pressure failure has occured.

   Lockout on completion of control programme sequence due to extraneous light (eg flame not extinguished leaking fuel valves) or due to a faulty flame signal (eg aged UV-tube, fault in flame supervision circuit or similar)

   If lockout occurs at any other point between start and pre-ignition, which is not marked by a symbol, there is normally a premature ie faulty flame signal.



LFL 1.....Series 01

a-b Start up sequence

a-b' With some variants "Idle steps" of the sequence switch up to the self shut down after burner start up (b' = running position of the sequence switch)

b(b')-a Post purge sequence after controlled shut down. In start position "A" the sequence switches itself off automatically or initiates immediately another burner start up (eg after a fault has been corrected).

Duration of safety time with expanding flame burners

Duration of safety times with interrupted pilot burners.

When lockout occurs, the control can be reset immediately. After the resetting (and also after the correction of a fault which resulted in a controlled shut down or after each mains failure) the sequence switch always runs through to its start

position, whereby only terminals 7,8, 10, and 11 receive voltage in accordance withe the control programme. It is only then that the control unit programmes a fresh burner start up.

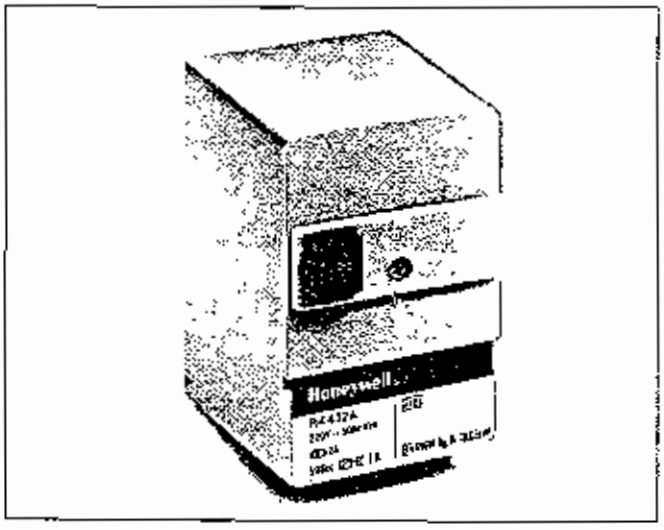
17.12 CONTINUED (1988 boilers use L&G LFL controller)

b) Flame Safeguard Control

In the event of failure of the flame safeguard control box, the complete unit should be replaced. Under no circumstances should repair work be carried out other than by the manufacturer.

R9 Series Boilers

R4412A Control Boxes



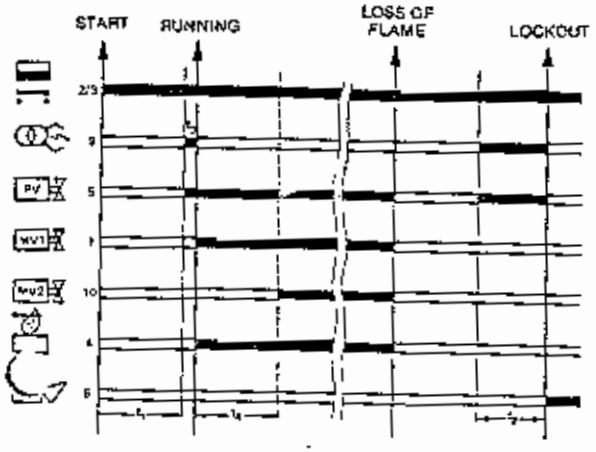
CHECKING THE FLAME CURRENT

The flame current should have a minimum value of 2 microamps. his figure should be checked after installation and after a system failure by connecting adc micro ammeter (range o to 10 micro amps) to the flame ionisation test point in the boiler wiring tray (see section b))

SYSTEM OPERATION.

When the boiler temperature controller calls for heat, a waiting period 9t1) elapses before the ignition transformer , and gas pilot burner, are switched on. The ignition spark ignites the pilot gas and the resulting flame is detected by the flame rod . If the flame is not established within the minimum of 10 seconds after pilot gas release (safety time t2) the control locks out. The ignition transformer is switched off immediately after establishment of the flame (y3) and the first main gas valve MV1 is switched on. The second gas valve . MV2 (if used) will be switched on approximately 30 seconds (t4) afterwards. f the flame is lost during normal run, the control repeats the start sequence.

SYSTEM OPERATION



18. REMOVAL OF BURNERS

- With burner tray removed (See 17.5 and 17.6)
- R9 only - remove nuts and bolts (1) and burner bar retaining bracket (2) Fig 47.
- R18 only - Remove bolts (1) and burner bar retaining plate (2) Fig 48.
- Remove air separation bracket on top of burner manifold (1) Fig 49
- Lift burner up (2) and away from gas manifold (3) Fig 49
- Remove injectors with box spanner provided and which is situated inside cable tray. Clean injectors in suitable solvant.
- Pilot burner only. See fig 50
- Remove wires from electrodes by detaching at pilot burner (1)

18. REMOVAL OF BURNERS

- With burner tray removed (See 17.5 and 17.6)
- R9 only - remove nuts and bolts (1) and burner bar retaining bracket (2) Fig 47.
- R18 only - Remove bolts (1) and burner bar retaining plate (2) Fig 48.
- Remove air separation bracket on top of burner manifold (1) Fig 49
- Lift burner up (2) and away from gas manifold (3) Fig 49
- Remove injectors with box spanner provided and which is situated inside cable tray. Clean injectors in suitable solvant.
- Pilot burner only. See fig 50
- Remove wires from electrodes by detaching at pilot burner (1)
- Remove ionisation and ignition electrodes by releasing securing nut and bolt (2)
- Lift burner up and to rear of the burner orifice
- Replace all items in reverse order, ensuring that the burners and retaining clips are correctly located (2) Fig 47, (2) Fig 48, (1) Fig 49

Fig 47

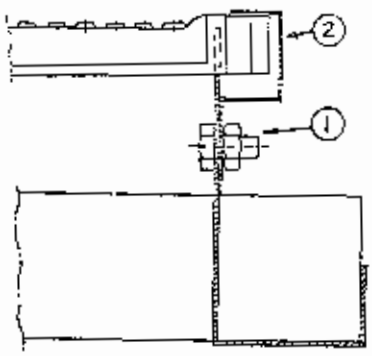


Fig 48

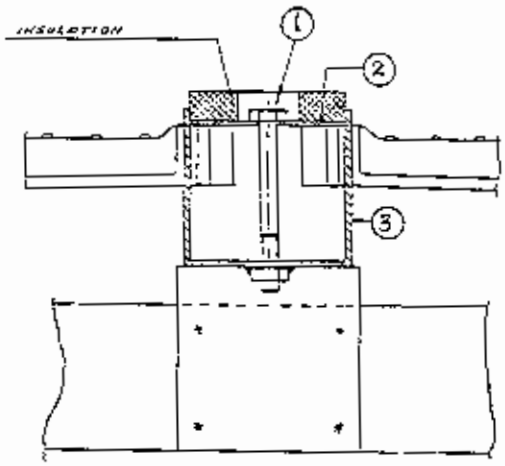


Fig 49

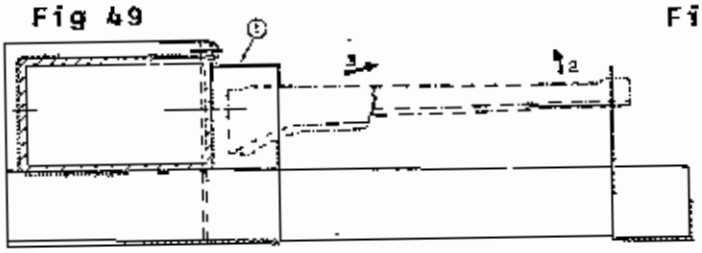
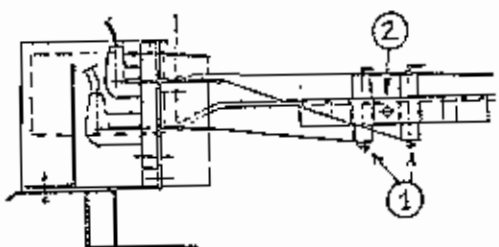


Fig 50



19. ALIGNMENT PROCEDURE FOR AIR DAMPER AND GAS MODULATING VALVE

19.1. GENERAL

The servomotor and interconnecting linkage to the gas modulating valve and secondary air damper are factory set to give optimum performance across the modulating range.

Since the gas modulating valve linkage is permanently fixed to the operating linkage, there are no adjustments that can be carried out. Also, should it be necessary to replace the gas modulating valve, it will be supplied complete with the factory set linkage (1) Fig 51.

The servomotor maximum and minimum position limit switches, burner start up switch and cascade sequence switch are all factory set and should under no circumstances should there be changed.

19.2. ADJUSTING MINIMUM DAMPER OPENING R9 (W505)

The damper minimum opening is factory set, but this setting should be checked when it has been necessary to disconnect the damper linkage for burner tray removal. The minimum opening is 4mm which is maintained by the spacer plates on the four underside corners of the burner frame (1).

- Let the servomotor run to the minimum position by turning the switch to on and the temperature control to minimum.
- The motor will stop by itself. Check the damper opening is equally aligned from the bottom boiler frame.
- Adjustment if necessary is made by releasing the two locking bolts (3), and the adjustment bolt locking nuts (4)
- Turn the adjustment nuts (5) so that the 4mm gap is equal around the damper. Lock in position (4) and secure the locking bolts. (3).
- If not necessary to adjust the maximum air damper position

19.3. ADJUSTING MINIMUM DAMPER OPENING R18 (Fig 53)

The damper minimum opening is factory set, and will only require checking if the damper has had to be removed or replaced.

The minimum opening is 8mm which is maintained by the spacer plates on the four underside corners of the burner frame (1)

- Let the servomotor run to the minimum position by turning the switch to on and the temperature control to minimum.

- The motor will stop by itself. Check the damper opening is level and equally aligned from the bottom boiler frame (2).

- Adjustment is necessary is made by releasing the two locking bolts (3) and the four adjustment bolt locking nuts (4)

- Turn the adjustment nuts (5) so that the 8mm gap is equal around the damper. Lock in position (4) and secure the locking bolts (3).

Fig 51

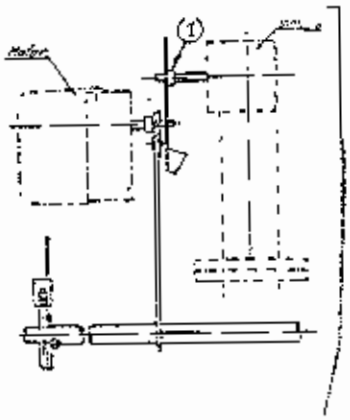


Fig 52

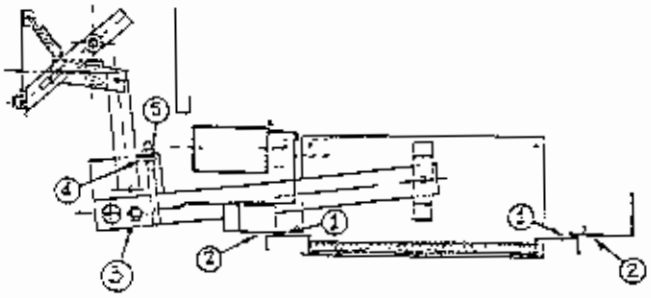
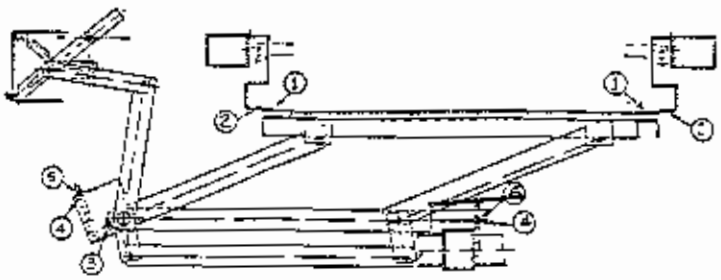
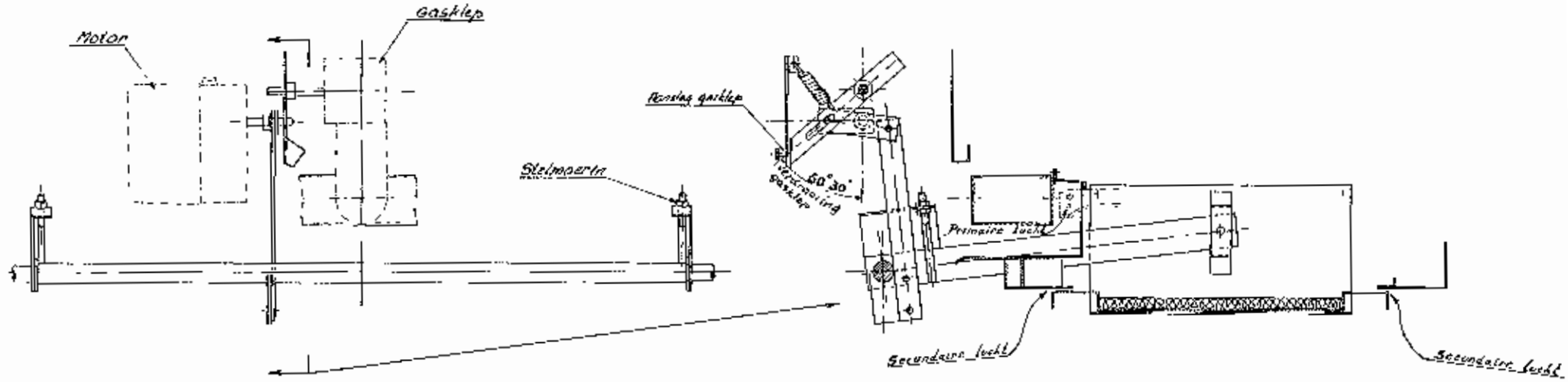
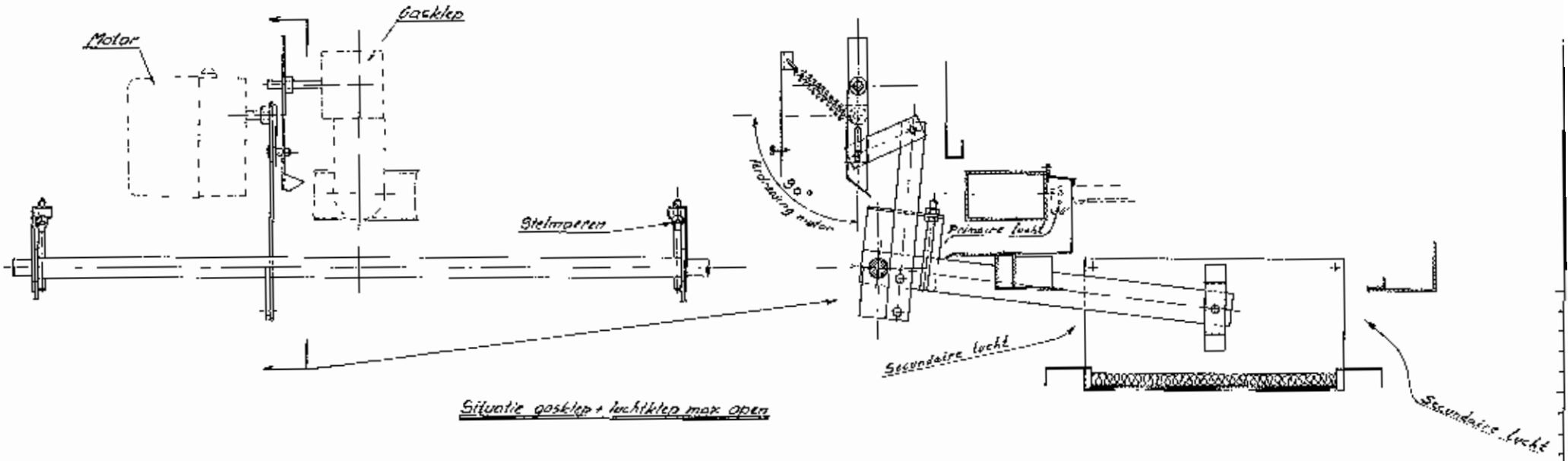


Fig 53





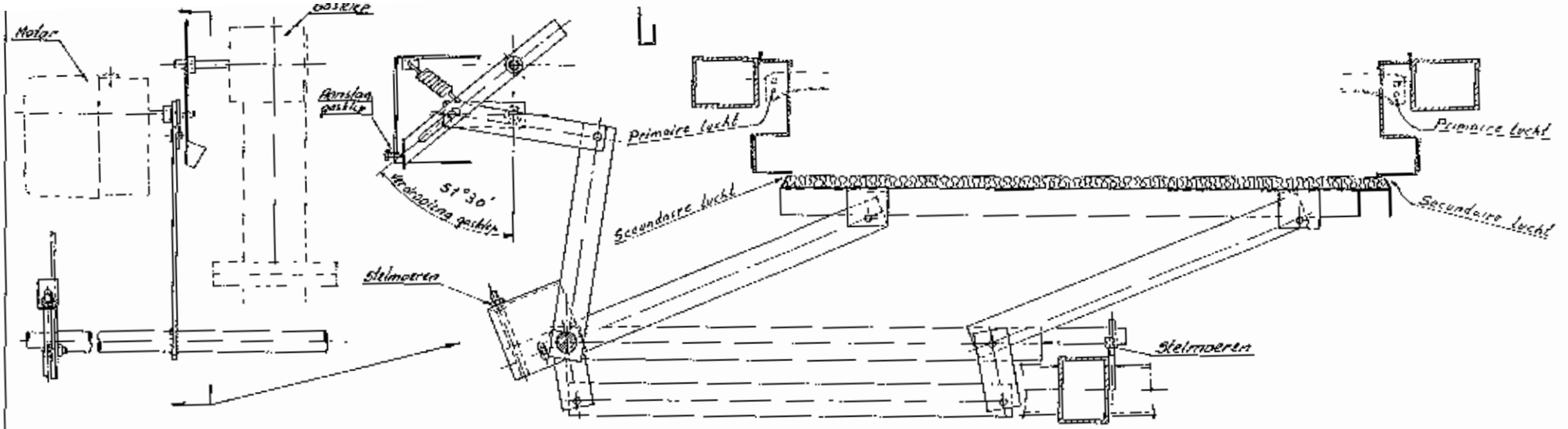
Situatie gasklep + luchtklep gesloten



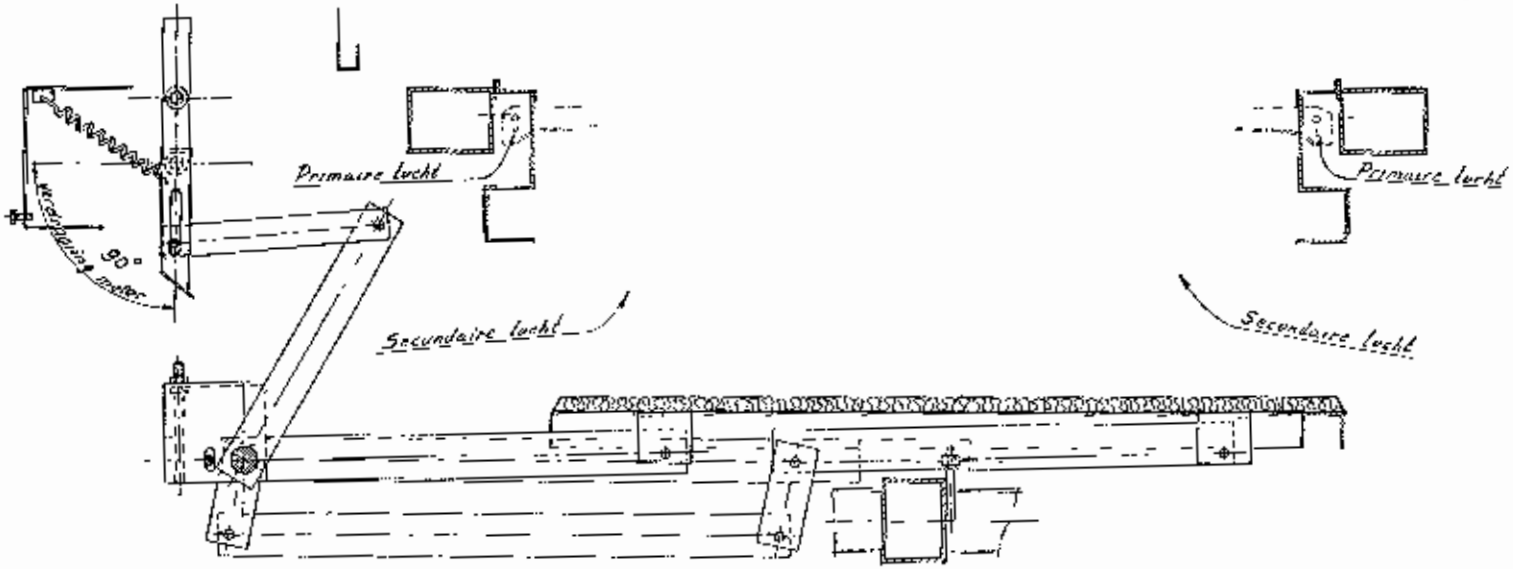
Situatie gasklep + luchtklep max open

POS	AANT.	BENAMING	MAT.	OPMERKING
		Berger/Lohr motor "Rendomax" R-9 Type 28/140 en "Condensamax" R-9 Type 34/105.		

A 26-2-'85 GEWIJZIGD	PROJ METH.	DAT 10-10-84	GET.	W 505	A
		SCH. 1:5	GEZ		



Situatie gasklep + luchtklep gesloten



Situatie gasklep + luchtklep max open.

POS	AANT.	BENAMING	MAT.	OPMERKING
		Berger/Lahr motor "Rendamax" en "Condensamax" R-18 Type 132/280		

A	26-2-'85	PROJ METH.	DAT 16.10.'84	GET	W 506
GEWIJZIGD			SCH 15	GEZ	A

20. FAULT FINDING TABLE

FAULT	POSSIBLE CAUSE	REMEDY
Boiler will not start	No electrical current	Turn on
	No heat demand	Set temperature regulator for heat demand
	No gas pressure	Turn on gas cock
	Gas supply pipes not purged of air	Purge
	Electrically, live neutral is reversed	Rectify problem
	Potential voltage difference between neutral & earth	Trace electrical wiring for the the earth leakage and repair
	Flame safety relay is damaged	Replace
	No ignition	See procedure
	No pilot flame	See procedure
No ignition	Electrically, the ignition transformer live/neutral is reversed	Re-wire
	High voltage wire is loose at ignition transformer	Attach
	Poor contact in the connector cap	Replace
	Aluminium feed through wire is loose	Attach
	Electrode is damaged	Replace

FAULT	POSSIBLE CAUSE	REMEDY
No pilot flame	Pilot gas supply not turned on	Turn on
	Gas supply pipes not purged	Purge
	Pilot gas pressure regulator incorrectly adjusted	Adjust
	Pilot valve will not open	Check voltage over pilot valve
	Voltages present at the pilot valve. Valve will not open	Replace pilot valve
Lock out directly after start	Insufficient pilot flame pressure	Adjust
	Too high pilot flame pressure	Adjust
	Poor contact in the ionisation electrode connector cap	Clean contact, adjust screw
	Aluminium feed through wire is loose	Attach
	Electrode is damaged	Replace
	Electrode is dirty	Replace
	Ionisation current is too low	Check pilot flame pressure
	Flame safeguard control	Replace relay
	No water flow through the boiler	Turn pump on
	Insufficient water flow	Check bypass and water valves

	Pumps turn in wrong direction	Re-wire pump
	Overheat cut off device tripped	Check flow temp
	Flow temp correct	Replace overheat stat
	Flue gas extraction fan not operating (R18 only)	Replace
Main burner will not light	Main gas valve will not open	Check for voltage
	Start switch in modulating motor not operating	Replace unit
	No voltage at the main gas valve	Replace auxiliary relay
	Still no voltage at the main gas valve	Replace flame safety relay
	There is voltage at the main gas valve but valve will not open.	Replace solenoid
	Modulating motor will not react	See procedures
Modulating motor will not react	Electronic temperature regulator is faulty	Check or replace
	Motor receives regulation voltage but will not turn	Replace motor
	Signal coming out of the temperature is erratic	Check water temp sensor, regulator or replace

FAULT	POSSIBLE CAUSE	REMEDY
	When automatic return is used motor is mechanically stopped	Check and replace auxiliary relay - check mechanical linkage and replace if damaged
	Air damper will not close	Check if air is mechanically damaged, repair or replace
Complaints of noise	Insufficient water flow	Check water flow against QPT diagram and adjust
	Capacity too high	Check gas rate and adjust
	Air in system	Purge
	Dirt in water filter	Clean water filter/strainer
	Air in system	Purge
	Dirt in water filter	Clean water filter/strainer
	Regulation temperature wrongly set (too high for system)	Check flow temp
	Pump noisy or vibrating	Replace or refit
	Wrongly positioned feed and vent	Reposition on suction side
	Heat exchanger blocked	Check internally
	Calcium build up	Remove chemically

21. SHORT LIST OF PARTS

Description	Boiler model
Honeywell R 4412 A Flame Safeguard	34 - 77 *
Danfoss 52 L 00 30 D ign transformer	34 - 280
Dungs MV 202 pilot solenoid valve	34 - 280
McDonnel & Miller FS4 water f/switch	34 - 280
Berger Lahr STM 30 servomotor	34 - 280
Ignition/ionisation electrode	34 - 280
Feed through electrode assembly	34 - 280
Pilot burner	34 - 105
Pilot burner	132 - 280
Piston Kronert on/off switch	34 - 280
Burner bars	34 - 280
L&G RWF 31 temp controller	34 - 280
L&G QAE 21 temp sensor	34 - 280
1.85mm injectors	34 - 280
Kromschroder VLA02D solenoid	34 - 77
Kromschroder VNA02D solenoid	34 - 77
L&G SKP 10.11102 valve motor	90 - 280
L&G SKP 20.21102 valve motor	90 - 280
L&G RAK 21.4030 overheat cut off	34 - 280
L&G LFL 1.148 flame safeguard	90 - 280
Rotodyne S6 400 fan motor	132 - 280
Huba 500.90.15 pressure switch	132 - 280
Jeavons 80.056 membrane	34 - 280
Jeavons J 48 1" membrane	34
Jeavons J 48 1 1/2" membrane	41 - 77
Sprecher & Schuh CS431Z auxillary relay	34 -280

* replaced by L&G LFL

22. CONDENSAMAX R9 and R18 SERIES BOILERS - USERS INSTRUCTIONS

The Condensamax boiler is a modulating atmospheric gas fired boiler with modulation of the secondary air. Ignition is by spark ignition and flame failure control using an ionising probe flame sensor.

The boiler is a constant flow temperature boiler and modulates over the output range 30% to 100% to maintain the set flow temperature. At outputs of less than 30% the boiler operates in an on/off mode.

Before commencing to light the boiler make sure that the water system is fully operational.

22.1. TO LIGHT

Ensure that the gas and electrical supplies are connected and the pumps are running. Switch boiler on. In case of failure press re-set button on flame safeguard control after 10 seconds.

If the boiler fails to light after the third attempt turn off the gas and electrical supplies and call the service engineer.

22.2. TO TURN OFF

To turn off for short periods switch boiler off.

To turn off for long periods switch boiler off and turn off pumps, gas and electrical supply.

22.3. CONSTANT TEMPERATURE CONTROL

The desired temperature should be selected on the graduation of the temperature controller (15) Fig 1, (11)(12) Fig 2, 0-100 Deg C. During operation the control signals for open (Y1) and closed (Y2) are indicated by the light emitting diodes.

22.4. PROTECTION AGAINST LOW WATER FLOW

The Condensamax boiler incorporates a flow switch which will operate if there is insufficient water flowing through the boiler.

The operation of this switch will cause the boiler to go to lock out. On re-establishing the water flow press the reset button on the flame safeguard control box. It is necessary to wait for one minute to allow the controls to automatically reset.

22.5. OVER HEAT PROTECTION

An overheat cut off device is incorporated in the boiler to protect it against excessive overheating. If this should operate the reason should be determined.

To re-light the boiler press the re-set button on the overheat cut off device and flame safeguard control box re-set button.

22.6. VENTING THE SYSTEM

If an excessive amount of air us allowed to circulate around the system and the boiler, this will lead to excessive noise and possible damage to the heat exchanger. It is important that the system be vented of air during installation and provision made for automatic venting of boiler and all systems high points during normal operation.

22.7. RE-FILLING THE SYSTEM

Should, for any reason, water be lost from the system ensure that it is automatically replaced by checking that, on open system, the ball valve in the header tank is working correctly. In sealed system this is done by the use of a temporary connection to the mains water supply.

NOTES

1. Do not place anything (clothing, linen etc) touching or so that it may fall into the boiler or its flue pipe

2. Do not use the boilerhouse for storage or airing

3. Do not block or obstruct any permanent ventilation - grilles or ducts providing combustion and ventilation air to the boiler and boilerhouse.

4. If you consider the boiler is malfunctioning, turn off boiler and seek expert assistance.

5. To keep the boiler casing clean wipe over with a soft cloth.

6. If ay any time a gas leak is suspected, turn off the gas supply - DO NOT USE NAKED LIGHT - and contact your local Gas Region immediately.

22.8. FROST PRECAUTIONS

If the boiler is in a vulnerable position it should be protected by a frost thermostat. If the boiler is likely to be closed down for extended periods during the cold weather the boiler and systems should be drained.

22.9. SERVICING

To obtain troublefree operation and to maintain efficiency it is important that the boiler is serviced at least once per year in the manner recommended by the manufacturers. An annual maintenance contract can be provided by :-

R S Stokvis & Sons Ltd
Pool Road
East Molesey
Surrey
KT8 OHN

Tel : 01-941-1212
Telex : 917116
Fax : 01-941-4136