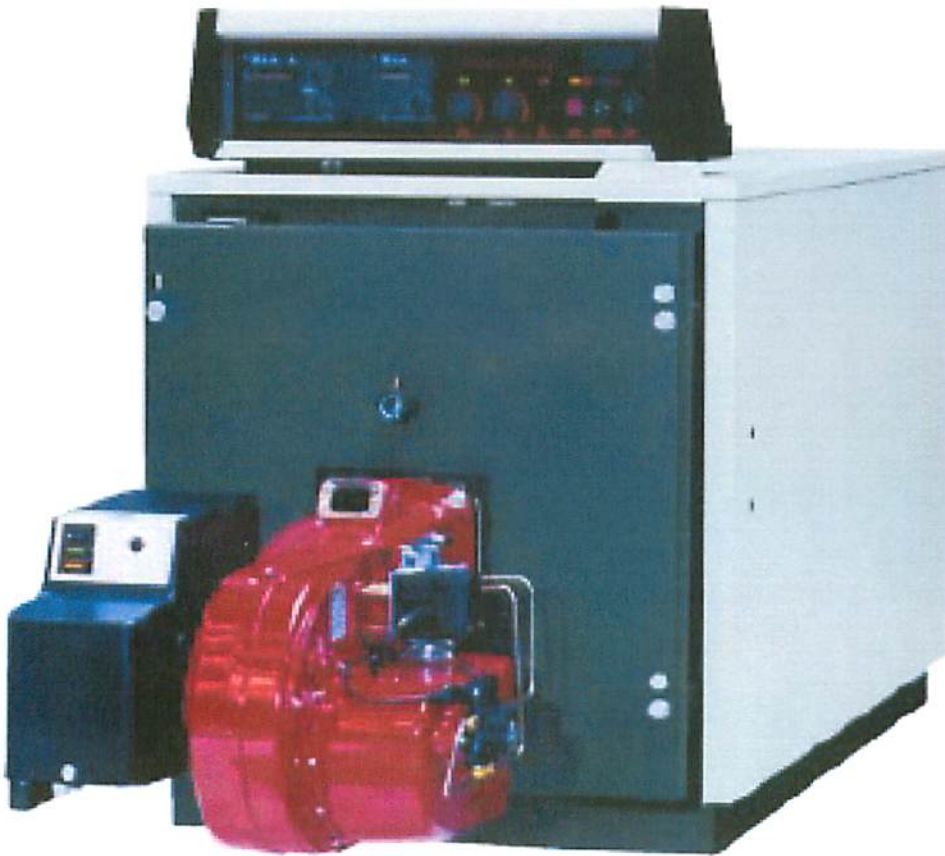


Arizona Evolution 1

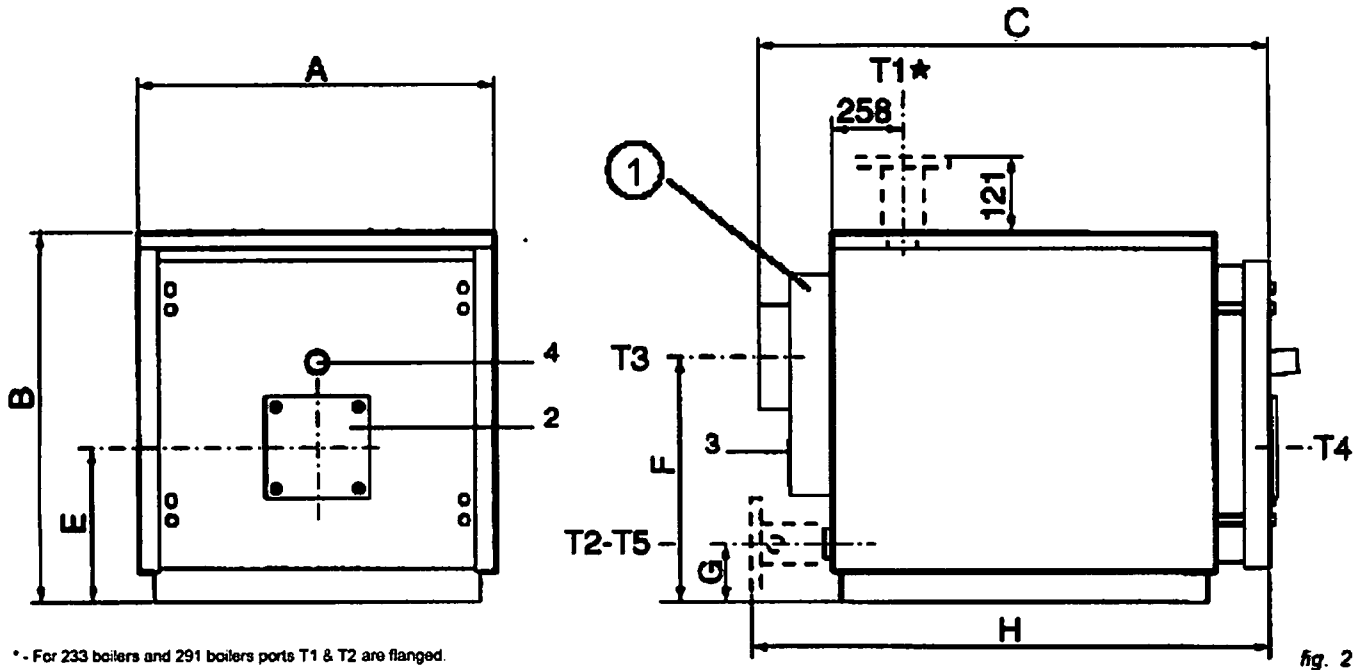
INSTALLATION, OPERATION & MAINTENANCE MANUAL



May 2006

POTTERTON
COMMERCIAL

Fig.1 – General Data & Dimensions (mm) (NOT TO SCALE)



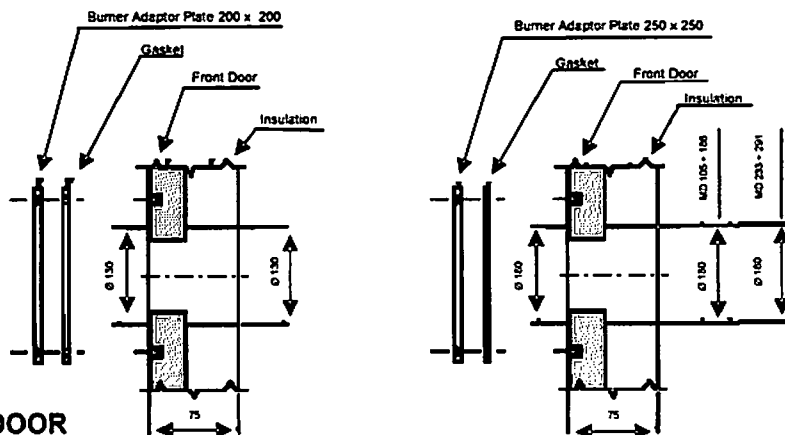
* - For 233 boilers and 291 boilers ports T1 & T2 are flanged.

fig. 2

- | | | |
|------------------------|-------------------|----------------|
| 1 Removable Smoke Box | 4 Flame Viewer | T3 Flue |
| 2 Burner Support Plate | 5 Heating Inlet | T4 Burner Port |
| 3 Sweeping Door | T2 Heating Outlet | T5 Drain |

Types	Useful Power (kW) kcal/h	Total Power (kW) kcal/h	Dimensions							Connections				Combustion Chamber Dimensions Ø x Lg mm	Boiler Water Capacity ltri	Water Load Losses (°) m c e	Smoke Load Losses mm c e	Max Service Pressure bar	Ports kg
			A mm	B mm	C mm	E mm	F mm	G mm	H mm	T1 - T2 ISO 7/1 UNI 2279 PN 16 Rp 1 1/2	T3 Ø mm	T4 Ø mm	T5 Ø mm						
90	(93) 80 000	(107) 99 000	690	722	990	305	450	115	-	Rp 1 1/2	Ø0	130	Rp 1/2	390 x 870	60	0.16	2.5	5	190
116	(115) 100 000	(128) 119 000	760	812	1205	350	500	130	-	Rp 2	200	160	Rp 1/2	390 x 850	126	0.10	3	5	200
140	(140) 120 000	(155) 145 000	760	812	1205	350	500	130	-	Rp 2	200	160	Rp 1/2	390 x 850	126	0.14	5	5	280
162	(160) 150 000	(200) 177 000	760	812	1305	350	500	130	-	Rp 2	200	160	Rp 1/2	390 x 1030	151	0.25	14	5	318
233	(233) 200 000	(255) 222 000	890	937	1437	421	560	165	1452	DN 65	250	160	Rp 1/2	470 x 1070	200	0.22	18	5	420
291	(291) 250 000	(322) 277 000	900	937	1687	421	590	165	1732	DN 65	250	160	Rp 1/2	470 x 1320	247	0.30	22	5	400

(*) Load losses corresponding to one Δt = 15K.



DETAILS OF DOOR DRILLING
ARIZONA 93

DETAILS OF DOOR DRILLING
ARIZONA 116 + 291

Table 3 – Technical Data

Arizona Model		93	116	140	186	233	291	
CE Certification Number		0694BM3697						
Output	kW	93	116	140	186	233	291	
Input	Net	kW	102.0	128.0	155.0	206.0	258.0	321.9
	Gross/GAS	kW	113.2	142.1	172.1	228.6	286.4	357.3
	Gross/OIL	kW	109.1	136.9	165.8	220.3	276.0	344.3
Fuel Options		Natural Gas, LPG or Class D 35 Second Oil ONLY						
1 Fuel Consumption	GAS	m ³ /hr	10.8	13.5	16.4	21.8	27.3	34.1
	OIL	lit/hr	10.7	13.0	15.4	20.1	26.0	32.0
Efficiency	Net	%	91.2	90.6	90.3	90.3	90.3	90.4
	Gross/GAS	%	82.2	81.6	81.4	81.4	81.4	81.5
	Gross/OIL	%	85.3	84.7	84.4	84.4	84.4	84.5
2 Maximum Design Pressure	Bar	5 BAR ALL MODELS						
2 Minimum Operating Pressure	Bar	0.3 BAR ALL MODELS						
3 Normal Flue Connection Size	mm Ø	200				250		
4 Flue Gas Volume	GAS	m ³ /hr	109	137	165	220	275	344
	OIL	m ³ /hr	116	145	176	234	293	365
4 Flue Gas Temperature (Net)	°C	201						
5 Flueway Volume (Incl. comb chamber volume)	m ³	0.057	0.101	0.101	0.123	0.185	0.229	
Flue Draught Requirements		2 – 4 mmwg						
6 High Level Natural Ventilation to BS 6644	cm ²	To be filled by POTTERTON according BS 6644						
6 Low Level Natural Ventilation to BS 6644	cm ²	To be filled by POTTERTON according BS 6644						
7 Water Connection Size (Flange PN6 or PN16)	mm	2"				DN65		
8 Water Flow (Nominal) at 11°C ΔT	lit/sec	2.0	2.5	3.0	4.0	4.9	6.2	
Water Flow (Minimum) at 20°C ΔT	lit/sec	1.1	1.4	1.6	2.2	2.7	3.4	
8 Hydraulic Resistance at 11°C ΔT	mbar	30	19	26	46	41	56	
9 Cold Feed Size to BS 6644 Minimum Bore	mm	To be filled by POTTERTON according BS 6644						
9 Open Bent Size to BS 6644 Minimum Bore	mm	To be filled by POTTERTON according BS 6644						
Safety Valve Size to BS 6644 Nominal Size	mm	To be filled by POTTERTON according BS 6644						
2 Maximum Flow Temperature	°C	90°C ALL MODELS						
10 Minimum Return Temperature	°C	60°C ALL MODELS						
Overheat Thermostat Setting	°C	110°C ALL MODELS (NOT ADJUSTABLE)						
11 Dry Weight	kg	174	251	251	267	383	437	
Water Content	litres	86	126	126	151	203	247	
Power Requirements		230 V 50Hz – Control panel (Optional 415 V 50 Hz 3ph – Burner)						

1. FUEL CONSUMPTION

Gas fuel consumption is based on natural gas with a gross calorific value of 38.6MJ/m³. The has rate should be corrected for the meter supply pressure particularly on high pressure supplies to prevent over firing.

2. MINIMUM OPERATING PRESSURE

This is the minimum operating pressure of the boiler with pumps operating (NOT static pressure). The requirements of the Health and Safety Executive guidance note PM5 regarding maximum operating temperatures should be observed.

3. BOILER FLUE CONNECTION

A spun aluminium flue adaptor is included for inconvenience that is designed to accommodate BS835 twin wall flue pipe. It is not obligatory to use this adaptor but always ensure that the internal diameter of the flue used is no smaller than the connection on the flue collector hood (see table 3 for nominal flue connection size). For transport the adaptor is tie wrapped to the flue hood.

4. FLUE GAS VOLUME

Flue gas volume are given at STP (standard temperature and pressure [15°C and 1013.25 mbar]. Typical flue gas temperatures for flue sizing are 140°C at 6.5% CO₂ with 1mm draught at the boiler flue connection.

5. NATURAL VENTILATION

The sizes indicated are free grille areas and are based on a single boiler installation.

6. MECHANICAL VENTILATION

The volume given is for a single boiler installation.

7. WATER CONNECTION SIZES

The boiler water connections are screwed BSP connections up to 18 section and the 20 and 22 section sizes are flanged 2 ½ " with screwed counter flanges.

NOTE: Only one flow connection and one return connection can be used on each boiler.

8. WATER FLOW RATES

Water flow rates are given for boiler flow and return temperature differentials of 11°C.

9. COLD FEED/OPEN VENT/SAFETY VALVE SIZES

Sizes indicated are minimum sizes for single boiler installations.

10. MINIMUM RETURN TEMPERATURE

If system return temperatures below 55°C are required then contact Potterton Commercial Technical Department.

11. WEIGHT

The dry weight is inclusive of the gas train. Each section measures approximately 800mm (high) x 500mm (wide) x 80mm (deep) and weighs approximately 40kg.

ANY PERSON OR PERSONS MOVING OR LIFTING SHOULD BE TRAINED IN MANUAL HANDLING TECHNIQUES AND IF NECESSARY USE SUITABLE LIFTING EQUIPMENT TO REDUCE THE RISK OF INJURY TO THEMSELVES OR OTHER PEOPLE.

WARNING

If the boiler is fitted with an air draught gas burner that does not belong to any of the categories dealt with in Appendix II of Directive 97/23/EC (pressurized equipment), but is dealt with in Directive 90/396/EEC (gas appliances), clause 1, paragraph 3, line 6.5; then it is considered to be out of the scope of the first directive.

GENERAL INFORMATION**Introduction**

These technical instructions form an integral and essential part of the appliance and shall be delivered to the end user.

Read the warnings in this booklet carefully as they contain important information concerning installation, operation and servicing safety.

Keep this booklet safe for further use.

These technical instructions contain details of how every task should be performed during boiler installation, servicing and operation.

Installation

Installation of the boilers and of auxiliary parts of the heating system shall comply with all current standards and regulations.

Installation and commissioning of the boilers and the heating system shall be performed by authorised and professionally qualified persons.

A professionally qualified person is someone with the relevant technical skills in the field of heating system components for domestic heating and hot water production, and in particular, the customer service personnel authorised by the manufacturer.

Commissioning

The main aim of commissioning is to check that all the safety and monitoring devices function correctly.

Before leaving the installation, the person responsible for commissioning shall monitor the boiler for at least one complete operating cycle.

Standards

The installer shall comply with local regulations on heating, safety devices, flues, fuel supply lines, electrical systems and all other local requirements and safety instructions.

Certification

The boilers have been EC certified to operate using gas by TECHNIGAS (BELGIUM) that has awarded the boilers a certificate of compliance with the following European Directives:

- Gas Appliances Directive (90/396 EEC), valid as of 1st January 1996
- Efficiency Directive (92/42 EEC) valid as of 1st January 1998
- Compliance with Low Voltage Directive (73/23 EEC), valid as of 1st January 1997 has been checked and confirmed by GASTEC ITALIE.
- Compliance with Electro-Magnetic Compatibility Directive (89/336 EEC), valid as of 1st January 1996, is not required for these boilers as they do not have any electronic components.

Data badge and series number

The boiler data badge is supplied in the information folder. This badge shows the series number that is stamped on an aluminium plate riveted on to the front tube plate in the bottom right hand corner.

Utilisation

These boilers shall be used to reheat water to a temperature no higher than the boiling point reached under installation conditions.

Guarantee

The boiler guarantee is linked to the information in this booklet.

The boiler shall be installed in accordance with good working practice and in compliance with EU and UK standards:

- D.T.U. 65-11 Safety systems for central heating installation in buildings October 1973
- D.T.U. 65-4 Technical requirements for gas and liquified hydrocarbon fired boiler houses – September 1978
- D.T.U. 70-1 Electrical installations in housing – February 1988
- ACCORD INTERSYNDICAL – Joint Union Agreement 2nd July 1969 (Reminder)

1. Water characteristics

The water in the hydraulic circuit shall always comply with the following characteristics:

PH ≥ 7.2

TH $\leq 25^{\circ}$

Resistivity $r \geq 2000$ W/cm

Note: If TH $\geq 25^{\circ}$, a water softener shall be provided.

If TH $\leq 25^{\circ}$, the other 2 values shall be reached by film treatment or by another type of treatment.

2. Purging device

To avoid any accumulation of gas in the upper part of the boiler, a suitable purging device shall be fitted directly on the boiler outlet without a low point or any insulation.

The correct operation of these purging devices shall be regularly monitored.

3. Filling and water supply

Filling and water supply shall always be restricted, and be monitored using a metering device in all cases.

If a large supply of fresh water is introduced, the system automatically requires monitoring.

If this water does not comply with the characteristics above, a softener must be added to treat the water.

4. Excess pressure

In no circumstances shall the pressure exceed the maximum service pressure indicated on the data badge, included with each boiler model.

5. Water circulation safety device

A safety device linking the circulators to burner operation is indispensable, so that:

- the burner cannot start up if the circulators have not first been activated;
- the burner stops immediately if the circulators stop operating.

6. Water shortage safety device

A safety device, possibly fitted with an alarm system, shall be capable of immediately stopping the burner if a water shortage is detected in the boiler.

7. Permanent recycling flow rate

The boilers require a permanent recycling flow rate between the generator water flow and return.

To be sufficient, this flow rate shall have the following value:

$$Q \geq \frac{P \times 0.86}{45} \quad , \text{where:}$$

Q in m³/h = recycling flow rate

P in kW = useful boiler output

8. Fuel flow rate

The fuel flow rate shall be governed by the boiler power. It should be remembered that 100kW power requires a flow rate of:

- 1.01kg/h of FUEL OIL
- 8.8 kg/h of OIL
- 9.6 m³ of GAS

3.1 Boiler construction

The boilers have a horizontal cylinder with a reverse flame. All aspects of construction comply with the instructions given in European Standard EN 303 part 1.

The steel sheets of the pressurised parts are S235JRG2 steel, in accordance with standard EN 10025, certified 3.1.B compliant in accordance with EN 10204; and the pipes are SR 37.0 steel in accordance with DIN 1626.

Welding and welding procedures have been certified compliant with Standards EN 287 - EN 288 by the TÜV (D) – UDT (PL) – SAQ (S) and ISPESL (I).

The boiler combustion chamber is covered with an insulation jacket of 60 mm thick glass wool, in turn protected by a mineral fibre fabric.

The upper part of the boiler body is provided with handling hooks.

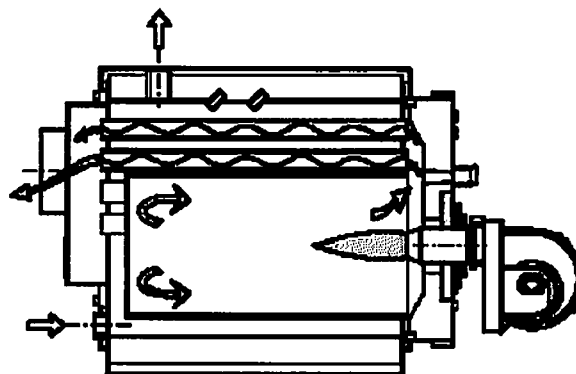
The boilers are provided with 2 thermometer pockets with an internal diameter of 15mm (with room for 3 bulbs each), to receive the thermostats and thermometer bulbs.

The jacket side panels are provided with ports for routing the cables for the power supply, pumps, burner and any other auxiliary devices

3.2 Operating principle

The boilers are fitted with a single entry combustion cylinder. The central burner flame reverses peripherally back to the front, where the burnt gases enter the fire tubes; at the end of the fire tubes the gasses collect in the smoke box and are sent up the flue.

When the burner is in operation within the boiler output range the combustion chamber is always under pressure. For this pressure valve see the tables on pages 5 and 6, in column "Smoke load losses". The flue shall be fitted so that no positive pressure can be detected at its base.



4.1 Packaging

The boilers are supplied with the fire door and the smoke box already assembled.

The sheet casing and rock wool insulation jacket are delivered in separate cardboard packaging and shall be installed once the heater body has been positioned in the boiler room.

After having removed all the packaging, make sure that all the contents are present.

If in doubt, do not use the appliance and contact the supplier. The packaging items (cardboard boxes, nails, clips, plastic bags, polystyrene etc.) must not be left in the vicinity of children.

Before beginning installation, ensure that the length and the width of the boiler body received correspond to dimensions A and C respectively, of the boiler ordered, as indicated in the preceding tables, and that the cardboard packaging containing the jacket components have the same model number.

In the combustion chamber will also be found:

- 1 box containing the hydraulic connection flanges, with the joints and the bolts and a cylindrical brush for sweeping the ducts;
- spring clips to secure the insulating jacket around the boiler body;
- the contact spring(s) for the thermostat bulbs and the thermometer;
- sweeping brush extension;
- a ceramic fibre cord gasket to ensure the burner head is air tight;
- the turbulator rod (for removing the turbulators)

4.2 Handling

The boiler can be easily transported by lifting using the suspension ring located on top of the heater body or by using rollers placed under the high resistance runners of the boiler support base.

If it should be necessary, for reason of space, the fire door and the smoke door can be removed to enable the heater body to be moved into the boiler room.

4.3 Positioning in the boiler room

Boiler installation shall only be performed by a professionally qualified person in compliance with the current standard and regulations, and the manufacturer's instructions shall be followed. Faulty installation may result in damage to people, animals or objects for which the manufacturer shall not be held responsible.

The boiler room shall be well ventilated via openings having a total surface area of no less than 1/30 of the surface area of the boiler room, and a minimum 0.5m². The ventilation shall guarantee the air flow required by current standards and be sufficient to obtain perfect combustion levels.

The air vents shall be located at upper and lower levels in compliance with current standards.

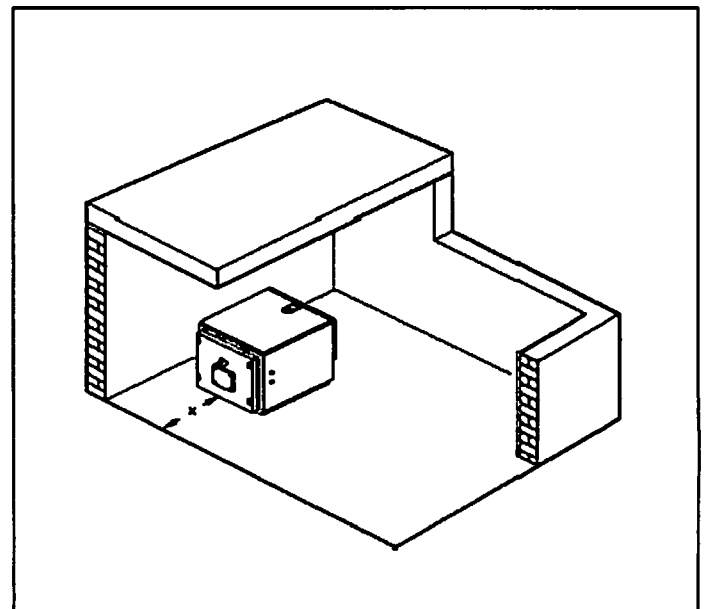
The positioning of the air vents, the fuel supply ducts, mains electricity supply and the lighting shall respect the regulations in force for the type of fuel used.

It is suggested that the boiler should be installed as close as possible to the flue connection.

To facilitate sweeping of the flue, a space should be left around the boiler that is at least as much as the length of the heater body. Check that the door can pivot through 90°, and that the distance between the door and adjacent wall is at least as long as the burner. The boiler may be positioned on the ground, as it is fitted with runners.

We recommend providing a cement base that is flat and level, and capable of supporting the weight of the boiler when filled with water.

When installation is complete, the boiler shall be perfectly horizontal and properly stable (to reduce vibrations and noise)



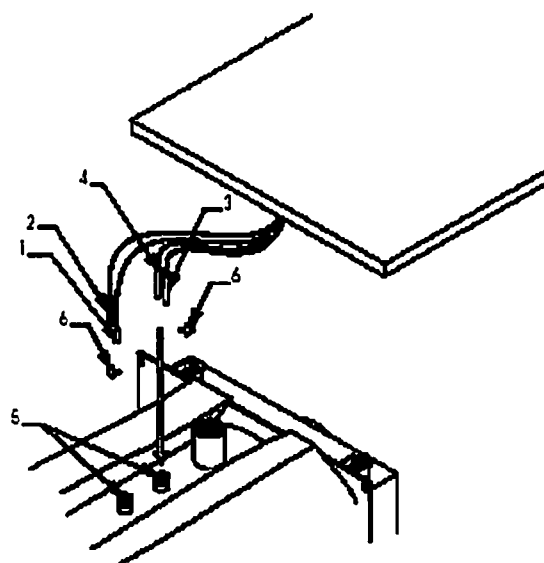
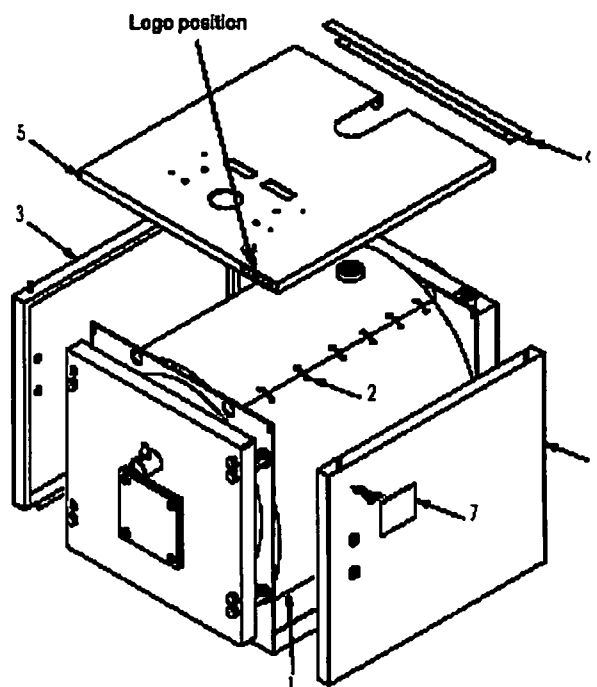
4.4 Fitting the casing

NB. We strongly recommend checking that the boiler is in its definitive position and that all the hydraulic connections have been assembled before beginning to assemble the boiler casing.

Before opening the packaging, ensure that the label on this box corresponds to the boiler model being installed.

Assembly order (see fig. 5 – 6)

- A) Place the insulation jacket (pos. 1) around the body and fix it using the spring clips (pos. 2) that just attach the external insulation jacket material.
- B) Position the side panels (pos. 3 and 4).
 The ports in the side panels should be to the front of the boiler assembly (ports with the plastic cable grommet).
 Insert the lower fold of the side panel into the L-shaped support welded onto the lower part of the boiler body.
- C) Raise the control panel cover after unscrewing the two screws on the side using a screwdriver.
 Secure the front piece bracket on the upper panel (pos.5) and route the electric cables (230V sector – temperature thermostat, pumps, burner, capillaries, etc) through the cable grommets on the side panels and then through the ports in the upper panels; secure the upper panel to the two side panels by routing the capillaries towards the socket.
- D) Insert the sensors in the thermometer pockets in the order shown in Fig.6, then connect the electric wires on the control panel.
- E) Fit the back reinforcement bracket (pos.6) on the upper panel,
- F) Secure the data badge on the side panel, after cleaning the area concerned.
The data badge can be found in the instruction pack.



1. *Thermometer bulb*
2. *1st speed thermostat bulb*
3. *Safety thermostat bulb*
4. *2nd speed thermostat bulb*
5. *Thermometer pocket*
6. *Capillary contact spring*

4.5 Flue connection

The flue is a fundamental importance for correct boiler operation.

The ARIZONA PROGRESS model is a high efficiency boiler. As a result, the smoke temperatures obtained may be lower than 200°C and if the flue is badly insulated or not made properly air tight, the risk of the temperature dropping below condensation point (56°C) is increased.

To avoid condensates and the resulting problem of clogging, the flue shall be fitted with

- correct insulation on each side and along the entire length of the flue duct.

It is essential that the flue is completely impermeable to any combustion product condensates and is constructed with corrosion resistant materials.

Duct insulation on existing flues is possible by using material compatible with oil or gas.

4.6 Installation water characteristics

The physio-chemical characteristics of the water in the heating system and the feed water are fundamental for correct boiler operation and safety.

- Of all disadvantages induced by poor quality of the feeding water, the most serious and frequent is the formation of scale on the boiler heat exchanger surfaces.
- Less frequent, but equally serious, is the corrosion of the water side of the surfaces on the hydraulic circuit.
- It has been proved that due to its low heat conductivity, scale reduces the heat exchanger levels even when just a few millimetres thick, and causes localised overheating.
- We strongly recommend treating the heating circuit water in the following cases:
 - A Very hard water in use (above 20°f)
 - B System requiring a large volume of water
 - C Unexpected water supply to compensate for leaks.
 - D Repeated refillings during servicing work.
 - E A mixture of different metals in the hydraulic circuit.

4.7 Burner assembly

As ARIZONA PROGRESS boilers are pressurized boilers, particular attention should be paid to the choice of burner oil or gas.

Ad of 1st January 1996, gas burners use d in these boilers shall be certified EC compliant with:

- Gas Appliance Directive (90/396 EEC)
- Electromagnetic Compatibility Directive (89/336 EEC).

Before assembling the burner, the position of the turbulators inside the fire tubes shall be checked.

We recommend using long head burners in ARIZONA PROGRESS boilers.

In the table opposite, suggestions are given for the choice of burner:

"A" indicates the maximum diameter and "L" the minimum length of the burner head.

The use of burners functioning at the limits of their capacity is not recommended.

Burner assembly on the fire door shall guarantee perfect air tightness to prevent combustion products escaping.

Among the accessories delivered with each boiler is a ceramic fibre cord gasket that is wound around the burner head so as to completely fill the space between the burner and the burner port door.

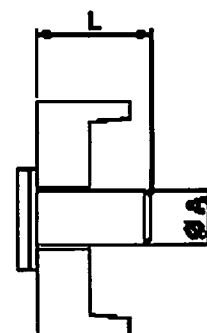
If a burner head is used that is wider than dimension "A", it must be removed before assembling the burner on the support plate, and replaced afterwards.

Ensure that any fuel supply pipes and electric cables are long enough to allow the fire door to open by 90° when the burner is mounted.

For gas burners, the use of flexible steel pipes is not authorised.

For the door opening of gas boilers, ensure easy removal of the end of the gas supply pipe.

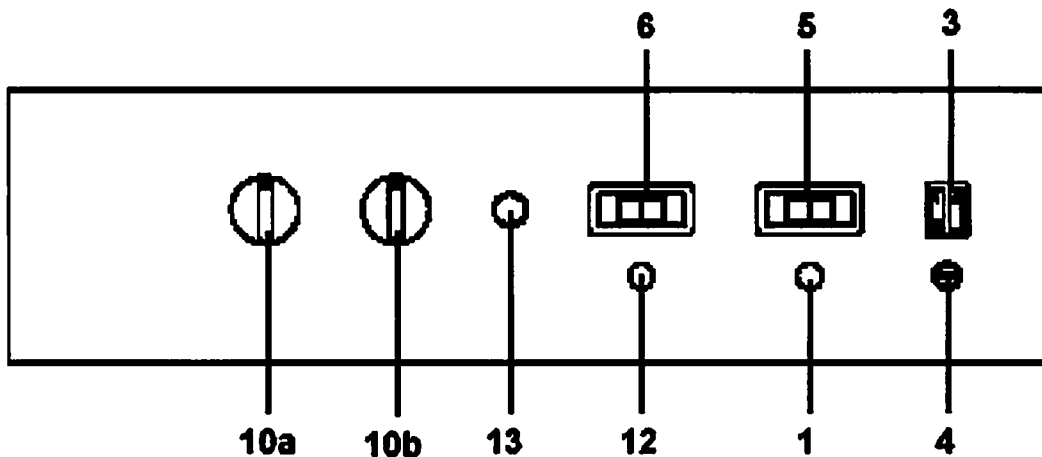
Boiler Type	ØA mm	L mm
ARIZONA 93	130	150
ARIZONA 116 + 186	180	170
ARIZONA 233 + 291	180	170



DIMENSIONS OF BURNER HEAD

5.1 Boiler fitted with control panel "STANDARD"

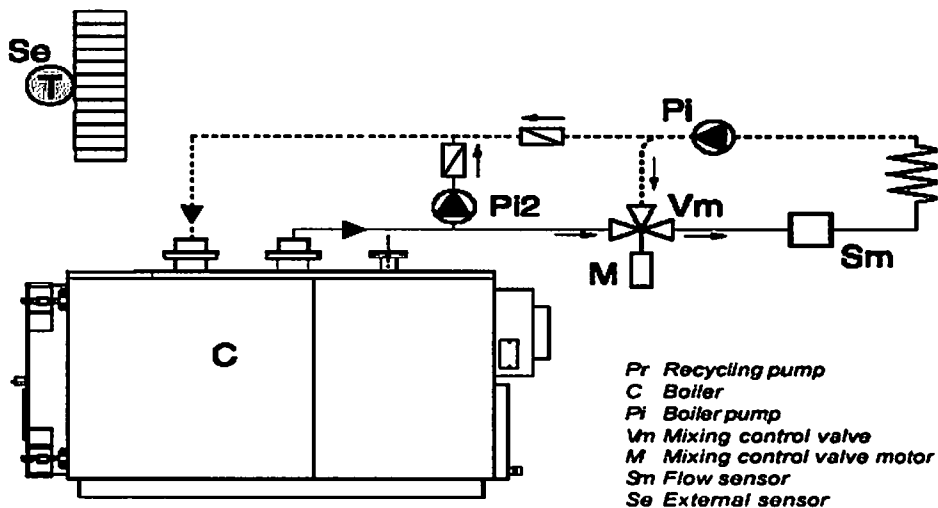
- Manual adjustment using the boiler thermostats (heating only) -



1	On/off lamp	<ul style="list-style-type: none"> • Illuminated when the boiler is on.
3	Burner on/off switch "Test" switch	<ul style="list-style-type: none"> • At O : Burner shuts down • At I : Burner on or off depending on boiler thermostat (10) • At Δ : Short test to monitor burner and safety thermostat operation (13)
4	Fuse	<ul style="list-style-type: none"> • 6.3 AT
5	Smoke thermometer (optional)	<ul style="list-style-type: none"> • Indicates smoke temperature at boiler outlet.
6	Boiler thermometer	<ul style="list-style-type: none"> • Indicates water temperature in boiler
10	a- 1 st speed boiler thermostat b- 2 nd speed boiler thermostat	<ul style="list-style-type: none"> • Adjusts the boiler water temperature (range from 30 to 90°C). The temperature increases as the numbers on the scale rise • Set the 2nd speed thermostat (right) to the required boiler temperature. Set the 1st speed thermostat (left) to 5 to 10°C above this value (around 1 number on the scale) <p>Example: - 2nd speed thermostat at 75°C. - 1st speed thermostat between 80 and 85°C</p>
12	Boiler safety lamp	<ul style="list-style-type: none"> • Illuminated when the thermostat (13) is triggered by a sudden surge in the boiler water temperature. The burner stops.
13	Boiler safety thermostat	<ul style="list-style-type: none"> • Set in the factory to 110°C (manual adjustment)

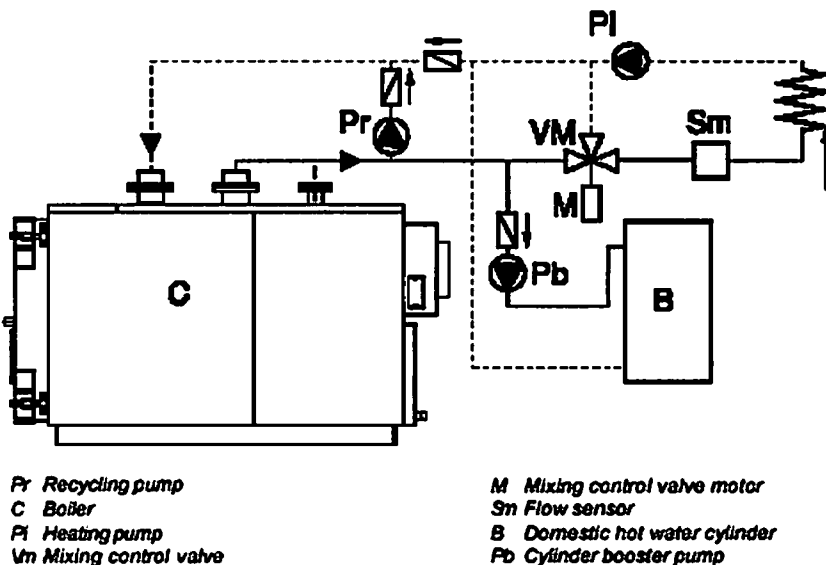
6.1 Heating system with mixing circuit

Fig.23 shows a heating system type diagram with a mixing circuit operating with a motorised 3 or 4 way valve, controlled by an electronic temperature regulator. N.B. Recycling pump "Pr" shown in fig.23 is obligatory (see STANDARDS - page 3) to ensure correct permanent water cooling of the heater body.



6.2 Heating system with domestic hot water cylinder

If the heating system has a domestic hot water cylinder, the type diagram shown in fig.24 may be used. N.B. Recycling pump "Pr" shown in fig. 24 is obligatory to ensure correct and permanent water cooling of the heater body. (see STANDARDS - page 3) to ensure correct and permanent water cooling of the heater body.



Variable or several speed boilers

7.1 Rated useful output range for boilers

The documents supplied with the boiler always indicate the rated output range. Maximum burner heat flow rate (corresponding to the output required to heat the building in question) should be set within the limits of the output range indicated.

7.2 Minimum boiler output

The boiler can function correctly at up to 40% below the minimum rated output indicated, provided that the installation instructions are followed.

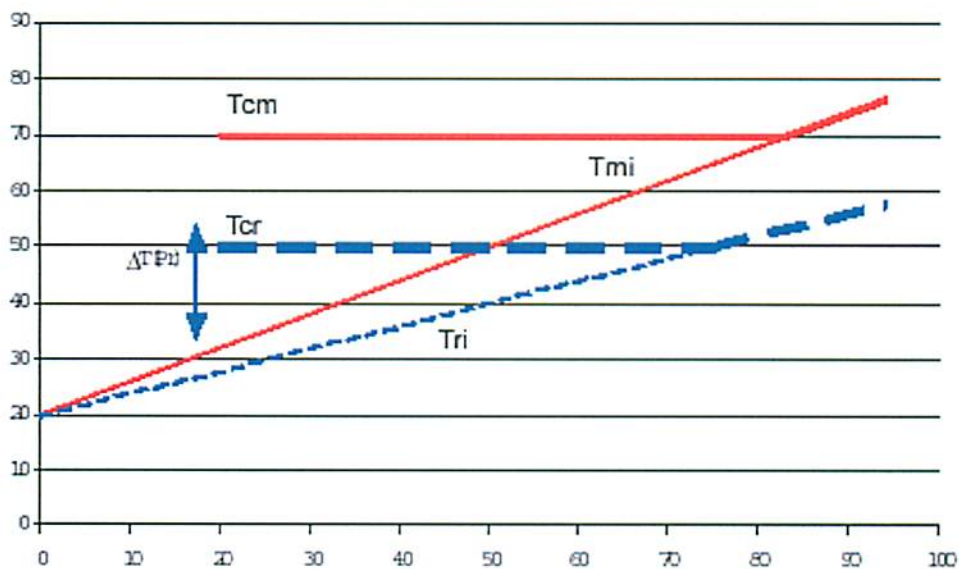
These instructions are given in the following sub-clause (7.3)

7.3 Operating conditions

a) As the average smoke temperature could drop to as low as 80-90°C, for gas and oil respectively, appropriate measures should be taken to make the flue air tight, and it should be possible to recuperate the condensates from the flue itself.

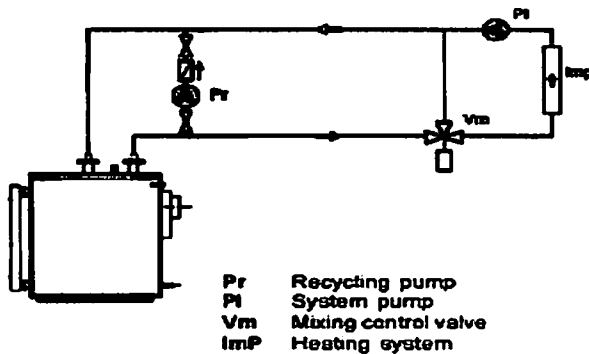
b) The boiler should operate at a fixed temperature, and the system shall include a recycling pump, a mixing control valve and a minimum thermostat fitted on the outlet pipe (to close the mixing control valve or to stop the system pump when the temperature drops below 50-55°C) so as to ensure an average boiler temperature of 60°C (flow ~ 70°C, return ~ 50°C) when using oil, or 65°C (flow ~75°C, return ~ 55°C) when using gas.

In the graph below, we have indicated that the boiler flow and return temperatures should never drop below 70°C and 50°C respectively. This is only possible using a recycling pump and possibly a mixing control valve, which guarantee a boiler return temperature of at least 50°C.



<i>Tcm</i>	<i>Boiler flow temperature</i>
<i>Tcr</i>	<i>Boiler return temperature</i>
<i>Tmi</i>	<i>System flow temperature</i>
<i>Tri</i>	<i>System return temperature</i>
$\Delta T (Pr)$	ΔT compensated for by the recycling header

7.4 Example of system layout



N.B. When setting up the system, a recycling pump shall be fitted to ensure the necessary circulation of water boiler in all the opening positions of the mixing control valve. This pump also has a very useful anticondensate role, by preventing the return temperatures from being too low.

7.5 Checks to be carried out before commissioning

Once all the hydraulic, electric, fuel and flue connections are installed, the following checks shall be performed before commissioning takes place:

- the expansion vessel and the safety valve (if necessary) are connected correctly, and it shall not be possible to separate them.
- the regulator, safety and minimum temperature thermostat and thermometer bulbs are properly inserted and secured in the thermometer pockets.
- the turbulators are correctly located in the fire tubes.
- the heating system has been properly rinsed out.
- the system has been filled with water to around 1.5 bar pressure and has been completely purged.
- the pump(s) are not blocked.
- the hydraulic, electric, fuel and flue connections have been performed in accordance with current local and national standards.
- the burner has been assembled in accordance with the manufacturers instructions.
- the line voltage and frequency are compatible with the burner and the electrical parts of the boiler.
- the burner is set of correct fuel type, which is one of those indicated on the data badge visible on the boiler and the burner output range is compatible with the boiler output.
- the burner instructions are available in the boiler room.
- the system pipe work is covered with an insulation jacket.
- the system is capable of absorbing the quantity of heat that is generated when the burner is first lit, during the test period.
- the various thermostats and other system safety devices operate correctly.

7.6 Commissioning

When commissioning the boiler, professionally qualified persons shall perform the following:

- a) monitoring the internal and external air tightness of the burner and the fuel supply pipe;
- b) setting of the fuel rate in accordance with the total rated capacity of the boiler by distribution between the first speed flame and the second speed flame; given that the first speed flame can generate as low as 60% of the total rated capacity (this rated capacity can also be varied between the maximum and minimum in response to the useful heat capacity required by the heating system).

Proceed as follows:

- Open the fuel supply
- Check that all the switches on the control panel are in the Off position and set the regulating thermostat to the minimum temperature.
- Switch the control panel on using the main on/off Switch.
- Switch the installation pump to On.
- Switch the burner to On.
- Cause a heating request to be generated by the 1st and 2nd speed regulator thermostat by setting it to the maximum temperature.

At this stage check that:

- the door, the burner support plate and the flue connection are air tight.
- the flue duct has a draw value between 2 and 4mm - C.E. there is no water leakage.
- the various thermostats and other system devices operate correctly.
- the recycling pump operates correctly.
- the burner lamp illuminates correctly.
- the burner characteristics (basic setting and spray nozzle type) correspond to the boiler technical data.

When the burner is set correctly, the following values should be obtained easily, when measured at the flue duct:

1°) Using oil having maximum viscosity of 1.5°E at 20°C:

- CO₂ = 12 to 13%
- Smoke spot number < 1
- Smoke temperatures = 190 to 210°C

2°) Using natural gas:

- CO₂ = 9 to 10%
- Smoke temperatures = 180 to 200°C (the values are given for a clean boiler with water at 70°C).

We recommend setting the fuel flow rate to a value that corresponds to the real needs of the system concerned (avoid over provision), by ensuring that the

smoke temperatures indicated above never rise or fall (a value never lower than 160°C).

7.7 Boiler ducts

The HIGH EFFICIENCY boilers are designed to operate with a return water temperature that is never lower than 54°C when using gas, to avoid (or reduce) the phenomenon of acidic condensates from the smoke, that can cause premature deterioration of the steel body in the boiler.

The regulator thermostat on the control panel should be set to around 80 to 85°C.

Room temperature must be regulated by a mixing control valve and a temperature regulator may also be used.

To standardised the water temperature and to avoid, as far as possible, return gases lower than 54°C using oil and 59°C using gas, recycling pump with suitable flow rate (see STANDARDS, subclause 7) shall be installed between the flow and return pipes on the boiler.

N.B.

- **Corrosion of the sheets due to acidic condensates from the smoke is not covered by the guarantee as this can only depend on how the heating system was installed.**

7.8 Boiler shut down

- Switch the burner to Off.
- Leave the system pump in operation until the temperatures all become equal.
- Cut off the electric power supply to control panel.

If the boiler is not to be used for a considerable period then the fuel supply valve(s) can also be closed.

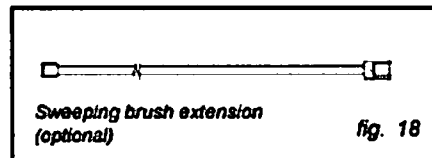
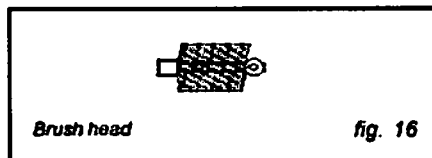
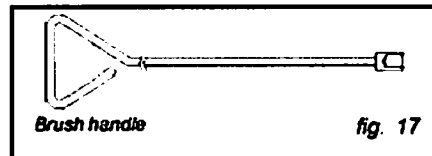
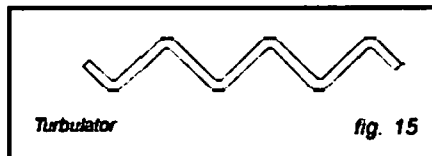
8.1 General Standards

After one month of boiler operation, open the burner support door and check the fouling levels in the fire tubes.

If considerable fouling has occurred:

- Remove the smoke turbulators from the heat exchanger tubes.
- Clean all the heat exchanger tubes using the brush delivered for this purpose with the boiler.
- Open the sweeping doors located on the smoke box and remove the cleaning residue by aspiration.
- Close the sweeping doors and replace the smoke turbulators, then close the fire door and check that it is till perfectly air tight.
- It may be necessary to reset the burner.

N.B: If the burner is set correctly then only one cleaning session at the end of the heating season will be necessary.



8.2 Ordinary Servicing

Boiler operating conditions are very different from one case to another, depending on the type of fuel used, burner adjustment, the number of start up times, the system characteristics, etc. For this reason it is not possible to establish a servicing frequency.

Therefore, the technician who performs the first servicing should define the servicing frequency based on the amount of fouling found.

In general, we recommend the following frequency, depending on the type of fuel used:

- Gas boilers: once a year.
- Oil boilers: twice a year, or more frequently if there is reason to suspect they are not correctly adjusted.

In all circumstances, current local standards shall be followed.

We recommend shaking the turbulators at least once a month while the boiler is in operation, without removing them from the tubes, in order to prevent the soot from clogging them, and making their removal extremely difficult.

6.0 OPERATIONAL SAFETY CHECKS

Wood Lane, Erdington
Birmingham, B24 9QP
Telephone 08706 050607 Fax 08706 001516

SITE VISIT (<i>Italics</i>)	COMMISSIONING
-------------------------------	---------------

Date:

Signature:

REPORT No:

SITE ADDRESS:

.....

.....

.....

INSTALLER NAME & ADDRESS:.....

.....

.....

.....

COMMISSIONING DATE:

1.0	BOILER		
1.1	<i>Type:</i>		
1.2	<i>No of Sections:</i>		
1.3	<i>Boiler No/Position:</i>		
	<i>RH/LH/Centre/1/2/3/ etc</i>		
1.4	<i>Serial No:</i>		
1.5	<i>Fuel: N/Gas, Class D, etc.</i>		
2.0	BURNER		
2.1	<i>Type:</i>		
2.2	<i>Serial Number:</i>		
2.3	<i>Spec Number:</i>		
2.4	<i>Control Box Type:</i>		
2.5	<i>Electrical Supply:</i>		
2.6*	<i>Gas Train Type & Size:</i>		
2.7*	<i>Gas Train Serial No:</i>		
2.8*	<i>Gas Booster Type & Size:</i>		
2.9*	<i>Gas Booster Serial No:</i>		
3.0	BURNER SETTINGS		
3.1	Draught Tube Diameter		mm
3.2	Draught Tube Projection		mm
3.3	Diffuser Diameter (if appropriate)		mm
3.4	Diffuser Setting (if appropriate) (Distance from end of draught tube)		mm
3.5*	Gas Nozzle: Side (if appropriate)	No of Holes	
		Diameter	mm
	End (if appropriate)	No of Holes	
		Diameter	mm
3.5¶	Oil Nozzles: High Fire	Size	
		Type	
	Low Fire	Size	
		Type	
3.6	Electrode Settings? (to burner card/manufacturers instructions?)		
3.7	<i>Burner to Specification?</i> (to burner card/manufacturers instructions?)		

4.0	PRE-COMMISSIONING CHECKS (See Note)				
4.1	<i>Is boiler house ventilation as per manual?</i>				
4.2	<i>Electric supplies fused, isolated & earthed?</i>				
4.3	Check external controls allow operation				
4.4	Check boiler/system flooded and pumps operational and any isolation valves open				
4.5*	Check gas available at burner				
4.5¶	Check oil available at burner				
4.6*	Check gas meter sizing adequate				
4.7	Check flue system clear				
5.0	COMBUSTION	Pilot	Low	High	Unit
5.1*	Gas rate				m ³ /hr
5.2*	Burner Head Pressure				mmwg
5.3*	Ionisation Probe/UV Cell Current				µA
5.4	Air Shutter Position				-
5.5¶	Oil Pump Pressure				bar
5.6	CO₂ or O₂				%
5.7*	CO				ppm
5.8¶	Smoke Number				-
5.9	Gross Flue Gas Temperature				°C
5.10	Ambient Temperature				°C
5.11	Flue Draught				mmwg
5.12*	Inlet Gas Pressure (high fire). If multi boiler installation, inlet gas pressure all boilers high fire.				mmwg
5.13	Combustion Chamber Resistance				mmwg
5.14	Burner Fan Static Pressure				mmwg

NOTE: Normally 5.13 and 5.14 only recorded when tappings provided. Position of measurement to be in accordance with boiler and/or burner manufacturers instructions.

* GAS FIRED INSTALLATIONS ONLY
¶ OIL FIRED INSTALLATIONS ONLY

NOTE: It is the installer's responsibility to ensure that the boiler is correctly commissioned by a competent engineer and that this report is completed and kept as a record. A commissioning service available from Potterton at the address listed on the back page of this manual. When a Potterton engineer commissions, this completed report will be sent to the installer. It is the installer's responsibility to action any points arising. Commissioning by Potterton engineers is restricted to equipment of our supply. No responsibility is accepted for the on site assembly or installation of the equipment unless specifically carried out by Potterton. The installer must ensure that the boiler is installed in accordance with the manufacturers instructions and all relevant BS Codes of Practice and Regulations (see manufacturers instructions for full details). Items 4.1 to 4.6 are related to the boiler installation and as such these pre-commissioning checks should be carried out in the presence of the installer.

Potterton is a Member of the Boiler & Radiator Manufacturers Association (BARMA), and the terms of this Commissioning Document follow the generally agreed conditions of the Association. Potterton, in line with its policy of continuous product development, reserves the right to alter and amend this Document as is deemed necessary at any time.

6.1	Check control stat operation	
6.2	Check limit stat operation	
6.3	Check high/low stat operation	
6.4*	Check for gas leaks	
6.5*	Check for gas leakage past valve assembly	
6.5¶	Check for oil leaks	
6.6	Check boiler locks out on loss of flame signal	
6.7	Check boiler locks out on air pressure switch operation	
6.8*	Check gas low inlet & overpressure outlet switches	
6.9*	Record switch settings:- LOW OVERPRESSURE.....	
6.10*	Check gas booster interlocks operational	
6.11*	Record switch settings:- INLET OUTLET	
7.0	BOILER/SYSTEM CHECK LIST	
7.1	Control stat left at	°C
7.2	Limit stat left at	°C
7.3	High/low stat left at	°C
7.4	Maximum flow temperature recorded	°C
7.5	Maximum return temperature recorded	°C
7.6	Boiler water pressure	
7.7	Are pipework connections as per manual?	
7.8	Is safety valve fitted? If so, SIZE _____ PRESSURE RATING _____	
7.9	Are water isolating valves fitted?	
7.10	Are water flow switches fitted?	
7.11	Are return water shut off or diverter valves fitted?	
7.12	Is shunt pump fitted?	
7.13	Is pump overrun fitted?	
7.14	Flue type and diameter of connection to boiler:- TYPE DIAMETER (mm) Where appropriate and for multi boiler installations sketch details of flue system showing length of runs and diameters. Conventional <input type="checkbox"/> Fan Assisted <input type="checkbox"/> Flue Dilution <input type="checkbox"/> Approximate overall height m Is the fan interlocked with the boiler? YES / NO	
7.15	Are flue dampers fitted? If so, interlocked?	YES / NO YES / NO
7.16	Fan assisted ventilation?	YES / NO
7.16	Fan assisted ventilation interlocked?	YES / NO
7.17	Any evidence of condensate formation?	YES / NO
7.18	Any evidence of water leakage?	YES / NO
7.19	Any evidence of flue gas leakage?	YES / NO
7.20	Has boiler been built and cased correctly?	YES / NO
7.21*	Is gas service cock installed? If so, accessible?	YES / NO YES / NO
7.22¶	Is oil filter fitted?	YES / NO
7.23¶	Is fire valve fitted?	YES / NO
7.24¶	Oil supply: Single Pipe	

8.0	COMMENTS ON ACCESSIBILITY FOR MAINTENANCE

9.0	NOTES & COMMENTS BY COMMISSIONING ENGINEER

FINDINGS		
	YES	NO
Is the installation safe for use?		
<i>If the answer is NO, has a warning label been raised?</i>		
<i>Is any remedial work required?</i>		
<i>Have warning labels been fitted?</i>		
<i>Has RIDDOR form been raised?</i>		
Customer Signature:		
Print Name:		
Date:		

ENGINEER DETAILS		
NAME		
COMPANY		
SIGNATURE		
DATE		

Registered Address: Pentagon House, Sir Frank Whittle Road,
Derby DE21 4XA
Registered in Eng

Conversion Table

	<u>IMPERIAL TO METRIC</u>	<u>METRIC TO IMPERIAL</u>
<u>HEAT</u>	1 Btu/hr = 0.2931 W	1 kW = 3412 Btu/hr
1 Therm = 100,000 Btu/hr	1 Btu = 1055 J	1 J = 0.0009478 Btu
	1 Btu/hr = 0.252 kcal/hr	1 kcal/hr = 3.968 Btu/hr
<u>FUEL CONSUMPTION</u>	1 ft ³ = 28.317 dm ³ (litre)	1 m ³ = 35.3147 ft ³
1 dm ³ = 1 LITRE	1 UK Gall = 4.546 litre	1 litre = 0.2199 Imp. Gallon
1,000 dm ³ = 1m ³	1 UK Gall = 1.2 U.S. Gallon	
<u>PRESSURE</u>	1 lb/in ² = 6895 Pa	1 bar = 33.45 ft.w.g.
1 PSI = 2.307 FT	1 lb/in ² = 68.95 mbar	1 kPa = 0.3345 ft.w.g.
1 kPa = 1000 Pa	1 in.w.g. = 249.1 Pa	1 bar = 14.5 lb/in ²
1 bar = 1000 mbar = 100 kPa	1 in.w.g. = 2.491 mbar	1 Pa = 0.3858 in.w.g.
	1 in.w.g. = 25.4 mm.w.g.	1 mm.w.g. = 0.0394 in.w.g.
		1 mm.w.g. = 9.8 Pa
<u>LENGTH</u>	1 inch = 25.4mm	1 mm = 0.03937 in
1m = 1000mm	1 ft = 0.3048 m	1 m = 3.281 ft
	1 yard = 0.9144 m	1 m = 1.094 yard
	1 mile = 1.609 km	1 km = 0.6214 mile
<u>VOLUME</u>	1 ft ³ = 0.02832 m ³	1 m ³ = 35.3147 ft ³
	1 ft ³ = 28.32 litre	1 litre = 0.03531 ft ³
<u>AREA</u>	1 in ² = 645.2 mm ²	1 mm ² = 0.00155 in ²
	1 in ² = 6.452 cm ²	1 cm ² = 0.155 in ²
	1 ft ² = 929 cm ²	1 m ² = 1550 in ²
	1 ft ² = 0.0929 m ²	1 m ² = 10.76 ft ²
<u>FLOW RATE</u>	1 gall/min = 0.07577 lit/sec	1 lit/sec = 13.2 gall/min
1 kg/sec = 1 lit/sec @	1 ft ³ /min = 0.4719 lit/sec	1 lit/sec = 2.119 ft ³ /min
0°C reference temperature	1 ft ³ /min = 0.00047 m ³ /sec	1 m ³ /sec = 2119 ft ³ /min
<u>TEMPERATURE</u>	°F to °C = ("X"°F - 32) x 0.5556	°C to °F = ("X" °C x 1.8) + 32
<u>TEMPERATURE DIFFERENCE</u>	"X"°F x 0.5556 = °C	"X" °C x 1.8 = °F
1°C = 1°K		
<u>WEIGHT</u>	1 lb = 0.4536 kg	1 kg = 2.205 lb
	1 cwt = 50.8 kg	1 tonne = 0.9842 ton
	1 ton = 1016 kg	1 tonne = 2204.6 lb

Commercial Sales
Technical and Service Enquiries

Potterton Commercial

Wood Lane
Erdington
Birmingham B24 9QP

Tel: 08706 050607
Fax: 08706 001516
Sales Hotline: 08706 001991

Technical Helpline: 08706 002322

Service Hotline: 08702 412759
Service Fax: 08701 653000

e-mail: commercial@potterton.co.uk
web site: www.pottertoncommercial.co.uk

Spares

Potterton Commercial spares are available nationwide through the **interpart** network of approved stockists. Alternatively please contact:-

interpart
Brooks House
Coventry Road
Warwick
CV34 4LL

Tel: 08706 000454
Fax: 08706 000545

Applications and Installations

Our experienced technical and applications team are available to offer advice on any aspect of heating system design and boiler installation.

Please contact:

Tel: 08706 002322

Commercial Service

Our service organisation covers the whole of the UK to look after your needs for all Potterton Commercial products. We are also able to offer our services for other manufacturers products.

Our service department offers a wide range of specialised services including:-

- Boiler site assembly
- Burner commissioning for all fuels
- Boiler maintenance and maintenance contracts
- Breakdown and repair services
- Boiler dismantling and re-jointing
- Burner and boiler replacement
- Oil/gas conversions
- Systems conditioning
- Water treatment and descaling
- Packaged units

“All descriptions and illustrations contained in this leaflet have been carefully prepared but we reserve the right to make changes and improvements in our product which may



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