

# Flexiflame 280 & 420 MKI



## Installation, Maintenance and Operating Instructions

The installation of these boilers must be carried out by a competent person

# INTRODUCTION

The Flexiflame 280 and 420 are developments of the widely used Flexiflame 140 and comprise two or three standard boiler assemblies connected together in one casing. The boiler assemblies (modules), each with an output of 41 kW (140,000 Btu/h), are mounted vertically above each other providing high output to floor space and high output to weight ratios.

The Flexiflame 280 and 420 are supplied with flanged water and gas connections to allow the simple connection of second or subsequent boilers. Each boiler has an integral common flue and is contained in a pre-assembled case that permits easy access for installation and maintenance.

## DESCRIPTION

1. Steel chassis.
2. Aluminium flue duct.
3. Copper finned tube heat exchanger.
4. Steel, dry wall, lined, combustion chamber.
5. Gas section. ON/OFF with two stage gas valve for quiet and stable ignition.
6. Water section. Differential pressure, water section assures gas valve cannot open until pump (10) is operating.
7. Flame spillage overheat thermostat.
8. Flow isolating valve.
9. Return isolating valve.
10. Grundfos pump.
11. High temperature overheat thermostat.
12. Stainless steel all gas burner with permanent pilot and thermo-electric valve flame failure protection.
13. Piezo ignitor.
14. Levelling bolts.
15. Boiler thermostat and electrical connection box.
16. Flanged gas header.
17. Flanged water monotube (insulated).
18. Double pole isolating switches for each module.
19. Fuses for each module.
20. Built in draught diverter. (Fitted on Flexiflame 280 supplied separate with the Flexiflame 420.)

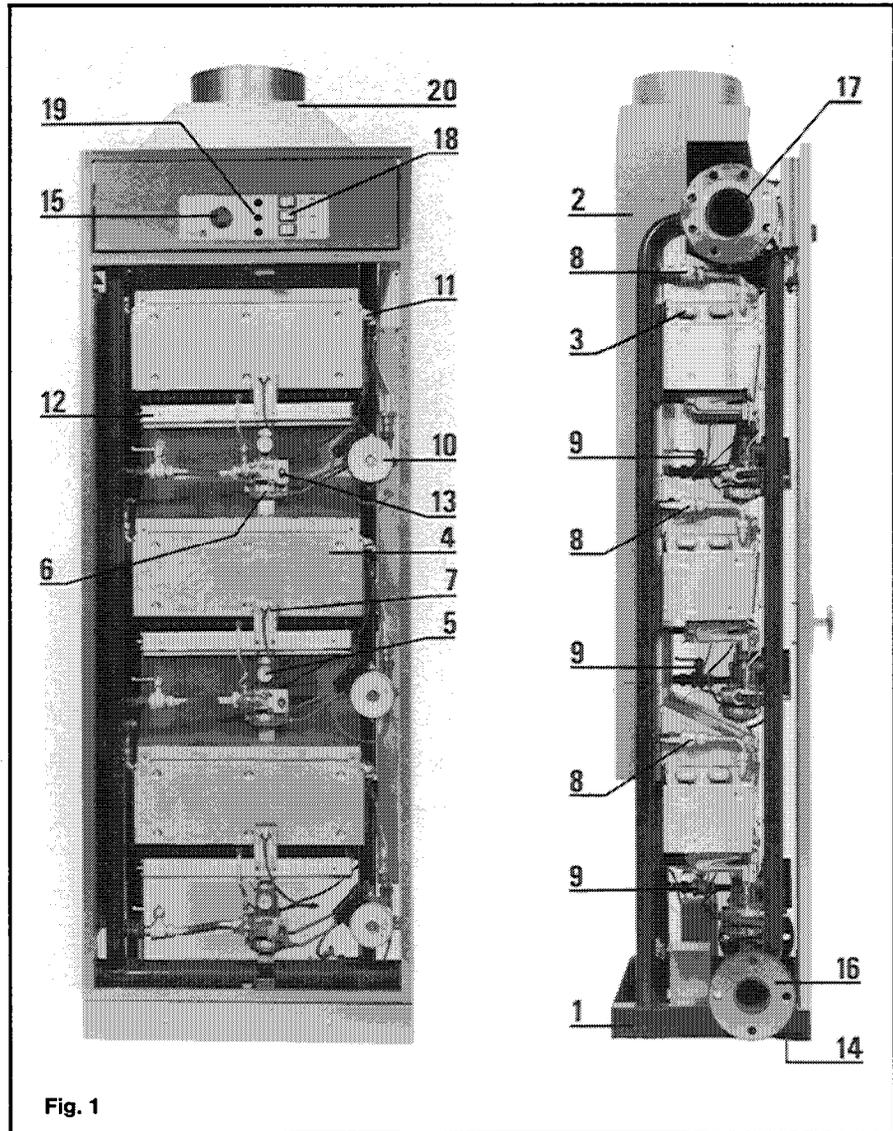


Fig. 1

**Please note** – If side panels are required to complete an installation, please consult installation instructions section 4 before ordering boilers.

## INSTALLATION AND OPERATING FEATURES

The Flexiflame 280 and 420 are designed to be used in installations where space for plant accommodation is limited, and where modulating output is a requirement. Three features distinguish these boilers from others of comparable output.

**Compact Construction** – The materials and methods of construction produce the following output to floor space ratios.

CORVEC Flexiflame 280 - equivalent to 268 kW/m<sup>2</sup>

CORVEC Flexiflame 420 - equivalent to 399 kW/m<sup>2</sup>

These ratios will be of particular significance where existing plant rooms are required to provide higher output, and where roof top installations are under consideration.

**System design** – The use of a unique monotube water flow arrangement obviates the need to include boiler resistance in pump sizing. Each module is provided with a pump to overcome the resistance of the associated heat exchanger. The modules are connected in parallel to a single water flow pipe (monotube) flanged at each end for simple connection to the system or additional boilers. This arrangement simplifies design, particularly in changeover installations where existing pump sizes may not be known. The boilers must be used with indirect systems and should only be used in multiples. The 280 should not be less than 2 off and the 420 not less than 3 off.

**Controls** – The boilers are fitted with simple controls suitable for use in a wide variety of applications. On/off control

of modules is by starting and stopping the associated pump either under the influence of the boiler thermostat or an external control signal. Each boiler is fitted with a variable setting thermostat that brings modules under fire at 1 °C intervals. Where more than one boiler is installed, continuous sequencing of modules can be effected, either by using boiler thermostats or by using an external signal from a step controller. Each module also includes a water stopping device that prevents unnecessary water circulation through unfired modules.

The boilers are arranged in series to provide increments of temperature rise to match variations in load and hence return water temperatures. The boilers are designed for a system temperature drop of 20 °C (36 °F), but the monotube arrangement provides a built-in bypass feature for temperature differences of less than 20 °C. Figures 3 and

4 show a typical boiler arrangement and a schematic layout of a single boiler.

The Flexiflame 280 & 420 boilers must only be used with indirect fully pumped systems.

The system circulating pump should be sized relative to the resistance of the connected load and the system design  $\Delta t$  selected. The mass flow rate through the monotube should not be less than 0.6 l/s (8.1 gpm) per **module** and the temperature difference across the monotube should not be greater than 20° C.

**Example :**

2 × model 280 = 4 modules = minimum flow rate through the monotube of 2.45 l/s (32.4 gpm)

2 × model 420 = 6 modules = minimum flow rate through the monotube of 3.68 l/s (48.6 gpm).

## DIMENSIONS

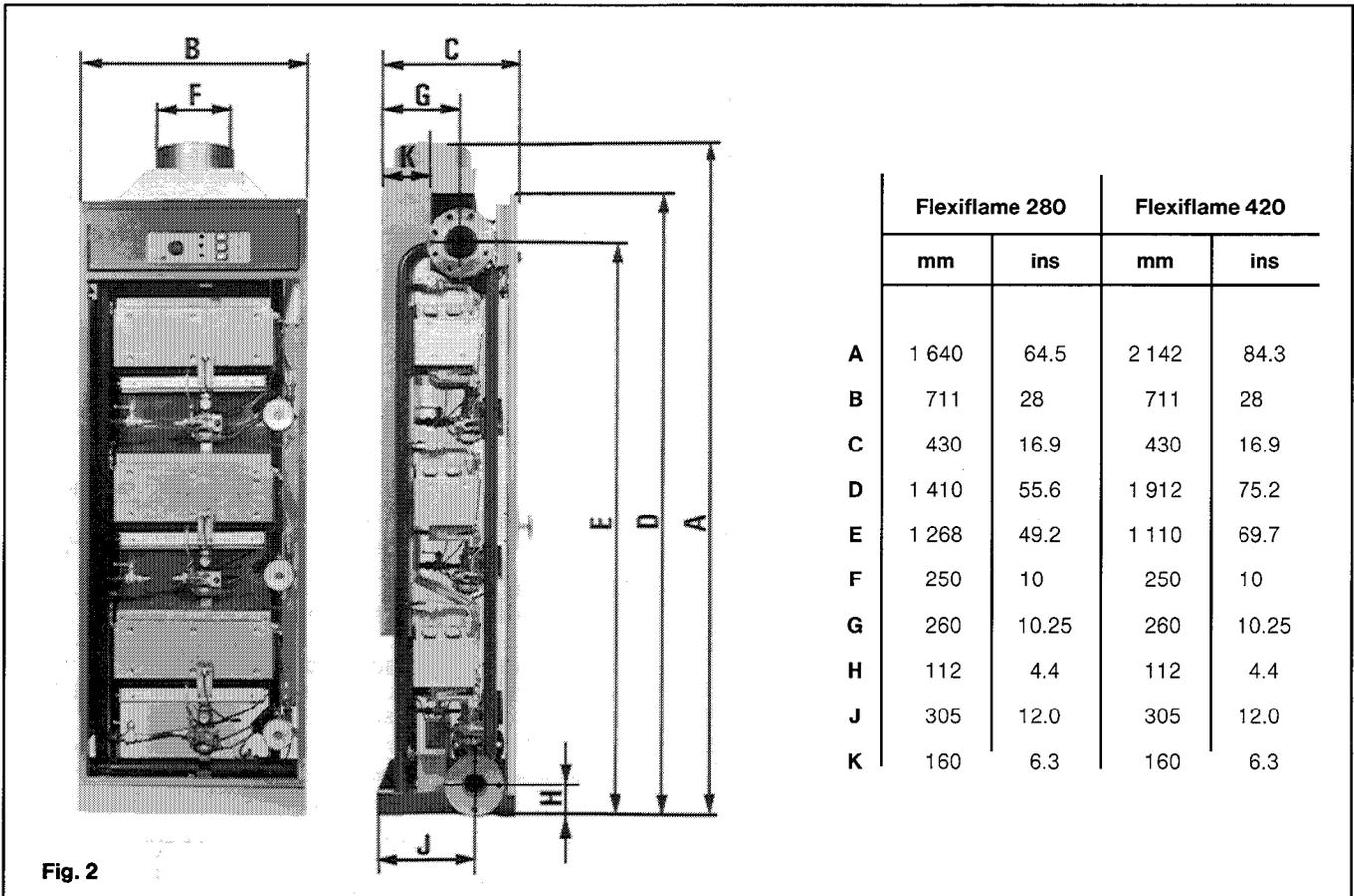


Fig. 2

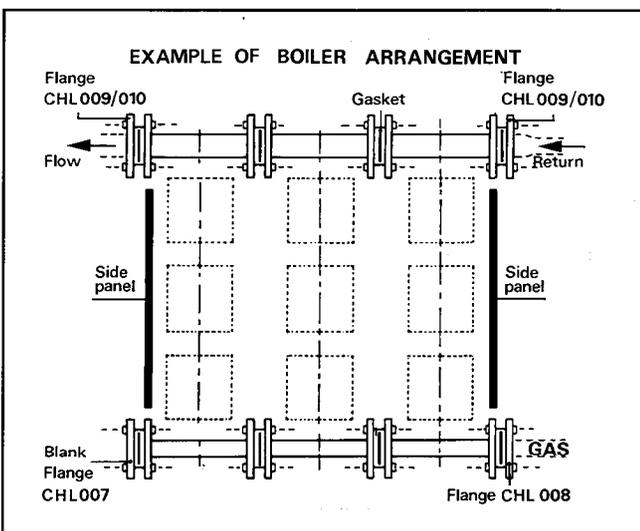


Fig. 3

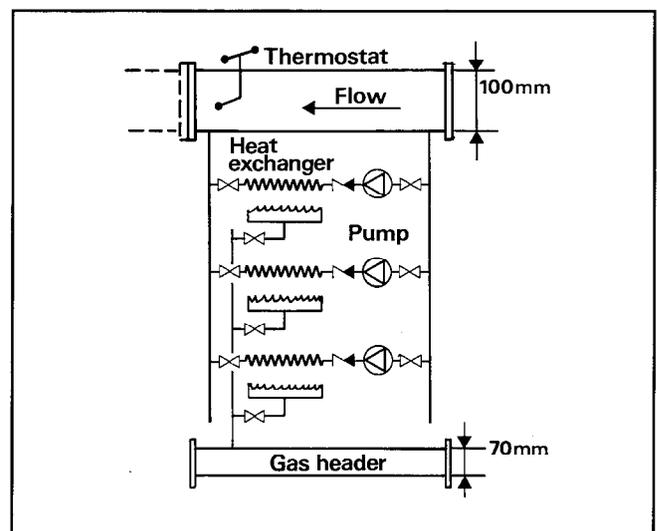


Fig. 4

## DESIGN DATA

The installation of the boiler(s) must be in accordance with the relevant requirements of the Gas Safety Regulations, building regulations, I.E.E. Regulations and the byelaws of the local Water Undertaking.

It should be in accordance also with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents :

The Building Regulations – 1976

The Gas Safety Regulations – 1972

The Public Health Act – 1936

British Gas Publications – Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters (1979)

"Combustion and Ventilation Air – Guidance Notes for Boiler Installations in excess of 586 kW output"

British Standards

BS 864 : Part 2 – "Capillary and compression tube fittings of copper and copper alloy"

BS 1387 – "Steel tubes and tubulars suitable for screwing to BS 21 pipe threads"

BS 2871 : Part 1 – "Copper tubes for water gas and sanitation"

BS 2871 : Part 2 – "Copper and copper alloy tubes for general purposes"

BS 4504 : Part 1 – Flanges and Bolting for pipes, valves and fittings

Code of Practice

BS CP 331 : Part 3 – "Gas supplies to appliances"

BS CP 332 : Part 3 : 1970 (4.5) – "Air for Combustion and Ventilation for Installations of up to 586 kW output"

BS CP 341 300 - 307 – Central Heating by low pressure hot water

BS CP 342 – Centralized hot water supply :

Part 1 - Individual dwellings

Part 2 - Buildings other than individual dwellings

**Chaffoteaux Limited Services** – Chaffoteaux Limited are delighted to assist with technical and design enquiries on all the product range. Chaffoteaux Limited do not normally prepare working drawings for installations, but all Consultants and Designers are encouraged to submit their proposals to the Company for comment.

Chaffoteaux Limited have Technical Advisers, who, for a normal fee to cover travelling and time, are available to commission installations throughout the United Kingdom. We will attend on site if appliance problems exist, but only where the installer will be present and when Representatives of other manufacturers who may be involved are present.

## INSTALLATION INSTRUCTIONS

**1) Handling the boiler** – The boilers are delivered fully assembled in wooden crates.

The draught diverter is packed separately in the Flexiflame 420.

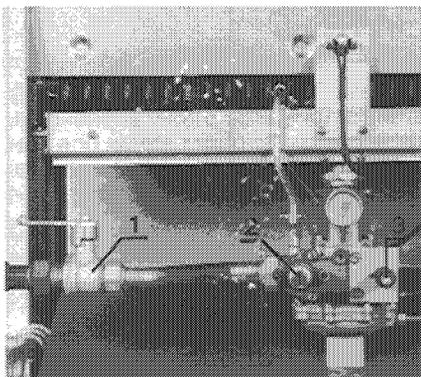


Fig. 5

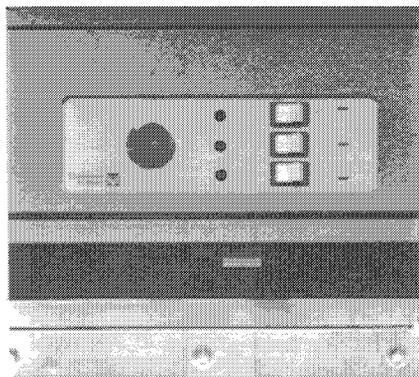


Fig. 6

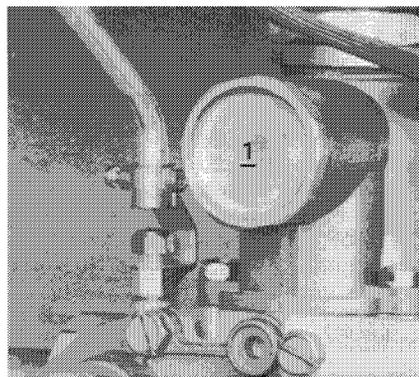


Fig. 7

The delivered weights are 113 kg (280) 155 kg (420).

Remove the wooden crate and any other packing materials.

Remove the accessory boxes and gaskets from within the boiler casing.

**Do not lie the boiler on its back.**

**2) Positioning the boiler** – Check that the proposed boiler location is sufficiently strong to take the weight of the boilers and other components.

No purpose made plinth is required for reasonably even floors.

Position the boilers away from adjacent walls by a minimum of 100 mm (4"). The boilers are self supporting and do not need to be fixed to the structure.

Level the boiler using the bolts provided in the accessory box (14 - fig. 1).

**3) Connecting the boilers** – For multi boiler installations fit the intermediate gaskets and bolt up the flanges.

**Do not connect the end appliances to the system before reading 4.**

**4) Side panels** – Side panels are not supplied with the boilers.

If side panels are required, the following accessories are available from Chaffoteaux Limited.

Component	Part N°
Side panel for 280 (left and right) . . . . .	60675/06
Side panel for 420 (left and right) . . . . .	48580/06
Top brackets 280 & 420 (left and right) . . . . .	48579
Screws 280/420 (six of each required per panel) . . . . .	5799/13
Nuts 280/420 . . . . .	26501/03

Before connecting end appliances to the system, fit side panel support brackets.

**5) Connecting to system** – Mating flanges are not provided with the boilers.

Should mating flanges not be readily obtainable, the following are available from the manufacturer.

Flange	Part N°
Blank for gas supply . . . . .	CHL 007
Mating for gas supply screwed 2 1/2" BSP Internal . . . . .	CHL 008
Mating for monotube screwed 4" BSP Internal . . . . .	CHL 009
Mating for monotube, slip on 4" BSP pipe for welding . . . . .	CHL 010

**6) Draught diverter** – Fit the draught diverter if supplied separately to each boiler and complete flue.

**7) Electrical connections** – Connect the boilers to the electrical supply as shown in the wiring diagram (fig. 12).

**8) Gas connection** – The gas supply can be connected to either end of the flanged manifold. An isolating tap should be fitted adjacent to the boilers.

**9) Water connection** – It is important that the flow and return connections are made so the direction of water flow is from right to left through the boilers.

# OPERATING AND COMMISSIONING INSTRUCTIONS

**10) Filling the system** – Fill the system slowly. The filling operation should be carried out with the flow and return isolating valves on each module (8 and 9 - Fig. 1) fully open.

**11) Lighting the pilots** – Open the gas valve on each module by turning gas cock in line with pipe (1 - Fig. 5). Press the gas control spindle (2 - Fig. 5) and hold in. Light the pilot by pressing piezo ignitor (3 - Fig. 5) and wait for approximately 20 seconds.

Release the gas control spindle (2 - Fig. 5) and the pilot should remain alight. If the pilot will not establish, check that the gas supply to each boiler is purged of air.

Repeat the lighting procedure.

**12) Firing the modules** – Establish the pilots on all modules as in 11.

Set the boiler thermostat on each boiler (Fig. 6) to a minimum, and check that all module isolating switches are off (18 - Fig. 1). The switches are wired to be on when at (\*) and off when at "STOP"

Check that pumps are free by using screwdriver on end of spindle.

Set the primary circulation pump in operation, and check that all system circuits are open and will allow circulation.

Turn up the boiler thermostat (Fig. 6) to the required value, and switch on the individual modules at the isolating switches. The modules should now fire. Check for gas leaks and flue spillage.

**13) Checking the gas rate** – The burner pressure of each module should be checked before completing the commissioning.

Turn off the module to be checked at the isolating switch (18 - Fig. 1) and remove the cap from the volume governor (1 - Fig. 7).

Remove the plug from the pressure test point on the end of the burner manifold and connect a suitable pressure gauge.

Turn on the module at the isolating switch and adjust the gas pressure to the value given in Technical Data on page 3.

Earlier models of the Flexiflame 280 and 420 have a knurled ring fitted around the gas control spindle.

Where this is fitted, screw in to reduce the gas rate, and screw out to increase the gas rate (2 - Fig. 5).

**14) Setting the boiler thermostats** – Where the modules are operated by an external control signal set the boiler thermostat to 50 °C above the maximum expected return temperature.

Where the modules are to be controlled in sequence by the boiler thermostats, the following table details the intervals between thermostat settings for various design temperature drops around the system.

N° of Boilers	Interval between thermostat settings °C			
	T = 20 °C	T = 15 °C	T = 11 °C	T = 8 °C
2	10	7.5	5.5	4
3	7	5	4	3
4	5	4	3	2.5
5	4	3	2.5	–
6	3.5	2.5	–	–
7	3	–	–	–
8	2.5	–	–	–

Where the interval would be less than 2.5 °C, it is recommended that boilers be grouped in pairs or threes, depending on the total number.

e.g. 1 – If 5 boilers were installed to provide a flow temperature of 82 °C at a system drop of 11 °C, the thermostat settings would be 82, 79.5, 77, 74.5 and 72 °C. The boiler nearest the flow would be set at 82 °C and the boiler nearest the return at 72 °C.

e.g. 2 – If 8 boilers were installed to provide a flow temperature of 90 °C at a system drop of 20 °C, the thermostat settings would be 90, 87.5, 85, 82.5, 80, 77.5, 75, 72.5 °C. The boiler nearest the flow would be set at 90 °C and the boiler nearest the return at 72.5 °C.

e.g. 3 – If 12 boilers were installed to provide a flow temperature of 82 °C at a system drop of 11 °C, the thermostat settings would be 82 for boilers 1 and 2, 79.5 for boilers 3 and 4, 77 for boilers 5 and 6, 74.5 for boilers 7 and 8, 72 for boilers 9 and 10, and 69.5 for boilers 11 and 12.

## SERVICING REQUIREMENTS

Chaffoteaux Limited recommend that boilers are serviced annually.

Installers and clients are reminded that the boilers are guaranteed for twelve months from the date of installation. Spare parts lists and prices are available from the manufacturers.

**15-1** Remove the boiler doors by removing lower hinge pin and pulling forwards at the bottom.

Isolate the module to be serviced by turning the isolating switch off (24 - Fig. 1).

Close the gas isolating valve turning gas cock across pipe (6 - Fig. 1).

Release the screw (1 - Fig. 8) holding the pilot supply pipe and remove the pipe (2 - Fig. 8).

Unscrew the union securing the thermocouple to the electromagnet at the rear of the gas section (4 - Fig. 1). Remove electrode lead from piezo, remove both overheat and skirt overheat from heat exchanger, remove complete electrode and thermocouple bracket assembly from appliance with the burner assembly.

Remove the screws holding the burner to the back plate (1 - Fig. 9).

Unscrew the union nut securing the burner to the gas section (2 - Fig. 9).

Clean the burner by removing any deposits with a brush.

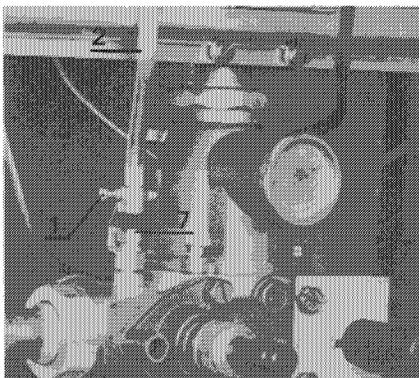


Fig. 8

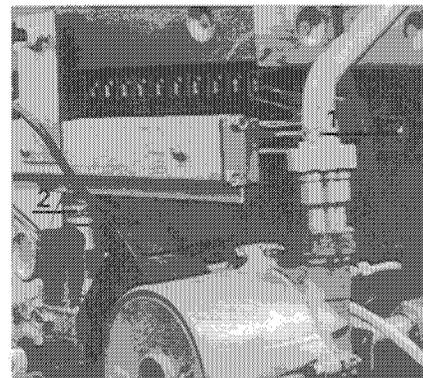


Fig. 9

### 15-2 To remove the pilot

Isolate the module as detailed in 15-1.  
Release the screw (1 - Fig. 8) holding the pilot supply pipe and remove the pipe (2 - Fig. 8).  
Unscrew the pilot injector (7 - Fig. 8) and replace if necessary. Do not attempt to clean the pilot injector as this could result in damage.

### 15-3 To remove the burner manifold

Isolate the module as detailed in 15-1.  
Remove the pilot supply pipes in 15-2.  
Unscrew the manifold retaining screws (3 - Fig. 10) taking care not to release the fusible overhear link.  
Remove the burner manifold and clean away any lint with a soft brush.

### 15-4 To remove the heat exchanger

Isolate the module as in 14 and close the flow and return isolating valves (7 and 8 - Fig. 1).  
Remove the burner as in 15-3.

Drain down the module. Remove right and left hand tubes from heat exchanger. Remove top two front plate screws and four rear retaining screws and lift out heat exchanger. Clean the heat exchanger with very hot water and detergent. Do not use wire wool or similar.  
Replace the heat exchanger using new washers where necessary.  
Replace the burner.

### 15-5 To remove the diaphragm

Isolate and drain down the module as in 17.  
Disconnect the high and low pressure pipes from the water section (2 and 3 - Fig. 11).  
Unscrew the retaining screws holding the water section to the underside of the gas section (4 - Fig. 11).  
Remove self tapping screws and bracket under water section.  
Remove water section.  
Remove screws from water section and split into two halves.  
Replace the diaphragm and "o" ring.  
Re-assemble water section and refit to module.

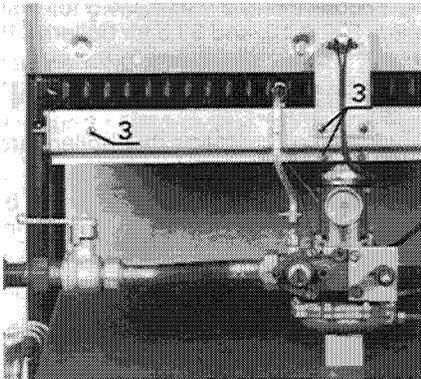


Fig. 10

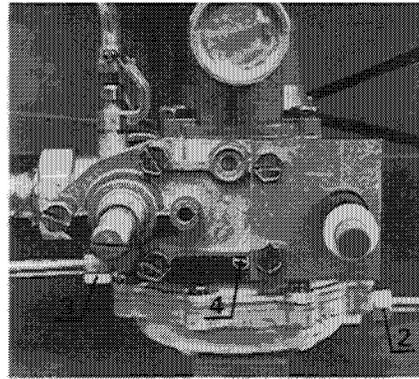


Fig. 11

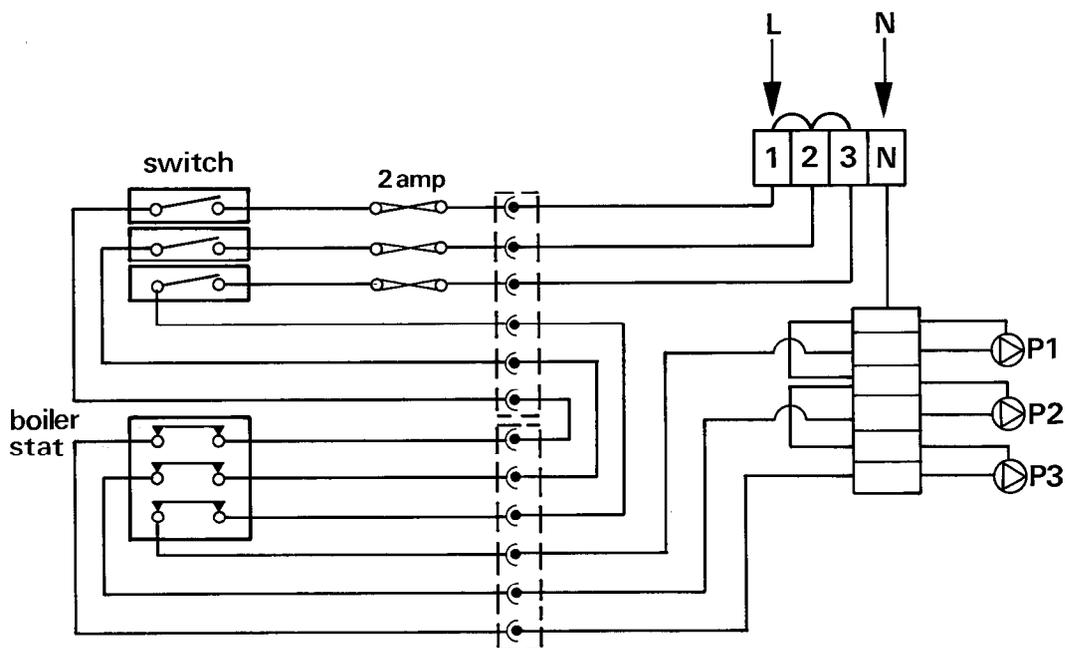


Fig. 12

## Fault finding chart

Fault	Possible cause	Remedy
<b>Pilot will not light</b>	<ol style="list-style-type: none"> <li>1) Gas supply not turned on.</li> <li>2) Gas supply pipes not purged of air.</li> <li>3) Blocked pilot filter or injector.</li> </ol>	<p>Turn on. Purge. Clean or replace (15-2).</p>
<b>Pilot goes out when gas knob is released</b>	<ol style="list-style-type: none"> <li>1) Gas control knob not fully held in before releasing.</li> <li>2) Thermocouple not in tip of pilot flame.</li> <li>3) Pilot flame too soft.</li> <li>4) Faulty thermocouple or union loose.</li> <li>5) Main gas valve not purged.</li> <li>6) Faulty thermoelectric valve.</li> <li>7) Overheat failing.</li> <li>8) Loose connection on overheat thermostat.</li> </ol>	<p>Press firmly before releasing. Adjust (12 milli-volts min. required measured at high limit thermostat). Tighten pilot injector securing nut (15-2). Replace or tighten. Repeat ignition sequence. Replace (15.1). Replace (15.1). Tighten.</p>
<b>Main burner will not light or lights at low flame</b>	<ol style="list-style-type: none"> <li>1) Electricity not switched on to boiler.</li> <li>2) Fuses missing or blown in control box.</li> <li>3) Boiler thermostat at low setting.</li> <li>4) Boiler thermostat faulty or not plugged into control box.</li> <li>5) Gas supply insufficient.</li> <li>6) Lack of water in system.</li> <li>7) Air in system.</li> <li>8) Boiler pump faulty.</li> <li>9) Water filter in return pipe blocked or high pressure and balancing tubes blocked.</li> <li>10) Bearing plate spindle bent or dry.</li> <li>11) Diaphragm split or stretched.</li> <li>12) Heat exchanger blocked.</li> </ol>	<p>Switch on. Replace 1 amp. Turn up fully. Replace or check connection. Check working pressure-8 in w.g. required at inlet. Fill. Purge. Check or replace (10 - fig. 1). Remove and clean. Replace or grease (15-5). Replace (15-5). Descale or replace (15-4).</p>
<b>Complaints of noise</b>	<ol style="list-style-type: none"> <li>1) Over-gassed.</li> <li>2) Air in system.</li> <li>3) Boiler thermostat wrongly set or faulty.</li> <li>4) Water section sticking open.</li> <li>5) Gas valve sticking open.</li> <li>6) Dirt/swarf on gas valve facing.</li> <li>7) Resistance to water flow.</li> <li>8) Pump noise or vibrating.</li> <li>9) Heat exchanger partially blocked.</li> </ol>	<p>Check gas rate and adjust (13-2 - fig. 5). Purge. Check flow temperature. Check operation and grease (15-5). Clean or grease. Clean and reassemble. Open valves. Replace or refit (10 - fig. 1). Clean heat exchanger and check system (15-4).</p>
<b>Excessively noisy burner</b>	<ol style="list-style-type: none"> <li>1) Over-gassed.</li> <li>2) Dirty burner bars.</li> <li>3) Burr on injectors.</li> </ol>	<p>Check gas rate (sec 13 - fig. 5). Clean (13-3). Remove or replace.</p>
<b>Frequent sooting of heat exchanger and burners</b>	<ol style="list-style-type: none"> <li>1) Linting.</li> <li>2) Insufficient combustion air to room or compartment.</li> <li>3) Heat exchanger fins blocked.</li> <li>4) Restriction in flue.</li> <li>5) Wrong injectors fitted.</li> </ol>	<p>Clean burner (13-3). Check requirements. Remove and wash thoroughly (15-4). Check flue. Check and replace (Page 3).</p>
<b>Gas staying on after pump is switched off</b>	<ol style="list-style-type: none"> <li>1) High pressure or balancing tubes blocked.</li> <li>2) Gas valve sticking open.</li> <li>3) Water section sticking open.</li> </ol>	<p>Remove and clean. Clean and grease. Clean and grease.</p>

TECHNICAL DATA	280	420	280	420
Output .....	81.4 kW	122.1 kW	280,000 Btu/h	420,000 Btu/h
Input .....	104 kW	156 kW	354,000 Btu/h	532,000 Btu/h
Gas Rate .....	9.6 m <sup>3</sup> /h	14.4 m <sup>3</sup> /h	338 ft <sup>3</sup> /h	508 ft <sup>3</sup> /h
Burner Pressure .....	15 mbar	15 mbar	6 ins w.g.	6 ins w.g.
Burner Injector Diam. ....	1.18 mm	1.18 mm	0.046 ins	0.046 ins
Pilot Injector Diam. ....	0.30 mm	0.30 mm	0.012 ins	0.012 ins
Height .....	1640 mm	2142 mm	64.5 ins	84.3 ins
Width .....	710 mm	710 mm	28.1 ins	28.1 ins
Depth .....	430 mm	430 mm	16.9 ins	16.9 ins
Weight .....	113 kg	155 kg	249 lbs	342 lbs
Water Content .....	15 litres	18 litres	3.29 galls	3.9 galls
Max Flow Temperature .....	110 °C	110 °C	230 °F	230 °F
Max Return Temperature .....	90 °C	90 °C	194 °F	194 °F
Min Static Head .....	0.3 bar*	0.3 bar	10 ft w.g.*	10 ft w.g.
Max Static Head .....	7.0 bar	7.0 bar	233 ft w.g.	233 ft w.g.
Flue Connection 10 in. Ø (250 mm Ø)				
Electrical Supply 240 V a.c. 50 Hz				

\* All combustion data is for natural gas. For data on town and LP gases, please contact Chaffoteaux Limited.

\* Minimum static head for flow temperatures not exceeding 82 °C (180 °F).

## DESIGN DATA

(i) **Hydraulics** – The maximum number of boilers that can be installed in series dependent upon the maximum mass flow capacity of the monotube. The following tables detail the total monotube resistance for installations of up to 2442 kW (8.3 million Btu/h) output, and for various system design temperature drops.

### CORVEC Flexiflame

No. of Boilers	Total Output kW	Total Length of Monotube m	Total Monotube Resistance in Metres w.g.			
			T = 20 °C	T = 15 °C	T = 11 °C	T = 8 °C
1	81.4	0.71	Total Monotube Resistance in less than 0.01 Metres w.g.			
2	162.8	1.42				
3	244.2	2.13				
4	325.6	2.84				
5	407	3.55				
10	814	7.10	0.03	0.01	0.01	0.02
15	1221	10.65	0.07	0.15	0.24	0.46
20	1628	14.20	0.20	0.32	0.58	1.07
25	2035	17.75	0.36	0.62	1.12	–
30	2442	21.30	0.62	1.04	1.91	–

### CORVEC Flexiflame

1	122.1	0.71	Total Monotube Resistance in less than 0.01 Metres w.g.			
2	244.2	1.42				
3	366.3	2.13				
4	488.4	2.84				
5	610	3.55				
10	1221	7.10	0.05	0.10	0.17	0.32
15	1831.5	10.65	0.17	0.30	0.53	1.02
20	2442	14.20	0.41	0.69	1.27	–

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