



**230 VOLT BUBBLE PRESSURE JET BOILER
ENGINE ROOM VERSION
MARINE INSTRUCTIONS ISSUE 27-09-11**

CE certificate no C17873A 08-04-03



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1 INTRODUCTION

The Boiler House version of the Bubble P.J. is a purpose designed, heavy-duty, automatic oil fired boiler which will run heating systems up to 17.5 kW. (60,000 BTUs)

It is powered by a down firing pressure jet oil burner used on most of the oil fired heating boilers produced in the UK, because of this it is known by all the oil firing technicians across the United Kingdom.

None of our competitors have this make of burner and all of them use obscure equipment, which can only be serviced by a few specially trained engineers.

Again, unlike our competitors we only use UK standard control systems which are common place across the length and breadth of the UK.

Space above the appliance must be provided for service access to the boiler and vertical removal of the burner, to achieve this the flue system must be so designed as to allow it to slip up from the boiler socket to allow the rear access plate of the boiler to be lifted off.

Simple and basic instrumentation is mounted on a removable front control panel.

Two separate power inputs are required, one is from the time control clock to energise the burner and the other must be provided whilst the burner is timed on.

The second live is required to allow the burner to go through its post purge timing sequence.

The boiler can be used to heat up hot water cylinders, central heating systems, or both.

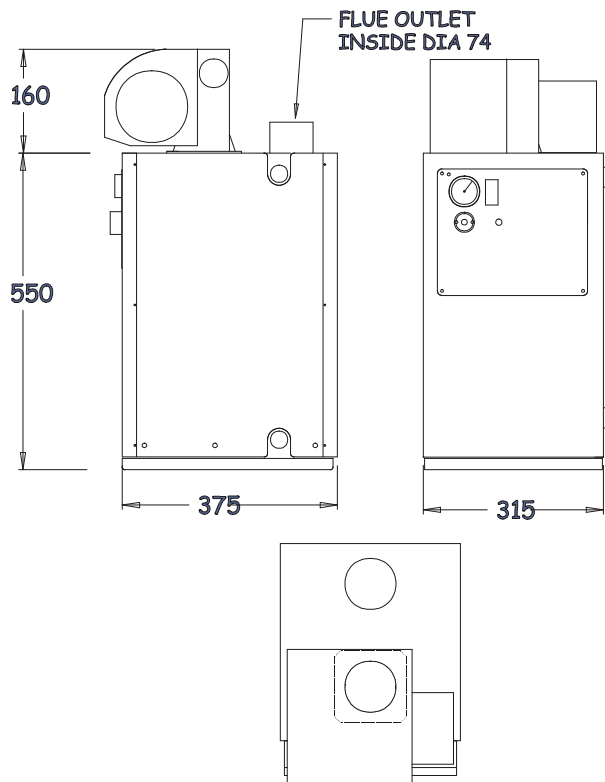
The water jacket is insulated with foil backed Thinsulate insulation.

Optional, automatic time control can be provided by a remote programmable time clock.

The operating functions of the boiler are controlled by a running thermostat and a re settable safety stat.

The boiler has been specially developed to fit into confined spaces.

Installation, servicing, faultfinding and operation are both simple and reliable.



The water content of the boiler is 16 litres.

Fuel tanks and fuel lines should be installed to BS EN ISO 10088:2001

The burner is supplied with a two pipe system, pre piped with appropriate quality hoses.

Fire prevention to BS EN ISO 9094-1:2003

2 OPTIONAL EXTRAS

2.1 REMOTE TIME CLOCK

Can be located in a galley or saloon and the hot water on signal is wired back to the boiler.

2.2 HIGH RECOVERY HOT WATER CYLINDER.

High recovery, unvented hot water cylinders equipped with safety vales and expansion vessels to prevent the wastage of domestic hot water.

The order code for the cylinders are in (section 5) Marine Spares Price List.

2.3 FLUE SYSTEMS.

1. The boiler is fitted with a vertical top flue take off to accept flue pipe of 70mm Dia.

2. Flue systems can be horizontal or vertical depending upon the installation requirements.

3. High temperature flue insulation is available in the form of a wrap around insulation blanket.

2.3A FLUE PIPE CLEARANCE FOR SERVICING.

1. The flue pipe must be fitted so as to allow vertical movement of 40mm min to facilitate boiler servicing.

Flue systems are in section 02 of the Marine Spares Price List

2.5 PRESSURISATION KIT FOR NON-POTABLE WATER.

Fig 2.



The Pressurisation kit for non-potable water is supplied as an optional extra. Installation of this kit is quick, easy and compact.

See section 05 of the Marine Spares Price List.

2.8 PRESSURISATION KIT FOR POTABLE WATER.

The Pressurisation kit for potable water is supplied as an optional extra.

3 MODES OF OPERATION

1. The boiler is energised via a live 230vac input from a manual or automatic source.
2. Once the boiler has received the signal and all the control devices are in a calling mode the burner gives a short burst of action lasting 2 - 3 seconds and then nothing will happen until the nozzle pre heater is up to temperature.

This period of silence can take up to 4 minutes.

3. When the nozzle pre heater thermostat is satisfied the burner will then go through its ignition sequence as follows.
4. The Motor runs.
5. H.F. spark is discharged across the electrodes.
6. Seconds later the fuel is released by the solenoid valve.
7. Ignition occurs.
8. Photocell recognizes ignition has occurred.

9. Photocell sends signal to DKO control unit, which turns the H.F. ignition off and then allows the burner to go into run mode.

10. The burner will run until it reaches the pre set temperature at which point it will shut down and then modulate in on-off mode until either the auto or manual supply is removed.

Devices which can control the on off cycle are-:

Cylinder Stat

Room Stat

Boiler stat

Safety Stat

Time clock

When used on diesel fuel, the burner is equipped with a fuel pre heater device, which can take approximately four minutes to heat up after power has been supplied to the boiler.

On kerosene fuel the burner will not need a fuel pre heater device.

Once the boiler has ignited it will modulate in line with demand via the control stat.

The burner is also fitted with a post purge timer, which will allow the burner fan only, to run on for a period of four minutes approx after it has received a shut down signal from the operating stat.

Power Input Connections details are shown in section 4-5.

4 INSTALLATION

ABREVIATED KEY INFORMATION.

EASY ACCESS is the key word when installing boilers.

They must **not** be fitted into situations where access is difficult or awkward.

The burner has to be lifted out of the boiler and the flexi oil feed pipes must not be fitted in such a way as to lock the burner in, there must be enough slack in the flexis to allow the burner to be lifted free from the boiler.

If boilers are fitted into situations where access is difficult or awkward you will find that service engineers will not want to service them or that higher service costs will ensue.

4.1 CLEARANCES FOR SERVICING THE BOILER.

1. The boiler must be fitted in a location, which provides easy access for servicing and controls adjustment.

THIS MEANS

2. The flue must be able to lift out and clear of the flue socket by about 20mm to allow the rear cover plate to be removed for servicing. To achieve this the flue pipe will have to be secured to the deck flange to allow it to self-support when the sliding lower part of the flue is lifted up. (See illustration in section 2-3)_

3. The burner will need to be rotated and lifted at least 80mm to allow for easy removal during servicing or setting up.

4. If the burner is fitted in an enclosed compartment, high and low level ventilation will be required.

The oil supply to the fuel pump on the burner is a two pipe system, make sure that the connection is made as per the direction indicators on the fuel pump and fuel filter.

Fuel will flow via a single feed through the filter and return directly to the fuel supply tank via a separate return, the return can be teed into the engine return if required, there is no need to run the return thro the filter. See 4-7-1

The filter can be fitted in a convenient position near to the appliance, make up interconnecting extension pipes as required, and make sure **that the filter can be easily serviced and exchanged.**

The water content of the boiler is 16 litres

4.2 LOCATION.

EASY ACCESS is the key word when installing boilers.

They must not be fitted into situations where access is difficult or awkward.

If they are you will find that service engineers will not want to service them.

Make sure that the boiler is fitted with adequate space above it.

The burner will need to be lifted at least 80mm to allow for easy removal.

The boiler is serviced from the top and access is required to remove the internal baffle system.

The burner can be fitted with a conventional flue system.

If the burner is fitted in an enclosed compartment, high and low level ventilation will be required.

4-2A CLEARANCES FROM COMBUSTIBLES

The boiler can be fitted up to combustible materials as detailed below but make sure that the burner oil pump is not fitted tightly up to a wall or panel, the commissioning and service engineers will have to gain easy access to adjust the fuel pump pressure and from time to time replace the flexi fuel feed hoses. **60mm minimum gap required from face of fuel pump.**

The objective of fitting flexible oil feed pipes to the burner is to allow the burner to be lifted easily from the boiler without restraint from the flexi oil lines.

Make sure that the burner is not locked into place by tight fitting oil lines.

1. Sides 0mm
2. Base 0mm
3. Back 0mm
4. Front 0mm
5. Top 200mm

UNINSULATED, SINGLE SKIN FLUE PIPE 150 from combustibles.

DOUBLE WALL FLUE PIPE 25mm from combustibles

2. Do not allow soft furnishings such as curtains or loose materials within 200mm of the burner.

3. Loose materials can block the air inlet to the burner.

4. If the boiler is used in the lower part of an airing cupboard make sure that loose materials can't fall on or near to the burner.

4-2B FASTENING DOWN

The boiler must be securely fastened down.

The degree of security depends on the category of use of the vessel to which the boiler is being fitted.

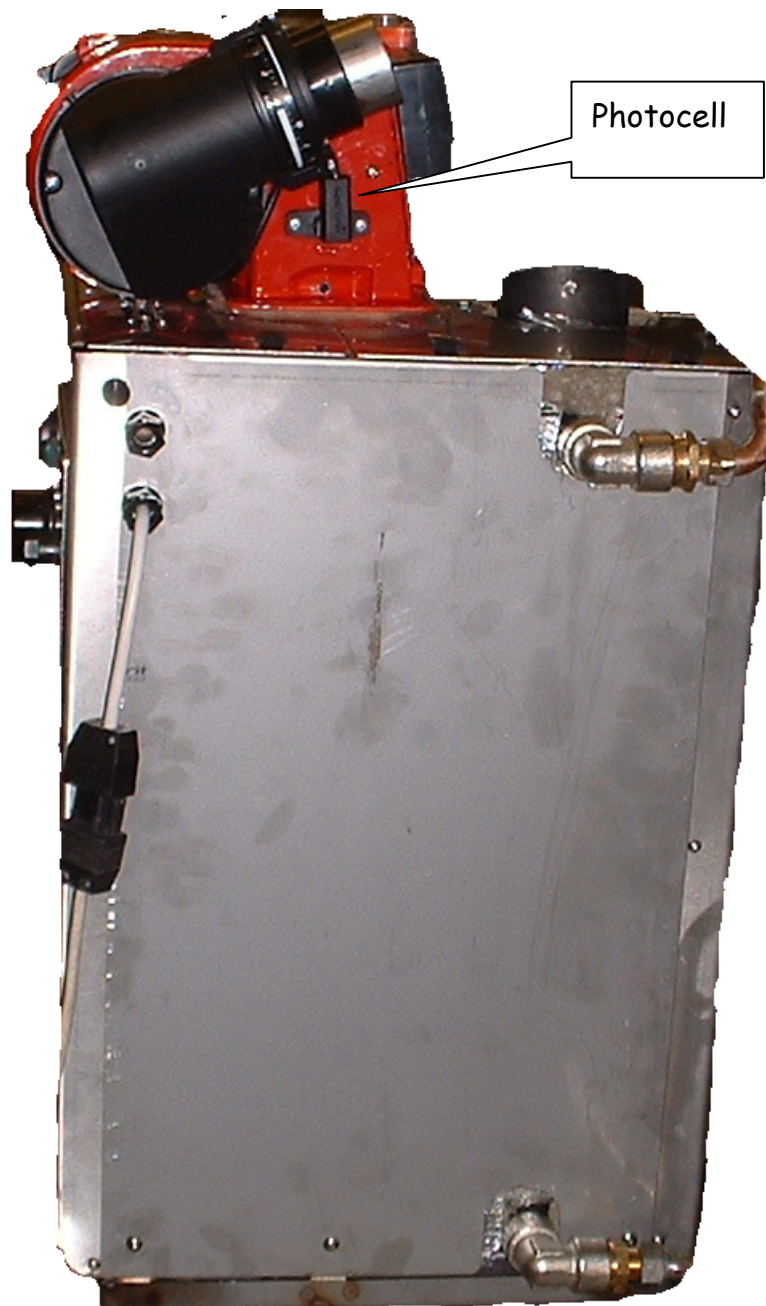
Up to category C, use the standard clips provided.

For category B, optional special fixing brackets can be welded to the drip tray.

4.3 PLUMBING.

Connection to the boiler is made via two $\frac{3}{4}$ " B.S.P.T. male fittings on the right hand side of the boiler.

It is assumed that the boiler will be installed using conventional pipe layouts and controls.



All pipe work (Primary and Secondary) must be free of air traps, where there is a potential for air traps to occur, automatic air vents must be fitted.

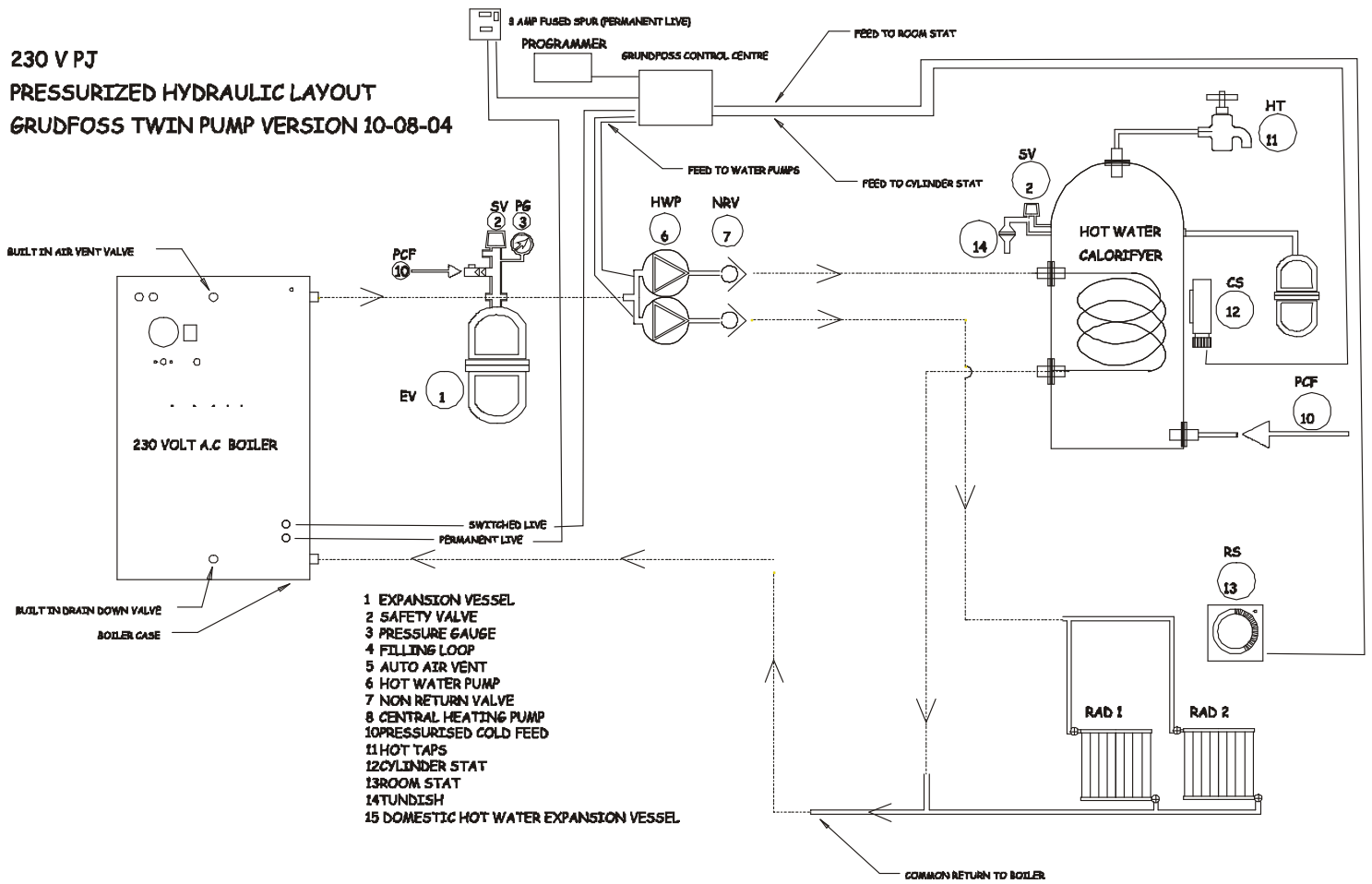
4.4 HOT WATER.

The calorifier must be of a suitable design with a high recovery coil fitted.

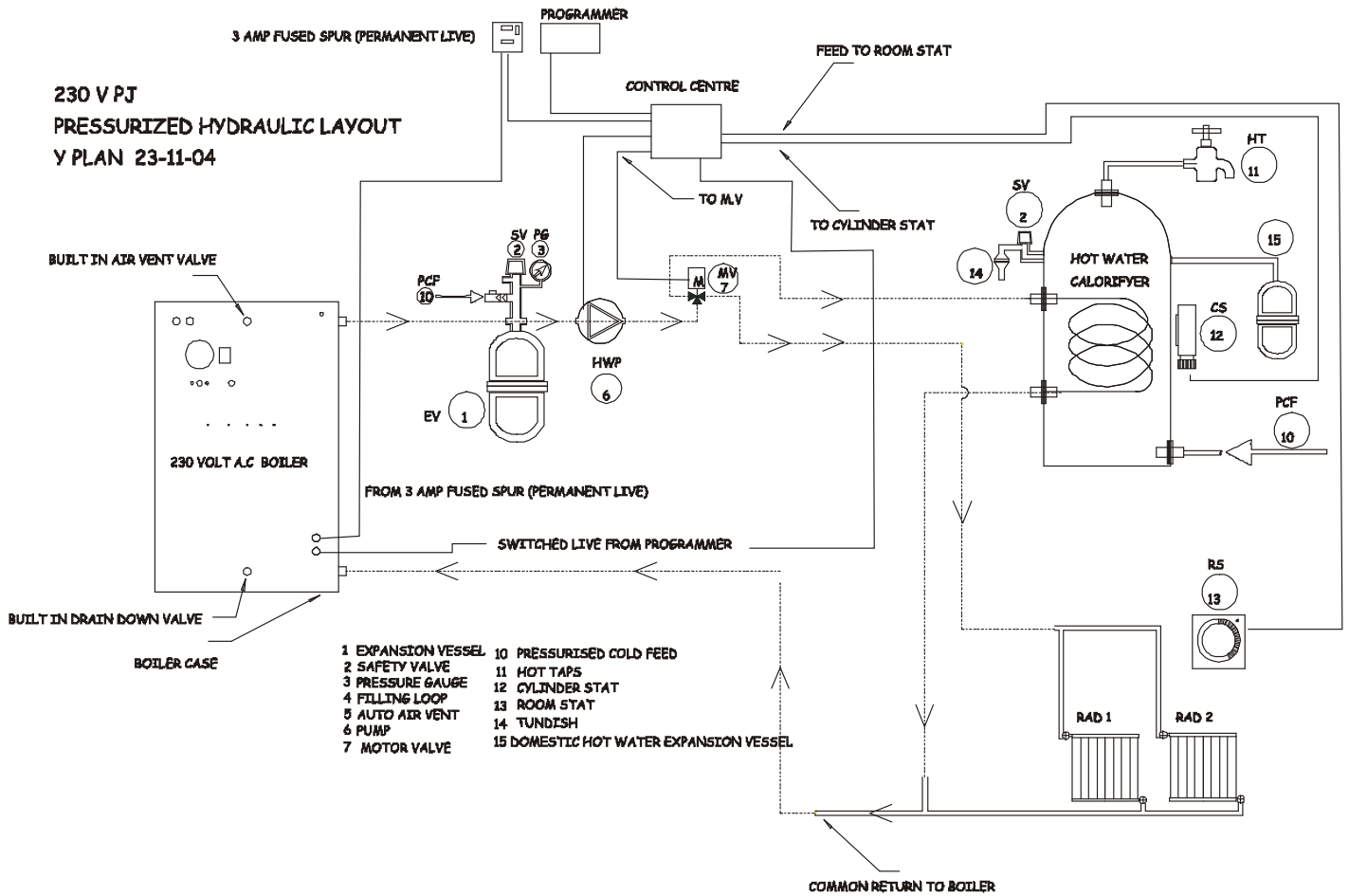
We can supply calorifiers as required.

4-4A SCHEMATIC GRUNDFOSS TWIN PUMP SYSTEM.

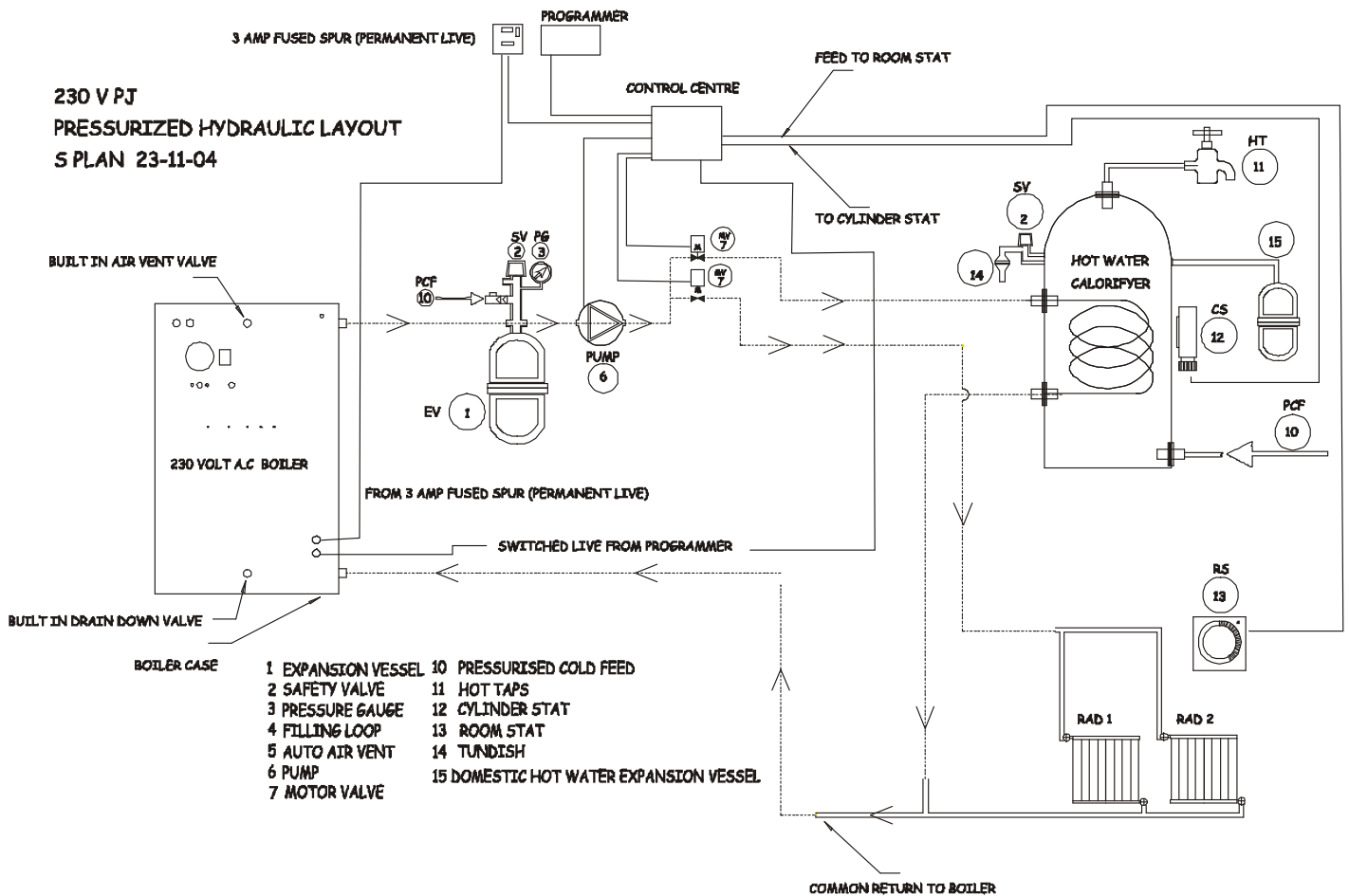
230 V PJ
 PRESSURIZED HYDRAULIC LAYOUT
 GRUNDFOSS TWIN PUMP VERSION 10-08-04



4-4B SCHEMATIC Y PLAN SYSTEM.



4-4c SCHEMATIC S PLAN



4.5 POWER SUPPLY 230-VOLT A.C.

The boiler can only be connected to a 230 vac mains electrical supply or a full sign wave inverter, any other type of inverter will not be suitable.

If the inverter fails and does not output a full sign wave supply, damage will be caused to the Burner control box located on the burner.

As is described in sec 3, the boiler can be operated in a manual mode or an automatic mode via a time clock or control pack.

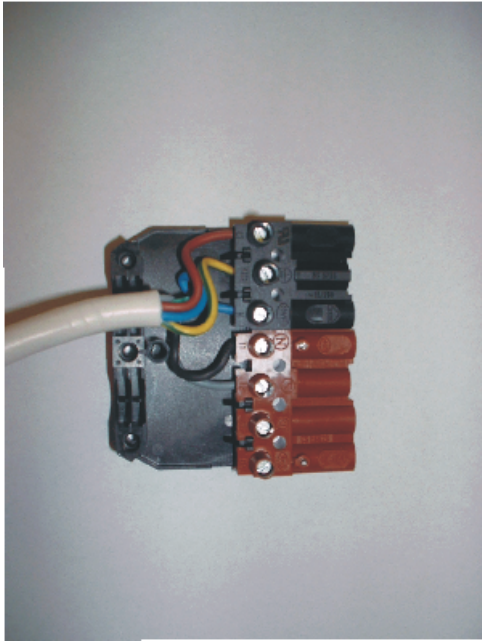
The boiler must always have a permanent live wired to it through a fused isolating switch protected by a 6 amp slow blow or 10 amp fast blow fuse.

The burner is supplied with a male and female 7 way connector.

The connections made in the plug are as follows-:

NOTE

1. THE ILLUSTRATION BELOW SHOWS THE BOILER SIDE OF THE PLUG WITH COVER OFF.
2. THE SUPPLY SIDE OF THE PLUG IS NOT SHOWN.



Permanent supply of Phase, Earth and Neutral in the black connections as marked.

Timed supply, Phase into T1 (Black wire) and Neutral into T2 (Grey wire) into the brown sockets marked T1 and T2.

A permanent live connection is required to allow the boiler to go through its 4 minute post purge cycle on shutdown. (If the permanent live is used to turn the boiler off it will not be able to go through its post purge cycle and as a consequence products of combustion fume may vent back through the air inlet duct on the burner.)

If the boiler is going to be connected to a standard Y, S or Grundfoss pump plan the boiler should be wired according to the wiring diagrams illustrated.

The boiler must be earthed.

4-5-1 TYPICAL CONTROL EITHER Y PLAN, S PLAN OR GRUNDFOSS PUMP PLAN.

Note.

Only qualified electricians are allowed to carry out electrical work on wiring and installing systems.

Most third party systems will have detailed wiring instructions provided with the package of components which will usually comprise of -:

TIME CLOCK PROGRAMMER.

EITHER ONE THREE PORT, (Y Plan) OR TWO SINGLE PORT, (S Plan) MOTOR VALVES.

ROOM STAT.

CYLINDER STAT.

WIRING CENTRE.

Make sure that all wiring into the boiler is correct polarity, inverted supply will damage the burner control.

4.7 OIL SUPPLY.

Fuel tanks and fuel lines should be installed to BS EN ISO 10088:2001

Flexible hoses to the burner must be to standard ISO 7840

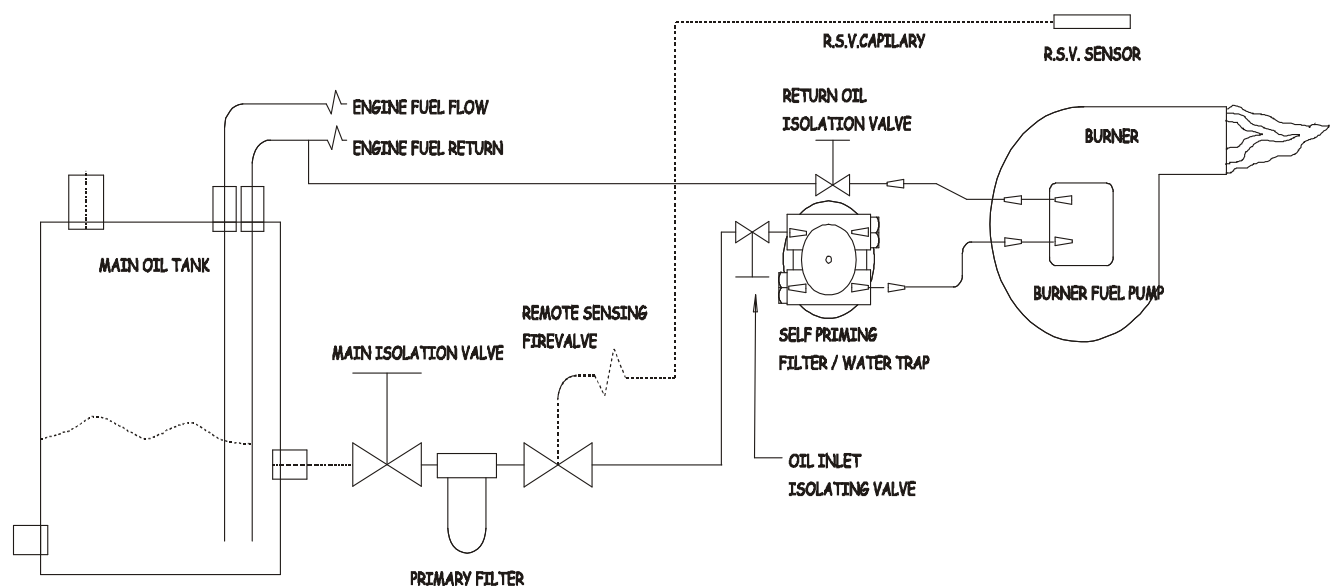
Oil supply to the burner can be via 8 or 10 mm pipe.

Fuel Supply Systems will be piped up as per a single feed through the filter and returned directly to the fuel supply tank from the return hose of the burner fuel pump as per the schematic layout.

Diesel Engine filters with multiple outlets can be used with the return flow going back to the fuel supply tank via the engine return line.

The boiler has a mechanical gear driven pump, which creates its own vacuum to lift oil through the filter.

4.7.1 Schematic Oil Layout

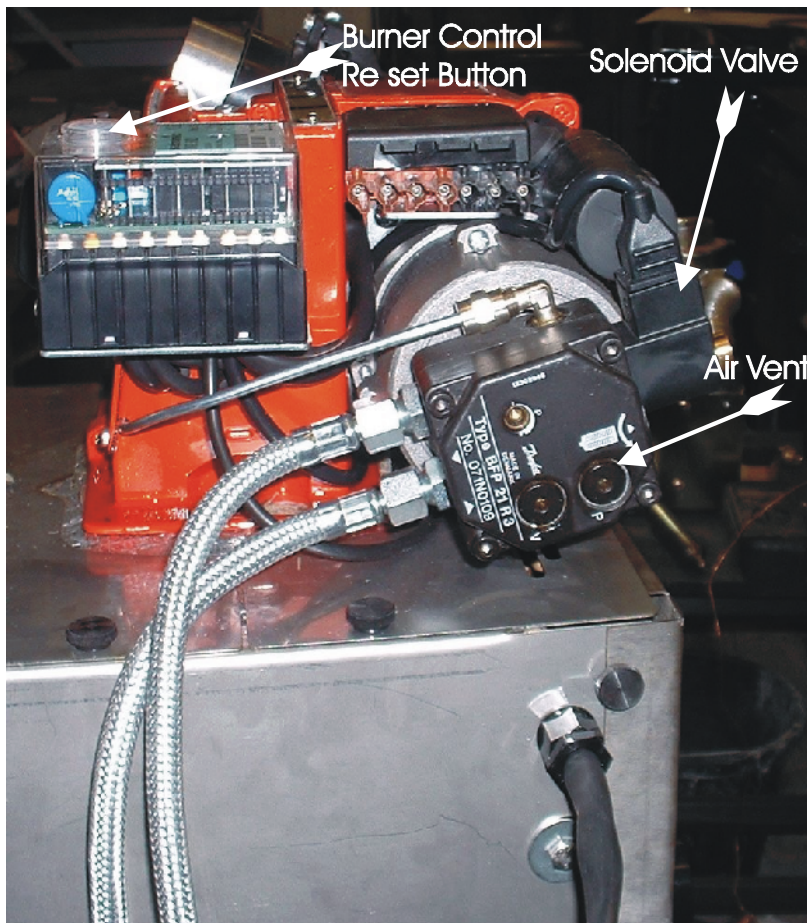


Note

The objective of fitting flexible oil feed pipes to the burner is to allow the burner to be lifted easily from the boiler, without restraint from the flexi oil lines.

Make sure that the burner is not locked into place by tight fitting oil lines.

4.8 FUEL PUMP



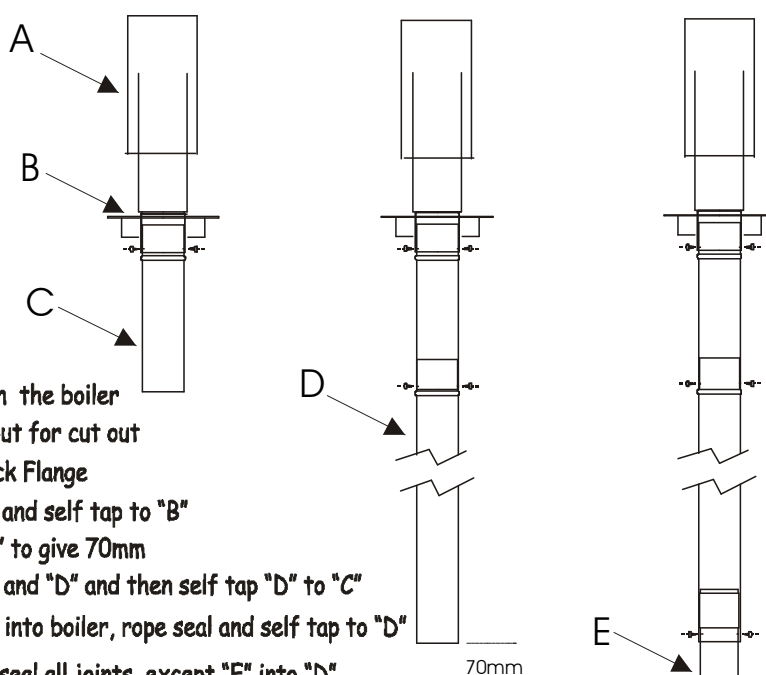
Note

When fitting the boiler make sure that the burner oil pump is not fitted tightly up to a wall or panel, the commissioning and service engineers will have to gain easy access to adjust the fuel pump pressure and from time to time replace the flexi fuel feed hoses.

50mm minimum gap required from face of fuel pump.

4.9 FLUEING.

Fig 1 VERTICAL FLUE OPTIONS



1. Position the boiler
2. Mark out for cut out
3. Fit Deck Flange
4. Fit "C" and self tap to "B"
5. Cut "D" to give 70mm
6. Fit "E" and "D" and then self tap "D" to "C"
7. Fit "E" into boiler, rope seal and self tap to "D"

Silicone seal all joints except "E" into "D"

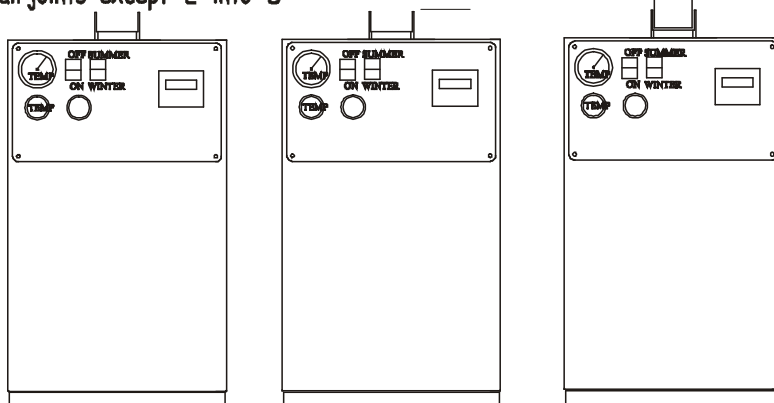


Fig 1A HORIZONTAL FLUE OPTIONS

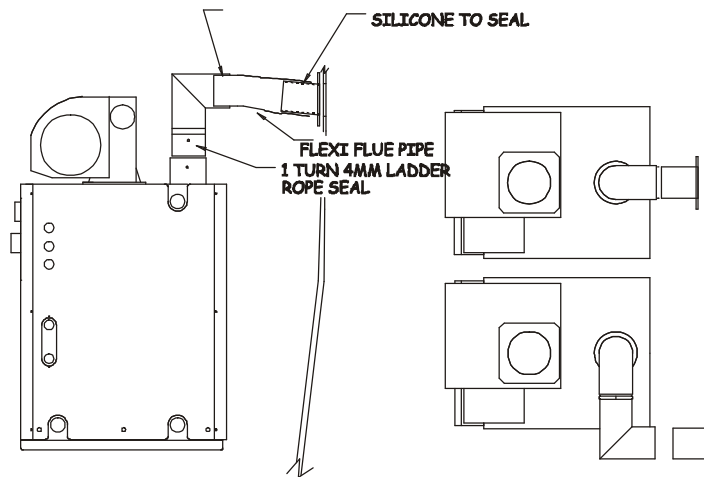
ALLOW ENOUGH MOVEMENT FOR FLU TO LIFT CLEAR OF SOCKET FOR SERVICING

STAINLESS SELF TAPPING SCREWS
ON EACH JOINT

1 TURN GAS TAPE
AND SILICONE TO SEAL

SILICONE TO SEAL

FLEXI FLUE PIPE
1 TURN 4MM LADDER
ROPE SEAL



The boiler is fitted with a vertical top flue take off. See fig 1.

The boiler can be flued horizontally if required via a 90 degree elbow, flexi stainless steel flue pipe and a through side adaptor. (See fig 1a)

The through side adaptor is designed with a 10 degree angle to offset the possibility of water entry.

The orientation of the 10 degree's is marked

via two small cut outs on the outer diameter of the adaptor.

The adaptor is provided with a series of holes through which it can be welded to the hull side plates.

Adequate provision to stop the ingress of water into the flue system must be made.

In all cases the horizontal or vertical flue pipe must be fitted so as to allow a vertical movement of 100mm min to facilitate boiler servicing.

On vertical flue applications this means that the lower part of the flue must be so designed so as to slide up into the upper part of the flue.

The upper part of the flue will need to be secured to the through deck adaptor so as to make it self-supporting when the lower part is not fitted to the boiler.

To prevent fire hazards, the horizontal or vertical flue pipe must be fully insulated if there is any combustible materials within 150 mm of the outer surface of the flue system.

4.10 VENTILATION.

Adequate ventilation must be provided and this will be calculated at 5cm sq per kW of output.

If the appliance is fitted in a compartment, high and low level ventilation of 10 cm sq per kW of output must be provided for compartment cooling burner combustion purposes.

150 sq cm at both high and low level.

If the appliance is fitted with a conventional flue system, in a compartment, the flue system must be fully insulated.

6 COMMISSIONING THE BOILER

6.1 READ THIS PREAMBLE BEFORE ATTEMPTING TO FIRE UP.

Before attempting to fire the boiler you will need to make sure that-:

6-1-1. The boiler, the hot water and heating systems are free from air or air locks, *air in the boiler could stop the pump from circulating and cause the burner to rapidly shut down.*

6-1-2. If the boiler is fed with oil via a negative head you will have to use the ignition process to pull oil from the tank and up to the burner, air can be vented from the fuel pump as illustrated in 4-8.

Make sure that any flexible oil lines are manufacture to the standard ISO 7840

Do not allow any oil to soak into the boiler insulation blanket, which wraps around the boiler.

It may need several ignition attempts to pull oil through.

It is sometimes possible to hear the return oil trickling back into the fuel tank.

If fitted, make sure that the room stat, the cylinder stat, and the boiler stat are all set to call.

NOTE. The boiler is equipped with a fuel pre heater device, which will take approximately three minutes to heat up after power has been supplied to the boiler.

This means that when the all the controls are turned on to fire the boiler up, nothing will happen for at least three minutes.

Once the boiler has ignited it will modulate in line with demand via the control stat without any delay.

However, the burner is fitted with a post purge timer, which will allow the burner fan only to run on for a period of four minutes approx after it has received a shut down signal from the stat.

If the burner does not fire it will lock out after the ignition attempt, to reset it press the flashing button on the burner control box or turn the power on and off for a re-set.

If the boiler stat becomes satisfied it will shut the burner down, but the burner fan will continue running for a 4 minute post purge period.

It is normal for the boiler to pulse on and off; up to it's maximum operating temperature.

6.2 VENT AIR FROM THE BOILER AND HEATING SYSTEM.

Using the temporary filling loop fill the central heating system and vent all air from it.

Watch the pressure gauge and pressurise the heating circuit up to 1.5 bar.

It may be necessary to keep topping up until the system is vented of all air, when it is the pressure gauge should hold at 1.5bar.

6.3 COMMISSION THE HEATING PRESSURE SYSTEM IF FITTED.

Check the action of all pressure release devices

Make sure that the temporary filling loop is disconnected.

6.4 CHECK THE HEATING SYSTEM.

Make sure that all the vents are closed off and balance the system to provide equal flow across all the radiators.

6.5 THE EFFECT OF TRV's.

If you intend to fit TRV's to the heating system you will need to fit a 22mm differential by pass valve.

The by pass valve will be fitted in between the output of the circulating pump and the three port or two single port motor valves.

For further advice contact Harworth Heating.

Failure to do this will invalidate the warranty.

6.6 CHECK HOT WATER SYSTEM, EXPANSION VESSEL AND PRESSURE RELEASE DEVICES.

To fill the hot water system open all the hot taps and admit water into the cylinder, check all the joints as the cylinder fills up and vent off all trapped air via all the hot outlets.

When the air has vented off, close the hot outlets and allow the system to come up to pressure.

Check all the pressure release devices and repeat the checks when the cylinder is up to temperature

6.7 CHECKING THE FLUE GAS EMISSIONS AND TEMPERATURE.

Nozzle Danfoss	0.4 U.S. gal x 60° S .
Fuel Pump pressure	10 bar.
Smoke	Zero to one on the Bacharach scale.
The net flue gas temp.	195 deg C when the boiler water temperature is at 70 deg C. <i>(If it is slightly lower this is acceptable)</i>
Efficiency	86 to 87%.
CO ²	10.5%.
O ²	6 to 6.5%.

Generally the air setting needs to be approx 2.8 on the air scale.

Before proceeding with testing the flue gas make sure that: -

You have Dwyer test point plugs and a suitable size of drill.

You have suitable Allen keys.

Your flue gas analyser is in good condition and set for the appropriate fuel.

Drill a suitable hole into the flue approximately 100 mm from the boiler outlet to allow insertion of the flue gas analyser probe.

Fire the burner up and allow the boiler to come up to 60 deg C.

(Whilst the boiler is coming up to temperature keep an eye on the terminal, if there is smoke about increase the air until it goes.)

The burner is fitted with a .4 x 60° S atomising nozzle.

(Always make sure that you have at least three spare nozzles)

The burner fuel pump pressure is set a 10 bar.

The smoke should register zero to one on the bacharach scale.

The net flue gas temperature should be 195 deg C when the boiler water temperature is at 70 deg C. *(If it is slightly lower this is acceptable)*

The efficiency should read off at 86 to 87% in some cases higher.

The CO² should be set to 10.5%.

The O² should be set between 6. To 6.5%.

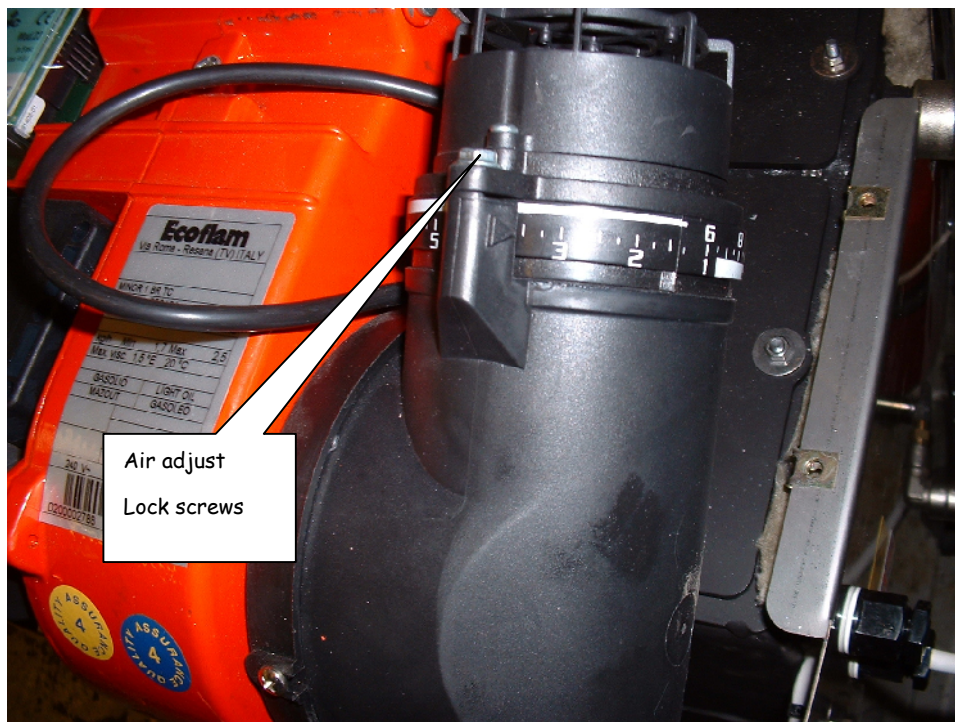
6.8 COMMISSIONING CHECK TICK LIST.

When power is applied to the boiler, the burner will run for about three seconds and stop, it will then wait for a further three to four minutes to whilst the nozzle pre heater warms up to 60 deg C,

When the pre heater reaches its temperature the boiler will attempt to ignite. If the boiler does not attempt to ignite make sure that the permanent live is available and the relay has clicked to indicate this.

Make sure that the boiler stat is set to call.

- ❑ 1. Check that the boiler is turned on.
- ❑ 2. check that the permanent live is applied to the boiler.
- ❑ 3. Check that the boiler stat is set to call.
- ❑ 4. If the burner attempts to fire but does not fire and goes to lock out, attempt another ignition and whilst the burner is attempting to ignite check that oil is flowing back down the return to tank line.



7 ROUTINE MAINTENANCE

7.1 INTRODUCTION.

A conventional 230-volt ac pressure jet burner similar to those used on all land based oil fired boilers, powers the boiler.

All OFTEC registered land based, oil fired service engineers will be able to service the boiler as per the routine maintenance section.

OFTEC can be contacted on 0845 65 85 080 they have details of all registered service engineers in the UK.

Because the boiler is fired by diesel oil it must be serviced at six monthly intervals.

EASY ACCESS is the key word when installing boilers.

They must not be fitted into situations where access is difficult or awkward.

If they are you will find that service engineers will not want to service them.

Servicing will take the form of -:

7.2 REMOVING AND CLEANING THE BURNER.

When the boiler is fitted a distance of 80 mm clearance above the burner is required to allow space for the burner to be lifted free from the boiler.

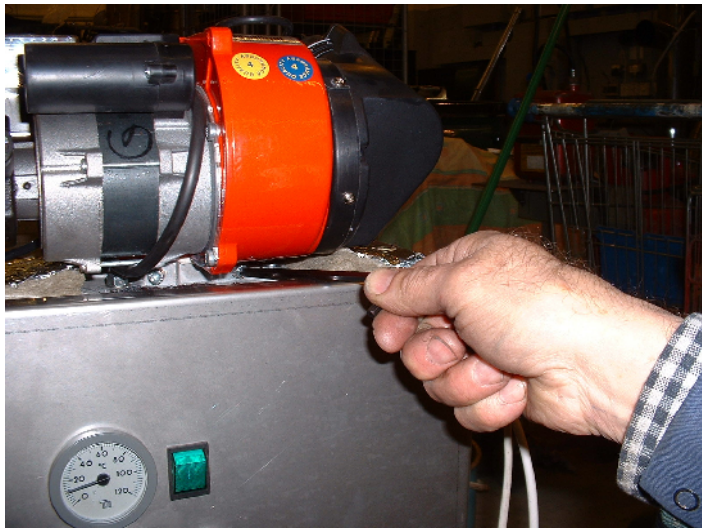
Space has to be provided for the service engineer to get his hand over the top of the boiler and down into it for removal of the baffles and vacuum hose access to clean out the base of the boiler.

If boilers are fitted under a worktop in a kitchen or galley environment the worktop over the boiler must be removable to allow the service engineer to gain easy access to it.

The burner fires down into the boiler and is secured by two horizontal grub screws and two fasteners.

One horizontal grub screw locks the burner flame tube into the cast aluminium-mounting flange.

This grub screw can be seen in the side of the aluminium burner mounting flange.



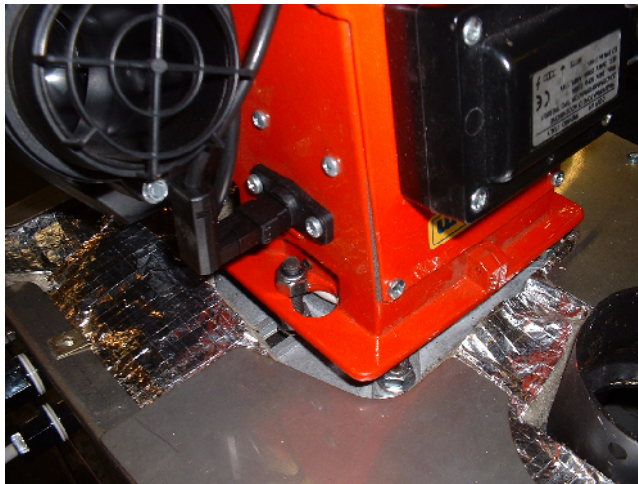
Remove the screw and the burner can then be rotated anticlockwise and lifted out of the boiler. (This will require the use of a long series 6mm allen key.)

When re fitting the burner it is important that the flame must fire concentrically straight down into the centre of the combustion chamber, any deviation could cause excessive sooting to occur on the side faces of the boiler.

Electrical power is supplied to the burner via a large multi pin plug, which has a latched fastener.

Rotate the burner and work it up and off the m8 fasteners.

Note the burner is a tight fit and some rotational movement will be required to get it up and out of the boiler-mounting flange.



The burner will still be attached to the oil line so take care not to damage, twist or kink the oil line.

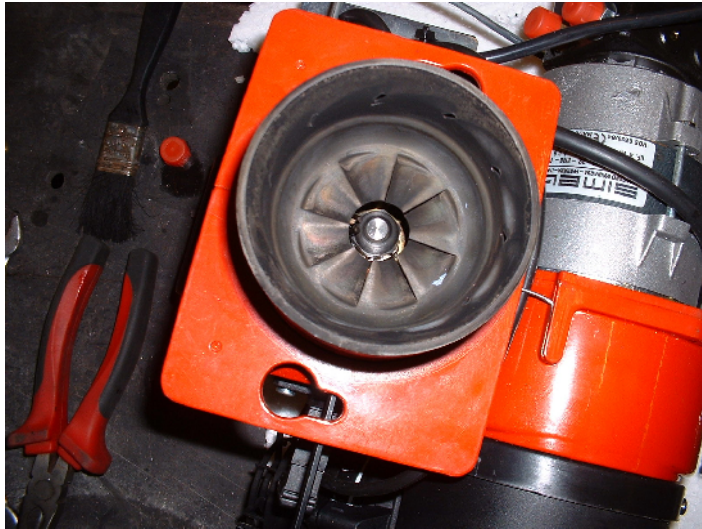
Work the burner out from the boiler by simultaneously rotating and lifting it up and out from the top of the boiler.

Once the burner is removed from the boiler it can be stripped down and cleaned as follows.

7.3 TO REMOVE AND CLEAN THE FLAME TUBE.



7.4 TO REMOVE EXAMINE AND ADJUST THE ELECTRODE.

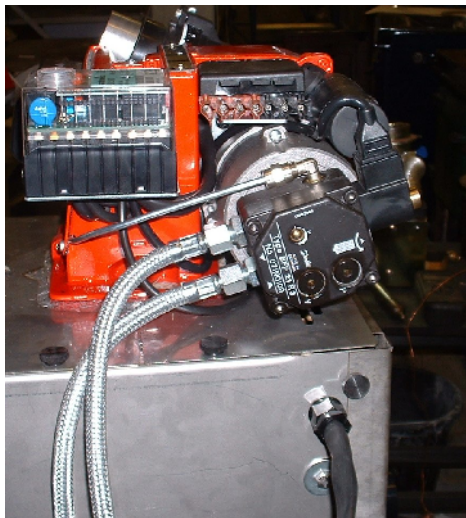


7.6 TO REMOVE AND CLEAN THE PHOTOCELL.

The photocell is plugged into the side of the burner and should be removed for cleaning.

The cell can be located in two positions, when fitting make sure that the cell is not fitted so that it is facing directly at the flame.

7.7 TO CHECK THE FUEL PUMP PRESSURE.



7.7A REPLACING A FUEL PUMP.

If it is found necessary to change the fuel pump make sure that the pump is set up for a two-pipe system.

The fuel pump is a Danfoss BFP 21 R3 No 071N0231

It is held in place via three grub screws located in the rear cast flange of the motor.

7.7B REPLACING A NOZZLE PRE HEATER.

If the nozzle pre heater fails, the burner will not go through the ignition process as described in Sec 3.

When the boiler is turned on the burner will give its customary short burst and then sit indefinitely.

This means that the pre heater has been energised but its built in thermostat has not switched the power back to the burner control unit thus not allowing the burner to proceed through it's normal ignition process.

The wiring diagram shows the switched live from the nozzle pre heater, returning to terminal B in the control box base unit.

To replace the nozzle pre heater-:

1. Isolate the boiler
2. Remove the burner from the boiler.
3. Remove the flame tube.
4. Remove the electrode holder from the pre heater tube.
5. The nozzle holder is secured via a single screw in the bottom plate.
6. Remove the screw
7. Remove the electrical connection plug.
8. Undo the oil line via the compression fitting.
9. Remove the nozzle holder.
10. Mark up the orientation of everything so as to be able to re assemble it as it was.
11. Remove the support rod via 1 screw in the top surface of the aluminium casting.
12. Remove the two fasteners holding the diffuser casting to the pre heater.
13. Slide the casting from the pre heater.
14. Remove the oil line fitting and fit it into the new pre heater.
15. Rebuild in reverse order taking care to get the side rod of the support foot into the location slot cast into the side of the burner housing.

7.7C REPLACING A TOP INSULATION BOARD.

1. Isolate the boiler
2. Remove the burner from the boiler.
3. Remove the front top cover from the boiler.

4. Gently lift out the top board note that on early boiler the top board is a single piece, on later boilers it is supplied in two halves.

7.7D REPLACING A BURNER BAFFLE BOARD.

1. Isolate the boiler
2. Remove the burner from the boiler.
3. Proceed as per 7-7c-4
4. Primary baffle board can be lifted out.

Note that the board is fastened to a carrier plate via a series of split pins.

7.8 TO SET THE BURNER COMBUSTION.

The burner leaves the factory with the combustion preset to give optimum performance

The settings are as follows-:

Air @t 6.5%

Pump pressure @ 10

Bar

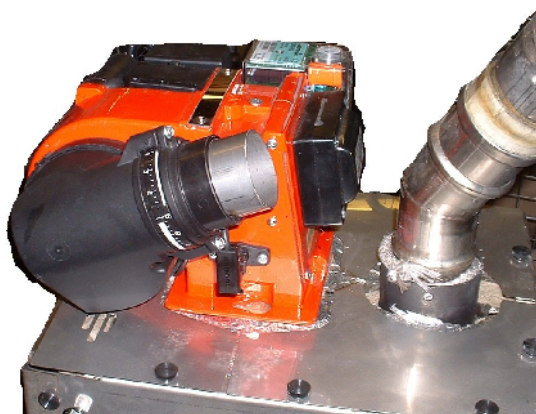
Efficiency @ 87%

Smoke @ 0-1

CO² 10.5%

CO-CO² Ratio .000

Nozzle .4 x 60 deg solid.



7.9 REMOVING THE BAFFLE SYSTEMS AND CLEANING THE BOILER.

To remove the boiler top plates, the flue system must be so designed as to allow the bottom part of the flue pipe to slip up vertically by a distance of about 80 mm.

Slip the flue pipe up away from the boiler flue spigot by the requisite distance of 80mm.

The boiler has front and rear removable top plates are held in place by 6 x m10 fasteners.

Remove the burner.

Undo the 6 x m10 fasteners remove the front top plate under which is a ceramic top board.

Remove the ceramic top board to gain access to the main baffle

Lift the main baffle out.

Remove the rear boiler top plate.

Once the rear top plate has been removed the boiler baffles can be carefully removed.

To help with the removal of all the baffles there are a pair of aluminium lifting hooks supplied with the boiler)

Note the order of removal and when they are out the boiler and the baffles can be brushed clean and vacuumed out.

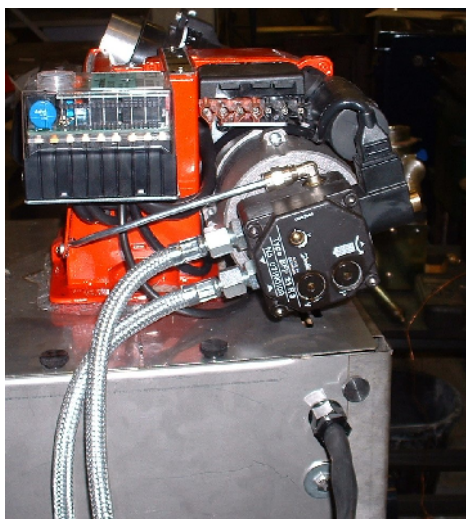
Rebuild in reverse order making sure that all the seals are in good condition and airtight.

When carrying out cleaning work make sure that the flue system is also thoroughly cleaned.

7.10 Checking the oil line.

Normal flexible oil lines are prone to deteriorate after a two to three years.

Check the oil lines for leaks or potential leaks every year and replace every second year.



7.11 CHECKING THE FIREVALVES.

The boiler must be fitted with a 60 deg C, remote sensing fire valve, which should be inspected every year.

The sensor of the valve should be located over the boiler at a distance of 200mm above the burner.

7.12 CHECKING THE FLUE SYSTEM.

The flue system needs to be checked to make sure that it is airtight.

Use a smoke bomb to carry out this procedure.

7.13 CHECKING THE PROVISION OF VENTILATION.

Make sure that the boiler has adequate ventilation for cooling and combustion purposes.

Make sure that all purpose made vents are free from obstruction.

7.15 CHECKING THE FUEL FILTERS AND CHANGING WHERE NECESSARY.

8 FAULT FINDING

8-1 INTRODUCTION TO FAULT FINDING.

Fault finding is divided into the following categories.

8-2 BURNER FAULTS.

Introduction to Burner faults.

Because the burner runs on diesel fuel and is also down firing, because of this there are a few differences, which the service engineer needs to know.

The burner uses a Nozzle pre heater and this is the most likely cause of failure to start.

From a cold start, the pre heater will take approx two minutes to heat up and allow the burner to go through an ignition attempt, if the burner just sits quietly and does not attempt to start, this could be caused by a failed pre heater.

The controller also has a built in post purge timer which is designed to allow the burner fan to post purge the products of combustion for a period of 4 minutes.

To allow the burner to go through its post purge cycle a permanent live is wired into a relay, wired in series with the control stat.

After a stat satisfied signal, the post purge timer will allow the fan to run for four minutes, if during this post purge period it receives a demand signal from the boiler stat, the burner will ignite.

8-3. Black Smoke is emitted from the flue terminal.

Change the nozzle.

Check for an obstruction on the burner air inlet

Check that the burner fan motor is running at optimum revolutions.

Check that the internal boiler baffle system is not distorted, damaged or sooty.

Remove the boiler internal baffle system and check that the boiler is not contaminated with excess soot, if it is, brush and scrape both of the boiler flue ways and vac the soot out from the bottom of the boiler making sure that there is no obstruction in the base of the boiler.

8-4. Grey smoke is emitted from the flue terminal.

This situation is caused where the boiler has failed to ignite and several ignition attempts have been made.

If the boiler does become flooded with excess unburned fuel, when it eventually lights, plumes of light grey smoke will issue from the exhaust as the fuel evaporates off.

If this situation is noticed, keep turning the boiler off every two minutes until the grey smoke clears, in bad cases this process can last for up to 1 hour.

8-5. Burner goes to lockout after initially firing up for a short period.

8-5-1. The boiler is energised via a live 230vac input from a manual or automatic source.

2. Once the boiler has received the signal and all the control devices are in a calling mode the burner gives a short burst of action lasting 2 - 3 seconds and then nothing will happen until the nozzle pre heater is up to temperature.

This period of silence can take up to 4 minutes.

3. When the nozzle pre heater thermostat is satisfied the burner will then go through its ignition sequence as follows.

4. The Motor runs.

5. H.F. spark is discharged across the electrodes.

6. A few seconds later the fuel is released by the solenoid valve, *(note that the fuel release is deliberately delayed and must not occur simultaneously with the spark release.)*

7. Ignition occurs.

8. Photocell recognizes ignition has occurred.

9. Photocell sends signal to DKO control unit, which turns the H.F. ignition off and then allows the burner to go into run mode.

10. The burner will run until it reaches the pre set temperature at which point it will shut down and then modulate in on-off mode until either the auto or manual supply is removed.

11. If the burner locks out after the flame has been heard to establish this would indicate that the fuel has been released too early and the cell and controller have spotted this and put the burner into lockout mode.

This situation can be caused by -:

A damaged solenoid spindle. (Bent)

A faulty solenoid actuator coil.

Micro dirt lodged under the solenoid valve causing it not to be able to close.
(let by)

8-3. INTERNAL BOILER CONTROL SYSTEM FAULTS.

1. Burner runs on continuously in post purge mode.

Post purge timer is not timing out. The post purge timer is integral to the removable, control box top, if it fails a new DKO 992 Mod .23 control box top is required.

8-4. EXTERNAL TIME CLOCK PROGRAMMER FAULTS

Not covered under this manual.

8-5. EXTERNAL CONTROLS FAULTS

Not covered under this manual.

8-6. FUEL SUPPLY PROBLEMS.

The fuel filter should be changed every year but this depends upon the cleanliness of the fuel, if the tank is contaminated or infected with diesel bug then appropriate cleaning out measures will be necessary.

8-7. FLUE AND EXHAUST FAULTS

The flue should be cleaned and swept every 12 months.

8-8. BURNER SERVICING

The burner should be serviced every 12 months.

8-9. BOILER SERVICING

The boiler should be dismantled and cleaned every six months.

8-10. ABOUT THE BOILER AND ITS CONTROL REQUIREMENTS.

Because the burner runs on diesel fuel and is also down firing, there are a few differences, which the service engineer needs to know.

The burner uses a Nozzle pre heater.

The controller is designed to allow the burner to post purge the products of combustion for a period of 4 minutes.

To allow the burner to go through its post purge cycle a permanent live is wired into a relay wired in series with the control stat.

This simple arrangement allows the boiler to be used in conjunction with standard off the shelf Y or S plan control systems, schematic layouts are illustrated.

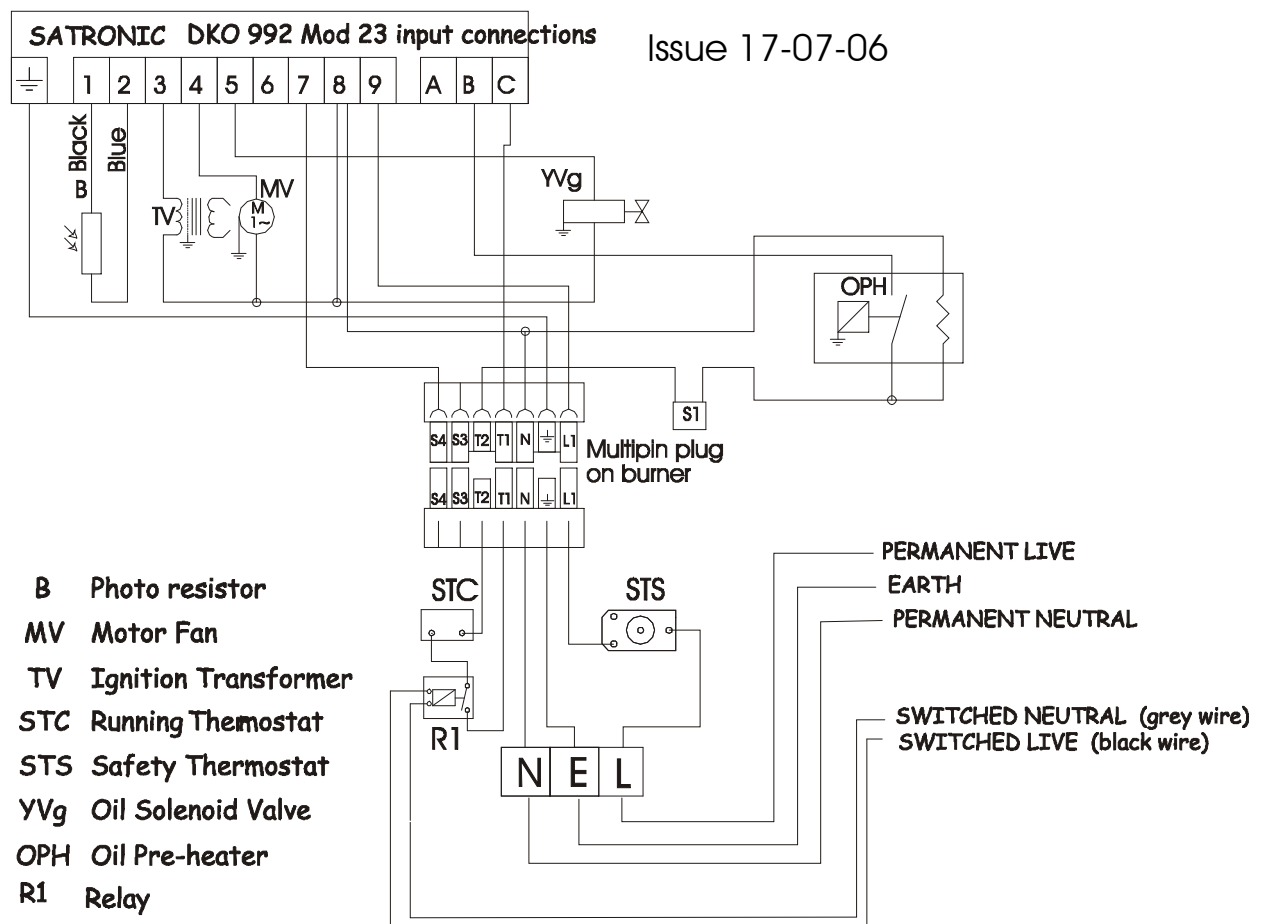
If the burner fails to ignite a warning light on the control top will illuminate, after a period of two minutes, this can be pressed to clear the warning light and a further ignition attempt will be made.

If the burner does not ignite and goes to lock out again call a service engineer.

Do not keep attempting to ignite the boiler as this will cause unburned fuel to accumulate inside the boiler.

If the boiler does become flooded with excess unburned fuel, when it eventually lights, plumes of light grey smoke will issue from the exhaust as the fuel evaporates off, in bad cases this process can last for up to 1 hour.

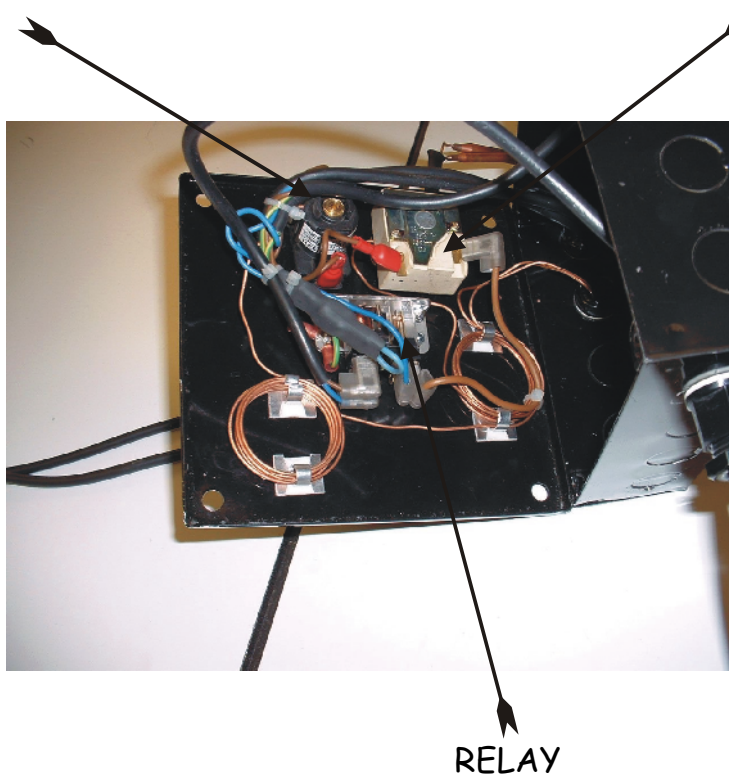
8.3 WIRING DIAGRAM.



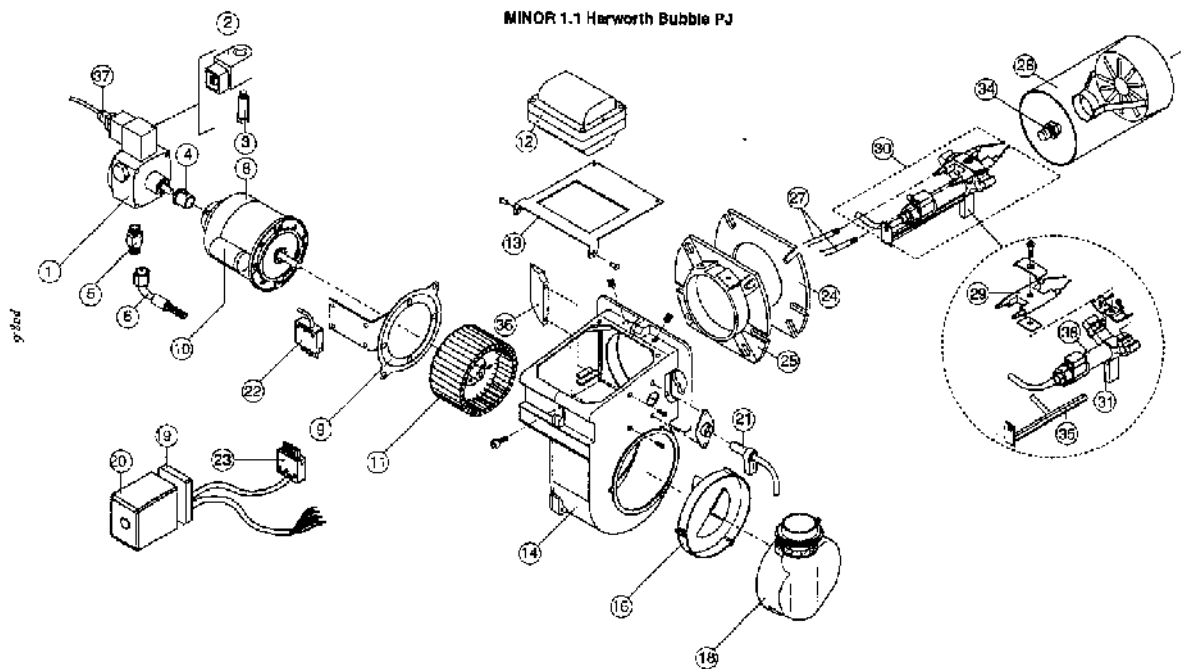
8-4 Illustration showing the control panel cover removed

SAFETY STAT

RUNNING STAT



8-5 BURNER EXPLODED DRAWING

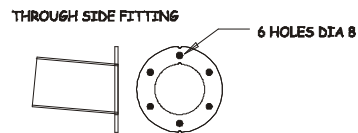
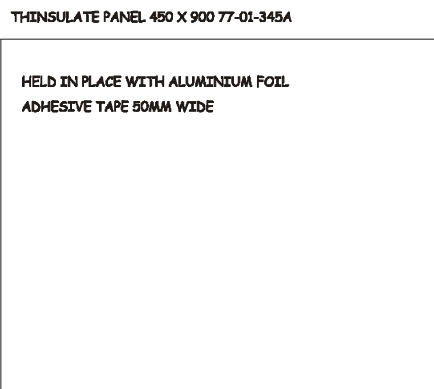
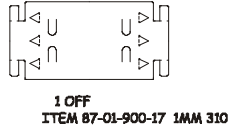
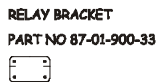
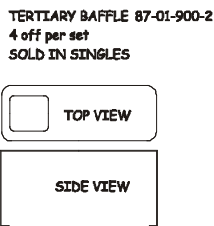
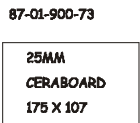
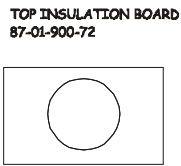
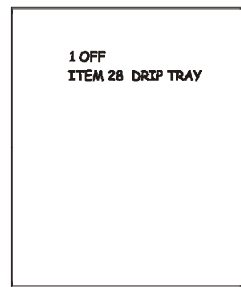
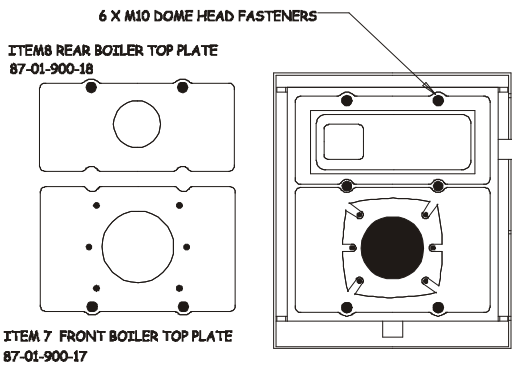
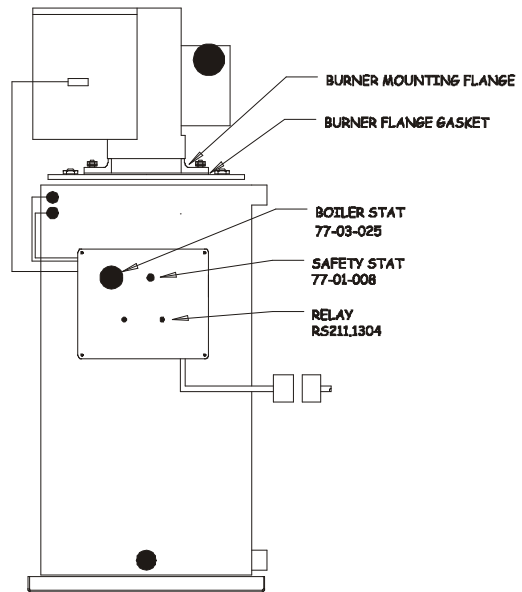
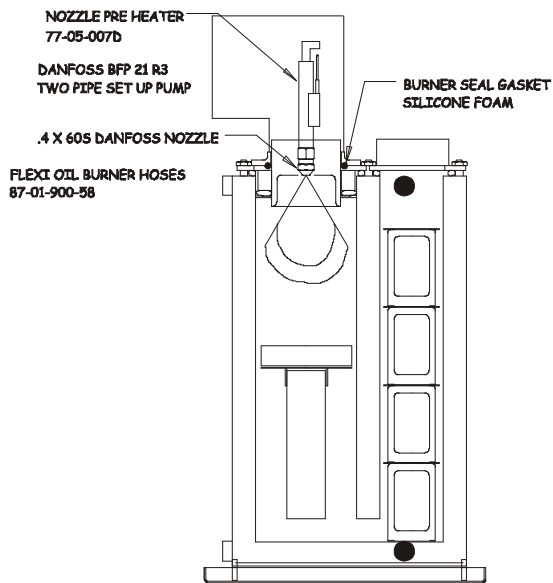


8-6 BURNER PARTS LIST

N°	DESCRIPTION	MINOR 1.1 Harworth Bubble PJ code
1	- OIL PUMP DANFOSS BFP21 R3	P121/7
2	COIL DANFOSS	V510/2
3	- OIL VALVE DANFOSS	V412/1
4	- COUPLING	MP501/5
5	- NIPPLE	BFR01103/001
6	- HOSES PARIGI NW 6	S252/11
7	- SUPPORT	-
8	- MOTOR 75 W	M:10/3
9	- SUPPORT	BFF03004/001
10	- CAPACITOR 3,5 uF	C107/8
11	- FAN 99 x 43	BFV10003/001
12	- IGNITION TRANSFORMER Cof E820 CM	T123/2
13	- COVER	BFC09002/011
14	- FAN HOUSING	BFF04315/011
15	- AIR DAMPER	-
16	- AIR CONVEYOR	GRMP002
17	- AIR DAMPER SCREW	-
18	- COVER AIR INLET	GRCA030
19	- CONTROL BOX BASE SATRONIC	A417
20	CONTROL BOX SATRONIC DKO 992	A156/3
21	- PHOTORESISTOR SATRONIC	A214
22	- PLUG WIELAND	E225
23	- SOCKET WIELAND	E225/1
24	GASKET	BFG02016
25	- FLANGE	BFF01012/008
26	- ORING	-
27	- CABLES TC	BFB01401/1
28	- BLAST TUBE TC	BFB01104/002
29	- ELECTRODES	BFE01106
30	- FIRING HEAD TC	-
31	- NOZZLE HOLDER	BFC10506/051
32	- DIFFUSER	-
33	- REAR DISC	-
34	- NOZZLE	-
35	- ROD	BFA05102/001
36	- FAN SCOOP	BFC02040
37	- CABLE DANFOSS	E:103
38	- PRE-HEATER FPFB 3 Danfoss	PP110/3

TC = SHORT HEAD TL = LONG HEAD

8-7 BOILER PARTS LIST



9 FILL IN THE WARRANTY FORM

Fill in the warranty form and return it back to the manufacturers for future spares reference purposes.

10 RUNNING COSTS

10.1 FUEL CONSUMPTION.

The burner is fitted with a .4 U.S.Gallon Nozzle set up at 10 bar fuel pump pressure.

For normal timed use the boiler should use about 42 litres per 7-day week.

10.2 ELECTRICAL CONSUMPTION.

The burner automatically stops and starts therefore it only consumes electrical energy when a demand is placed on the control system from either the room or cylinder stats.

11 AMENDMENT LIST

20-07-03-1 Horizontal flue drg added, 2 Picture of air adjustment added. th

14-02-04 -1 Relay added and wiring diagram altered -2 Text regarding relay addition added. (About the boiler and it's control requirement.) 3- Fault Finding (Introduction to Fault Finding) th

26-02-04-1. Fuel consumption figure added. th

11-08-04-1. Y, SAND GRUNDFOSS Wiring diagrams added. th

27-05-05 Info added. th

1. Leave slack in flexi oil lines to allow burner removal.
2. Leave adequate clearance for a service engineer to get to the left hand side of the burner for adjustment of the pump pressure.
3. Leave enough space at the left hand side of the burner to allow the burner to rotate for removal.
4. Do not allow clothing to obstruct air vents or burner air intake.
5. Do not invert mains electrical supply.

17-07-06 Following Changes.th

1. 5 Core Cable used instead of one three and one two core cable.
2. Illustration of Boiler input power plug changed to show new 5 core cable.
3. 5 core cable used on control box to burner pug.
4. Thinsulate insulation used to replace ductwrap insulation.

5. IP66 box introduced to house stats and relay.
6. Differential by pass valve fitting position added.

17-10-08 Info Added th

1. Notes on plumbing from flue due to excessive start attempts.
2. Exploded burner parts added
3. Burner parts list and parts numbers added

18-11-10 th

Notes on fault finding re ignition and damaged solenoid notes. 8-5

Notes on burning off excess fuel see 8-4

03-02-11

Flue gas analysis notes modified.

27-09-11

Pump pressure setting changed from 9 bar to 10 bar