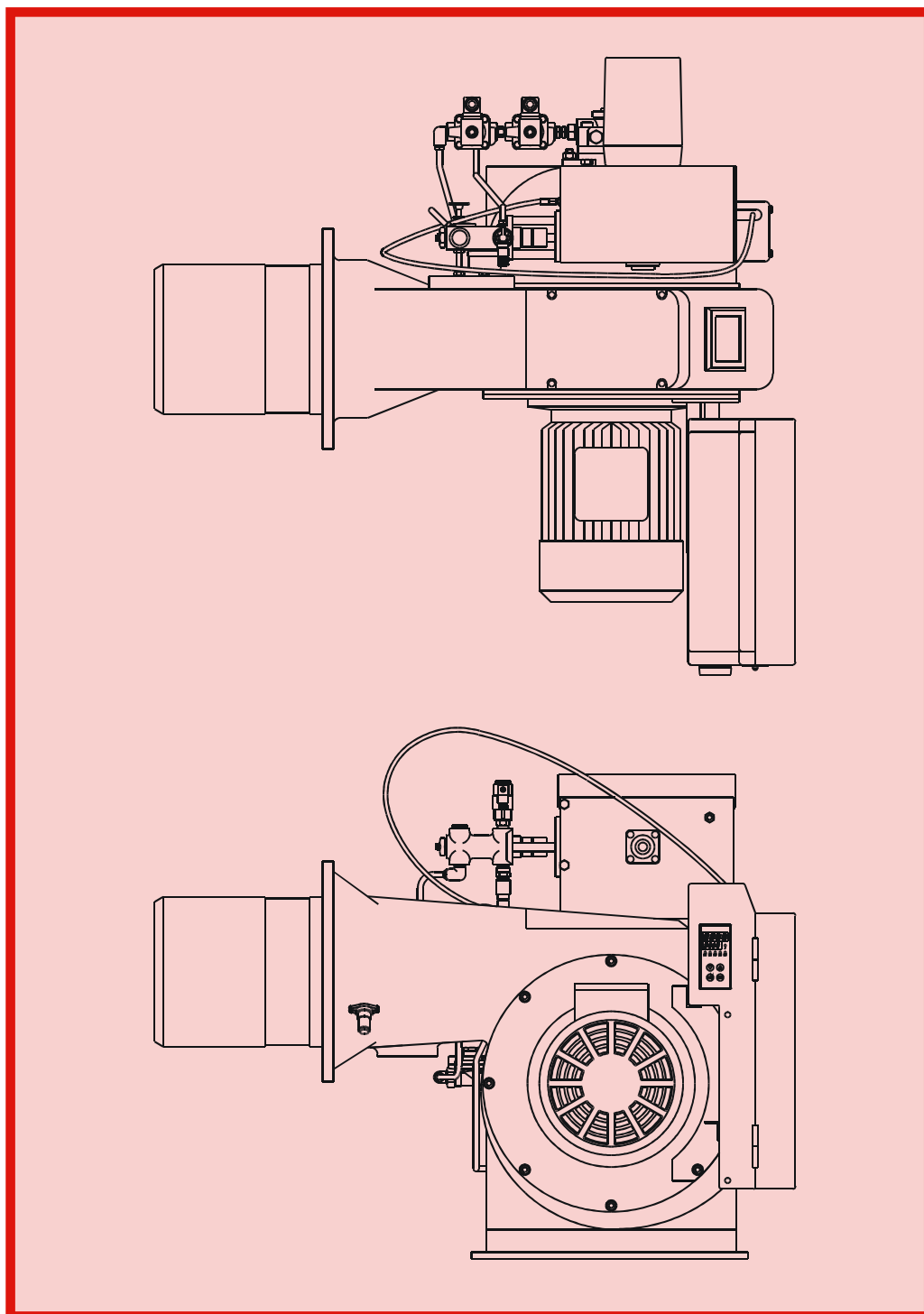




# HANDBOOK

## Series NOL fully automatic oil burner Models NOL Compact Modulating



Class D Oil

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## **IMPORTANT - SAFETY**

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It is essential that the following instructions and adjustments are carried out by qualified engineers that are experienced in pressure jet oil burner commissioning. The manufacturer cannot be held responsible for any consequential damage, loss or personal injury as a result of customers failing to follow these instructions, or as a result of misuse. Your attention is drawn to the **Emergency Instructions** on page 10

## **EUROPEAN BOILER EFFICIENCY DIRECTIVE (B.E.D.)**

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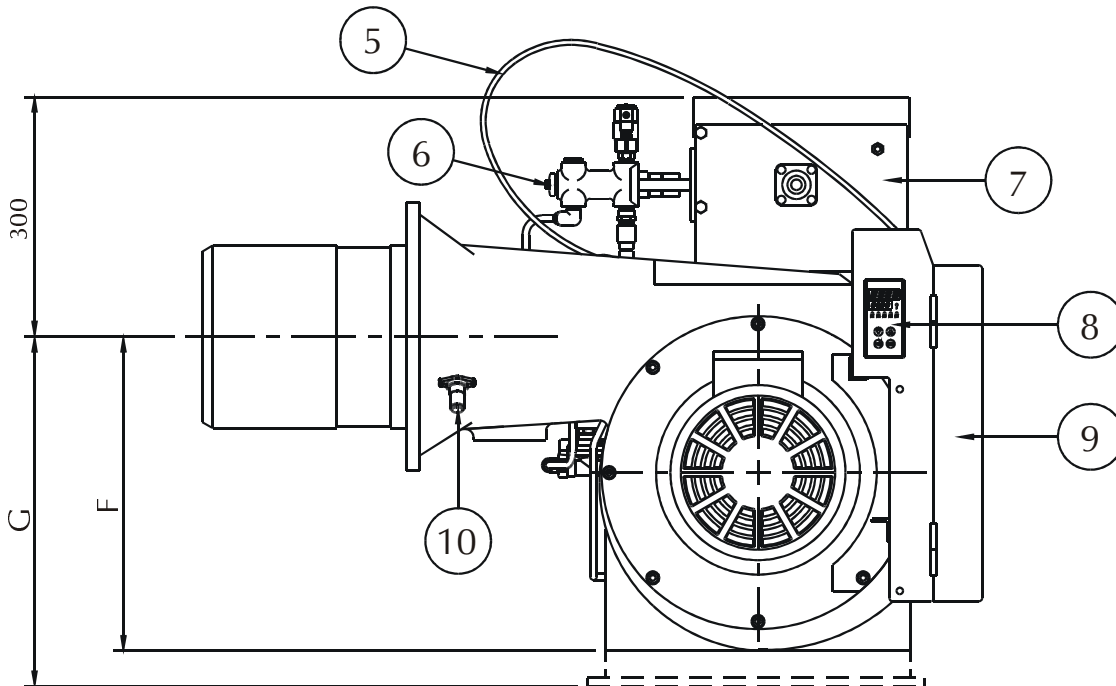
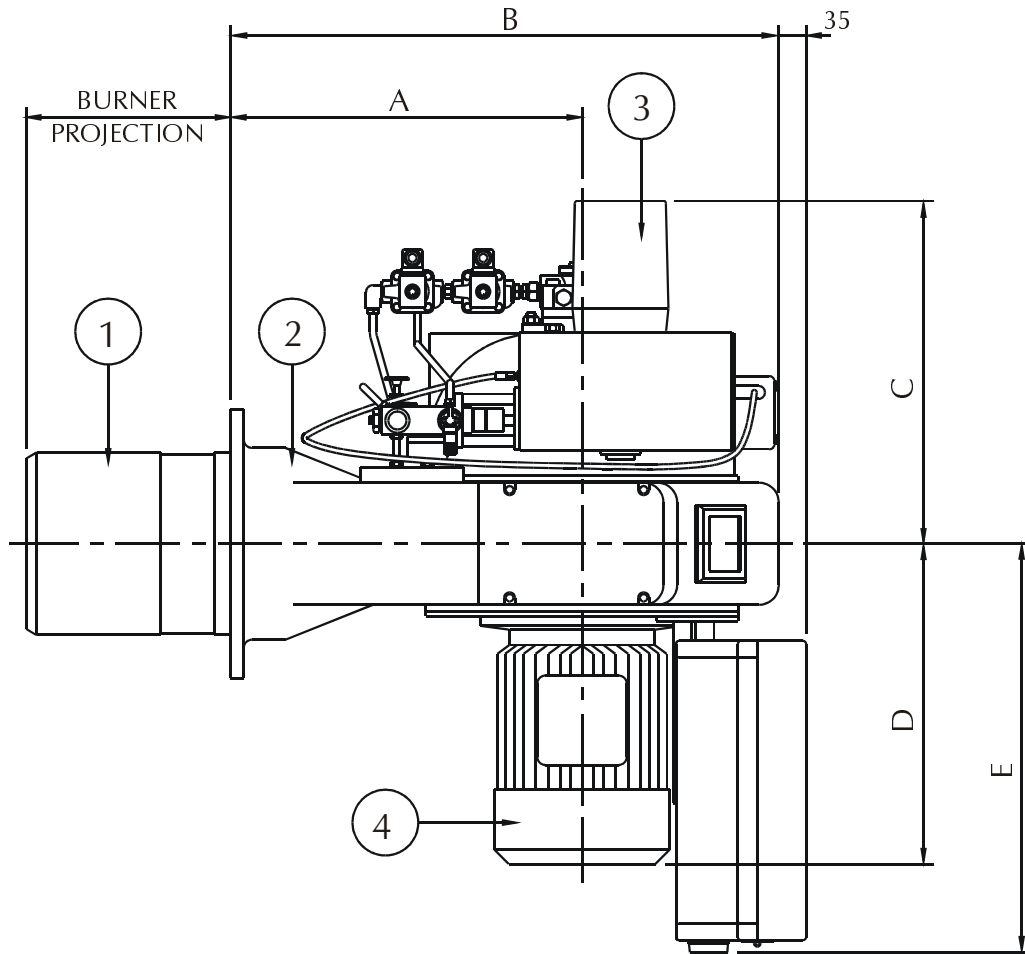
All burners and boiler bodies marketed separately should comply with EN267 (oil burners) or EN676 (gas burners) and EN303-1 (boiler bodies).

Burner adjustments must be made in accordance with boiler manufactures' instructions, and these must include flue gas temperatures, average water temperature, and CO<sub>2</sub> or O<sub>2</sub> concentration.

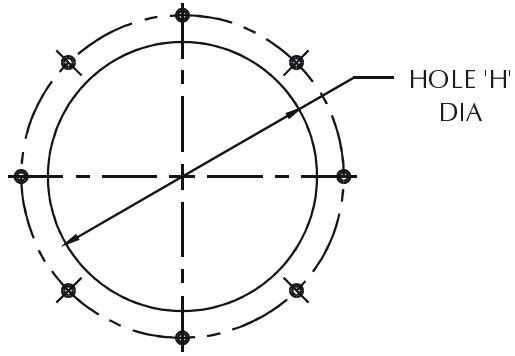
# **BURNER & COMPONENT IDENTIFICATION**

Standard Burner Arrangement Shown

All dimensions are mm.



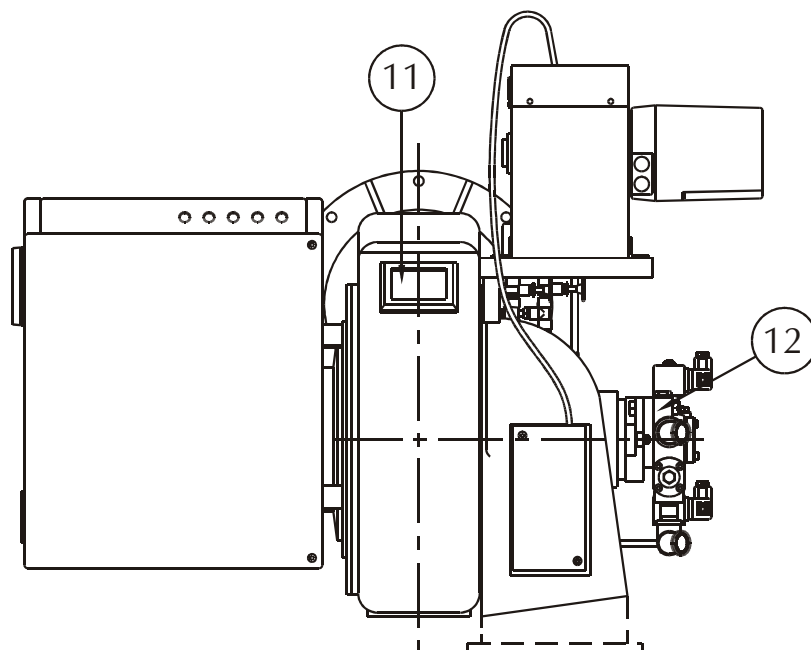
## Burner Mounting Details



8 HOLES M10 EQUI-SPACED  
ON 'J' PCD FOR M10 x 35 PROJ. STUDS

ITEM	DESCRIPTION
1	Flame Tube
2	Burner Casing
3	Modulating Motor
4	Fan Motor
5	Air Control Cable
6	Oil Spill Control Valve
7	Modulating Cam Unit
8	Temperature Controller
9	Control Panel
10	Photocell
11	Viewing Window
12	Oil Pump

BURNER	A	B	C	D	E	F	G	H Dia.	J PCD
NOL18-34	440	674	430	420	457	387	440	230	305
NOL18-38	465	721	430	457	457	-	480	230	305
NOL30-25	365	544	430	307	457	314	360	230	254
NOL35-25	365	544	430	307	457	314	360	230	254
NOL35-34	440	674	430	420	457	387	440	230	305
NOL35-38	465	721	430	457	480	-	480	230	305
NOL50-28	440	674	430	420	420	387	440	254	305
NOL50-34	440	674	430	457	457	387	440	254	305
NOL50-38	465	721	430	480	480	-	480	254	305
NOL60-28	440	674	430	457	457	387	440	254	305
NOL60-34	440	674	430	480	480	387	440	254	305
NOL60-38	465	721	430	480	480	-	480	254	305
NOL85-38	465	721	430	537	480	-	480	280	305



## FEATURES

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Developed from Worldwide field experience, the NOL Modulating series sets new standards in efficient and reliable operation. The burners, which are designed to meet the requirements of all International markets, are designed for flange mounting to the appliance front plate and are delivered ready to install with a pre-wired packaged control system.

### Air Regulation

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Air for combustion can be adjusted to give maximum efficiency.

### Controls and Safety Systems

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Flame supervision is by photocell with a sequence controller for automatic start-up, running, and shutdown of the burner.

### Fuels

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Light distillate oil class D (1.5-5.5 cSt @ 40°C).  
Burner outputs are based upon a gross CV of 45.5 MJ/kg.

### Fuel System

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Suitable for single pipe gravity or two pipe suction lift systems. The filter supplied with the burner is of the disposable element type.

### Construction

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Of monobloc design using fasteners to ISO standards. and designed for flange mounting.

## GENERAL

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The burners are supplied for fully modulating operation only.

This manual is structured to enable the user to proceed from the delivery of the burner to its commissioning and use.

The conditions to be fulfilled and the controls and adjustments to be used are dealt with in the sequence that should be followed for the correct installation and use. Pre-commissioning and Live Run are described, and the location of necessary controls and adjustments to undertake these are illustrated and supported by appropriate tabular matter and graphs.

Routine maintenance, Fault Finding and Spare Parts identification complete the manual. Literature on proprietary components is available on request.

## SITE CONDITIONS AND SERVICES

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### Fuel Storage and Handling

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The requirements of BS2869 will ensure that the fuel is suitable. Under sustained cold and exposed conditions, class D grade of fuel should be stored and supplied to the burner at a minimum temperature of 5°C (41°F).

### Fuel Supply

---

The oil line should consist of metallic tube (NEVER galvanised steel). The final connection to the pump inlet port is made with a flexible pipe supplied with the burner. Joints should be made with compression fittings.

When gravity feed is used, the maximum head should not exceed 4m, (35 kPa).

On installations where the fuel tank is situated below the level of the burner the maximum suction permitted is 40 kPa (300 mm HG) and a two-pipe (supply and return) fuel supply system MUST be used.

### Single Pipe system

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On a single pipe (gravity feed) system, the pump should be primed under gravity from the tank and not by running the pump mechanically. To prime the pump remove the purge plug, connect the purge port to a suitable container.

### Two-Pipe System

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The suction line will require priming before energising the pump mechanically. It is essential to ensure that the return pipe is not obstructed in any way. Any obstructions will damage the pump. The fuel supply line may need priming if the oil storage is allowed to drain completely.

### Flue and Chimney Requirements

---

The flue and chimney must be constructed and installed to the appropriate local conditions, Codes and Standards. It shall be of sufficient size to satisfy the volume of flue gases at all firing conditions.

### Plant Room Ventilation

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An adequate dust free supply of fresh air is required for the burner at both high and low level in accordance with the appropriate standards.

## Existing Appliances

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In preparing the appliance to receive the NOL oil burner, a careful inspection should be made of its condition after it has been cleaned thoroughly to remove all adhering tars, scale and dirt.

## Combustion Chamber Conditions

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When the burner is fitted to an appliance designed to work under balanced or negative combustion chamber conditions, the over-fire draught must not exceed 0.25 mbar.

Should the over-fire draught exceed this figure, then steps should be taken to reduce it to this level.

## INSTALLATION

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### General

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Check that the burner is appropriate for the appliance rating. Detailed burner performance data is given on page 19.

### Fitting to the Appliance

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If the burner is to be fitted to a new packaged unit, refer to the manufacturers recommendations.

If the burner is being fitted to an existing appliance, prepare the mounting flange as detailed on page 5.

Ensure the joint between appliance and burner is effectively sealed with the gasket provided.

Unless the appliance manufacturer specifies extensions, the flame tube should be flush with the inner face of the appliance combustion chamber.

### Oil Supply Connections

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Connect the oil supply to the burner oil pump using the flexible pipes supplied. Refer to the burner oil system diagram on page 8.

### Electrical Power Connection

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Connect a three-phase, 50 Hz electrical supply to the burner, observing all applicable Codes and Standards. The electrical connections required are shown on page 9 and in the wiring diagram contained in the instruction pack attached to the burner. These diagrams also show the auxiliary control connections, which must be made.

If the burner is supplied as part of a packaged appliance/burner unit refer to the appliance manufacturers instructions.

## BURNER AIR CONTROLS

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A motorised, cable driven air flap controls the air for combustion. It is located inside the air inlet.

### Air Diffuser

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The air diffuser creates a pressure drop to ensure good fuel/air mixing and flame stability.

## BURNER OIL CONTROLS

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### Oil Nozzle

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The oil nozzle is of the spill-back type and is fitted to the front end of the inner assembly and located in the flame tube.

The nozzle should be sized to match the rating and turndown requirements of the appliance.

### Oil Control Train

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The oil control train consists of a high pressure fuel pump driven by the burner fan motor.

The oil nozzle throughput is controlled by a variable orifice regulator situated in the return supply oil line, and actuated by the Modulating Unit described below. Solenoid operated normally closed valves in the feed and return lines act as the safety shut off for the nozzle.

### Modulating Unit

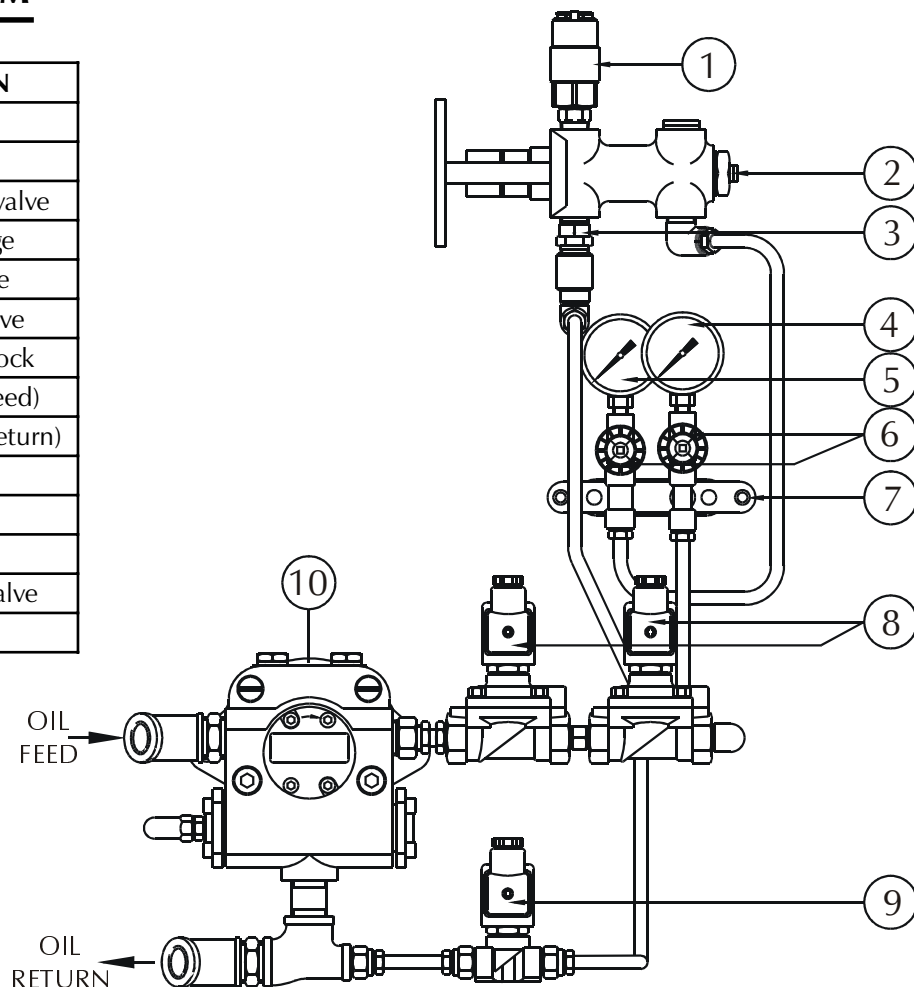
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The Nu-way modulating unit consists of a reversible servomotor, which is directly coupled to the camshaft of the modulating unit. Two adjustable cams are mounted on this shaft, one of which is connected to a flexible cable operating the burner air inlet control damper and is of the variable contour type (see fig. 2 on page 12). The second cam is the modulating oil cam and is illustrated in fig. 1. The *Burner Oil System Drawing* on page 8 shows the burner hydraulic circuit. Oil for combustion is drawn from the supply through a fixed displacement pump and supplied direct to the burner nozzle. A return line from the back of the nozzle is connected to a 'spill regulating valve' which regulates the oil pressure at the nozzle according to the position of an internal piston which is actuated by the oil control cam in the modulating unit.

There is a well defined relationship between the delivery of fuel through the nozzle and pressure behind the nozzle, therefore movement of the oil cam 'modulates' the nozzle output and hence the output of the burner.

# BURNER OIL SYSTEM

ITEM	DESCRIPTION
1	Pressure Switch
2	Spill Control Valve
3	Non-Return check valve
4	Feed Pressure Gauge
5	Spill Pressure Gauge
6	Gauge Shut-Off Valve
7	Burner Manifold Block
8	N/C Safety Valve (Feed)
9	N/C Safety Valve (Return)
10	Oil Pump
11	Spill-Back Nozzle
12	Flexible Oil Pipe
13	Manual Shut-Off Valve
14	Oil Filter

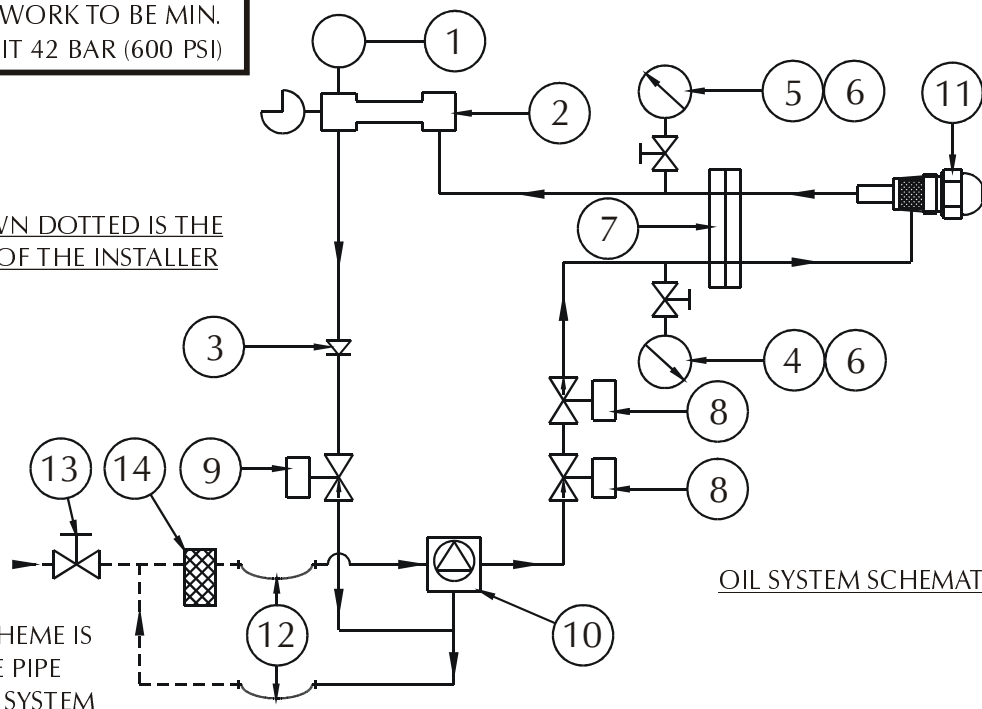


GRAVITY FEED SYSTEMS MUST HAVE AN INLET PRESSURE AT THE BURNER PUMP OF 0.14 TO 0.70 BAR (2-10 PSI)

CONNECTING PIPEWORK TO BE MIN. 19mm BORE TO SUIT 42 BAR (600 PSI)

BURNER MODELS NOL18 TO NOL35 ( $\leq 100$  kg/h) REQUIRE SINGLE SAFETY VALVE (ITEM 8) ONLY. ITEM 9 IS OMITTED

PIPEWORK SHOWN DOTTED IS THE RESPONSIBILITY OF THE INSTALLER



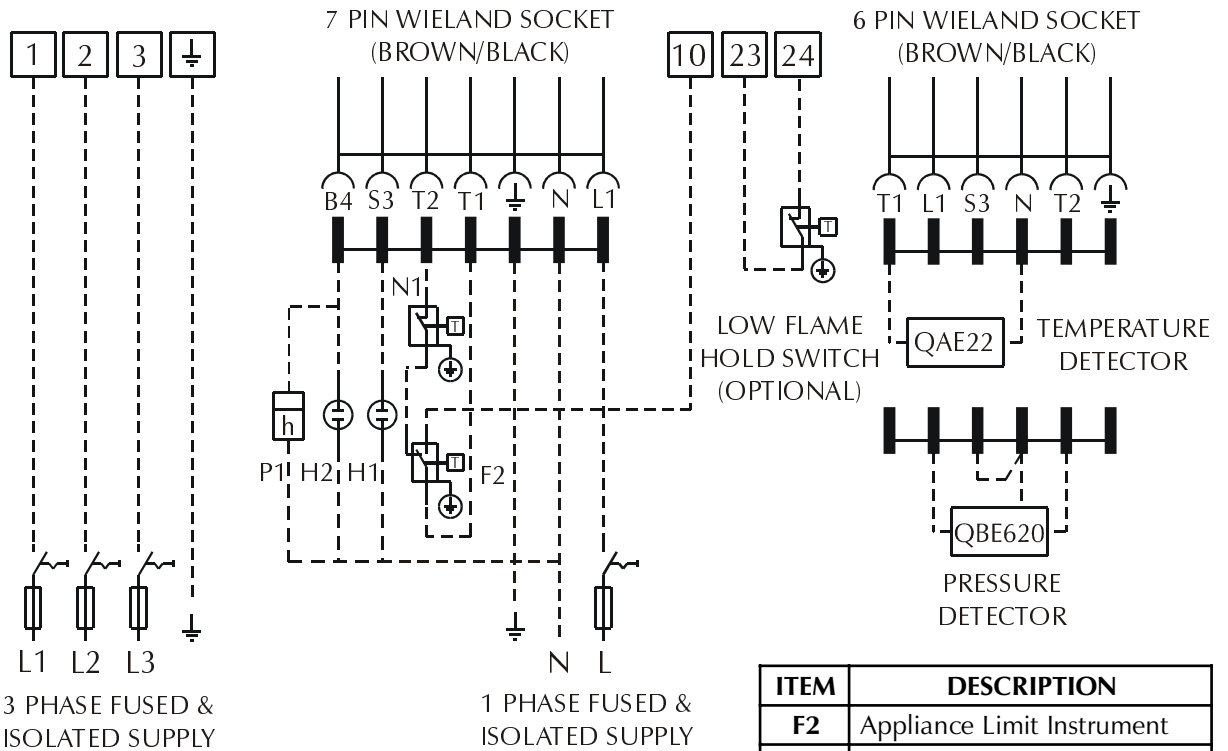
OIL SYSTEM SCHEMATIC

PIPEWORK SCHEME IS FOR SINGLE PIPE GRAVITY FEED SYSTEM



# ELECTRICAL CONNECTIONS

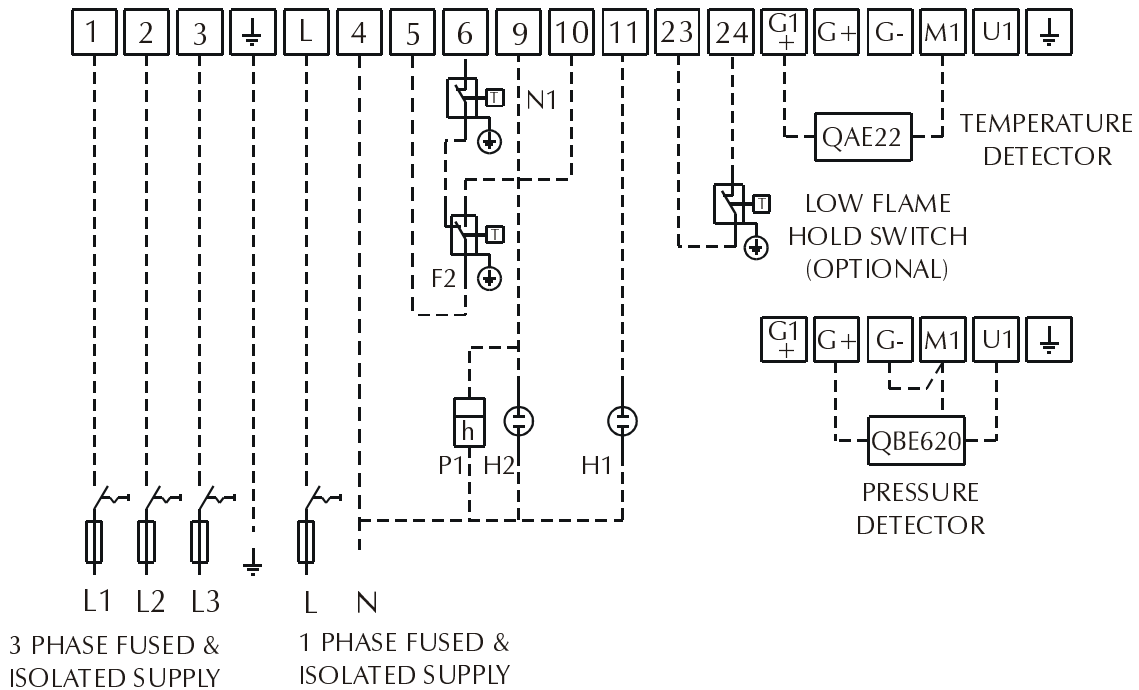
## POWER & EXTERNAL CONNECTIONS VIA 7 & 6 PIN PLUGS



ITEM	DESCRIPTION
F2	Appliance Limit Instrument
H1	Burner Fault Signal
H2	Burner Operating Signal
N1	Appliance On/Off Instrument
P1	Burner Operating Hours Run Counter

## POWER & EXTERNAL CONNECTIONS VIA BURNER TERMINAL STRIP

(OPTIONAL - REMOVE 7 & 6 PIN PLUGS)



The volume of air required for combustion must also be varied as the nozzle output varies, and this is done by the air control damper operated by a flexible steel cable connected to a lever system bearing against the air control cam.

Once the oil cam has been adjusted as described in the *commissioning* section of this handbook, the profile of the air cam must be adjusted to give the required combustion conditions. This is achieved by turning the thumbscrews under the cam in or out as the burner is 'inched' through its firing range. The air control damper is spring loaded 'open' for safety in the event of cable failure.

## **OPERATION**

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When the boiler control calls for heat, the burner modulating unit will travel to the 'high flame' position and interlock the control circuit. An air pre-purge will take place at this position for a pre-determined period, at the end of which the burner sequence controller will stop until the modulating unit has travelled to the 'low flame' position and interlocked the control circuit again. The sequence control will now recommence its operational cycle and the burner will light and remain at low flame until the high flame release signal is given by the sequence control.

Under the instruction of the modulating controller, the modulating unit will now move to high flame and remain at this position until the desired boiler temperature/pressure is attained. From this stage, the modulating controller will drive the burner towards the low flame position, but, depending on the temperature/pressure, will stop in any intermediate position between low and high flame.

## **COMMISSIONING**

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### **IMPORTANT - SAFETY**

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It is essential that commissioning shall be undertaken only by suitably qualified and experienced personnel. In the case of NOL Modulating burners, commissioning engineers should be experienced in pressure jet oil burner commissioning. Nu-way can accept no responsibility for consequential loss, damage or personal injury which results from a failure to follow the commissioning instructions provided or from commissioning procedures being undertaken by unqualified personnel.

## **EMERGENCY INSTRUCTIONS**

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NOL Modulating burners are designed and constructed to meet current legislation. When used in accordance with the instructions provided, NOL Modulating burners are unlikely to produce a hazardous condition. If, however such a condition should arise in connection with the burner, the appliance or of any instrument, machine or service in the vicinity of the burner, the **OIL AND ELECTRICITY SUPPLIES SHALL BE ISOLATED IMMEDIATELY** and they shall remain isolated until the fault has been identified and rectified.

### **Inspection**

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Before commissioning is begun it is important to:

- Check that the electrical wiring is complete and complies with all applicable Codes and Standards.
- Ensure that the fuses are fitted and are of the correct rating.
- Check electrical earthing.
- Verify that the oil supply system is correctly designed and that the supply pipework is correctly sized and free from leaks.
- Ensure that all manual fuel isolation valves are operable, fully closed and leak tight.
- Make all personnel involved in the commissioning aware of the location of the emergency fuel and electricity isolation points.
- Check that fittings for bleed and pressure testing are fitted.
- Establish that the appliance is in an appropriate and safe condition to be fired; for example, that there is water in the boiler.
- Set the appliance controls to call for heat.
- Check the appliance's ventilation and flueing arrangements.
- Ensure that any warning notices appropriate to the commissioning procedure are in position.
- Ensure that all necessary tools and test equipment are available and ready for use. Essential items include temperature measuring instruments for measuring flue gas and appliance water temperatures, and a means of analysing the flue products for carbon dioxide (CO<sub>2</sub>), oxygen (O<sub>2</sub>), carbon monoxide (CO) and smoke.

- Check that all relevant documentation is available including, where appropriate:
  - The agreed plant performance specifications.
  - Plant drawings and pipework layouts.
  - Electrical logic and wiring diagrams.
  - Certificates confirming satisfactory completion of procedures such as soundness testing and electrical safety tests.
  - Commissioning, operating and maintenance instructions for the plant.
- Establish that the operation of plant other than being commissioned will not have an adverse effect on the operation of the plant to be commissioned and similarly, that the operation of the plant to be commissioned will not have an adverse effect on other plant.  
Confirm that the operation of adjacent plant and machinery will not constitute a hazard to the personnel involved in commissioning.
- Remove the access lid on the modulating cam box unit.
- Switch on the burner at the control panel. The modulating unit camshaft should now rotate to the high flame setting, and the combustion air motor will start the air pre-purge phase.
- Allow the fan motor to run up to speed, switch off the burner and check the fan rotation (Anti-clockwise as viewed from the motor side) as the fan slows down.
- Remove and cover the photoelectric cell with a clean lint free cloth, switch on the burner, and allow it to run through to lockout. During this run check that the ignition spark is occurring, and note the spill and line oil pressures at the moment of ignition. Reset the sequence control and repeat the run if necessary to check these functions. If necessary, adjust the spill pressure to the correct figure according to the nozzle specification and the line pressure at the burner pump to 27.8 bar (400 psi).

### Pre-firing Checks

With the oil and power switched off, carry out the following checks.

- Check the nozzle size and position relative to the diffuser plate. (The burner head dimensional details are given on page 20).
- Check that the electrode positions and H.T. leads are correct.
- Check the fan motor overload settings.
- If the appliance is a boiler, check that the water level is correct, the controlling valves are open and that the water pumps are in working order.
- If a flue damper is fitted, check that it is correctly interlocked to the burner or fixed in the fully open position.
- Ensure that there is a good oil supply to the burner pump. Bleed one or two gallons from the flexible to eliminate any pipe scale and air from the system.
- Check that the oil supply is of the recommended temperature and pressure.
- Bleed the burner pump manually by removing the right hand 1/4" BSP plug in the top of the pump until air-free oil flows.
- Switch on the electricity supply to the burner.

**THE BURNER IS NOW READY TO BE COMMISSIONED.**

### Manual Operation

Check that the RWF40 controller is configured correctly (refer to page 17). Press and hold the 'EXIT' key until the 'manual operation' indicator illuminates. The modulating motor can now be inched using the 'increase' & 'reduce' buttons on the controller face. Press and hold the 'EXIT' key until the 'manual operation' indicator extinguishes to return to automatic mode

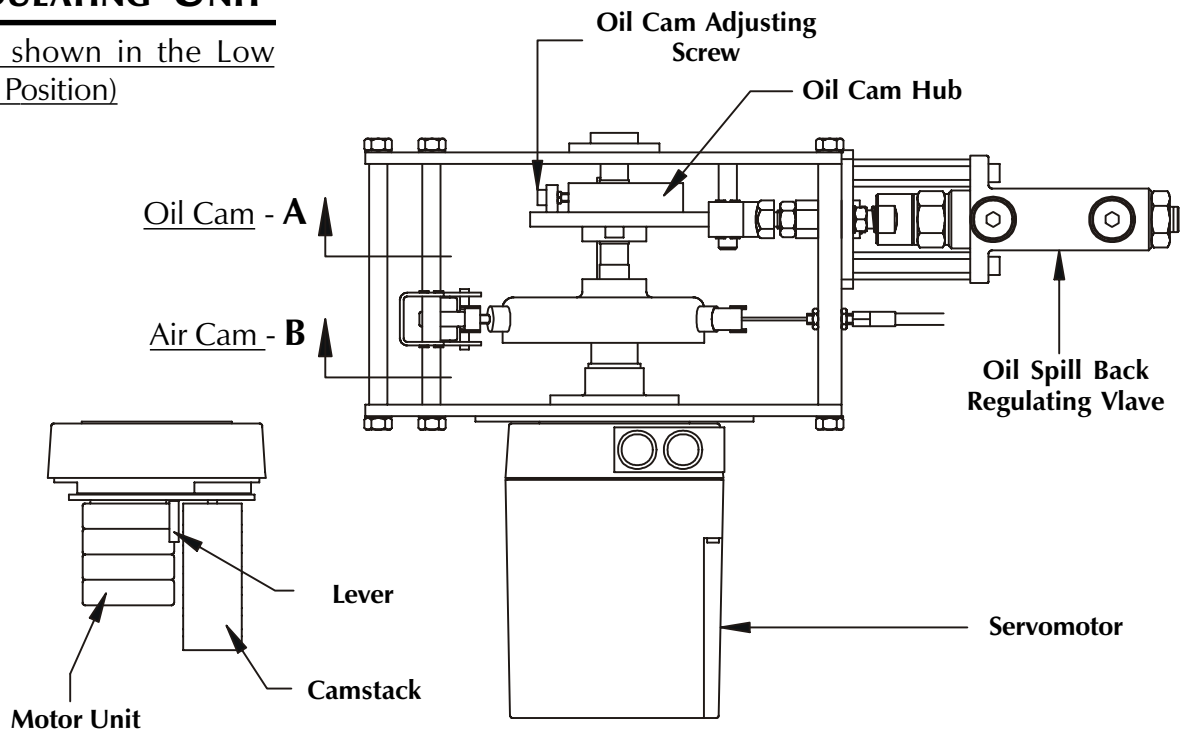
### Commissioning the Burner

New burners are generally supplied against the firing specification of the appliance. In this case the system and spill pressures may be pre-set and require checking and minor adjustments only. The following section describes how to set up the modulating cam box unit from a 'scratch' situation. The modulating cam layshaft can be rotated by hand by using the gearbox disengagement lever in the drive servomotor.

- Ensuring that the modulating cam arrangement is in the low flame position, adjust the oil cam (see fig. 1 on page 12) so that it gives approximately 1.5mm throw (3mm stroke) and lock in position.
- Check to ensure that the spill valve push rod bears lightly against the oil cam.

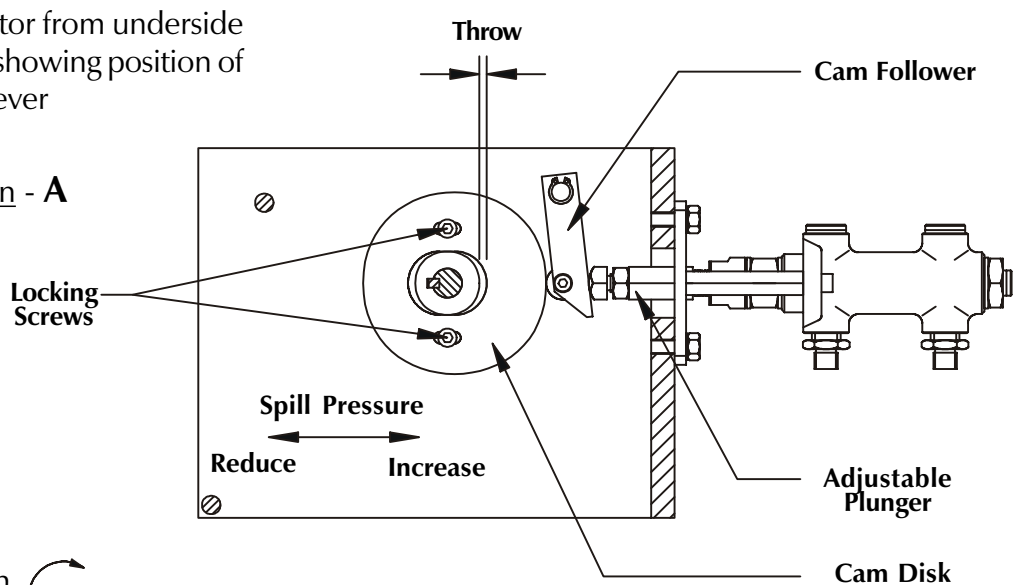
# MODULATING UNIT

(Cams shown in the Low Flame Position)



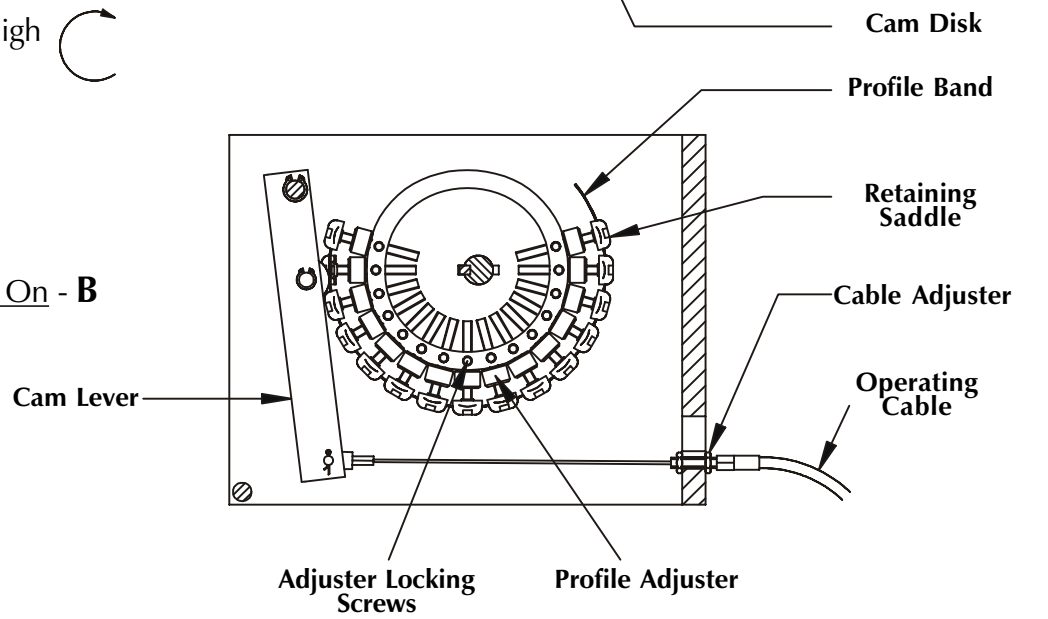
View of Servomotor from underside (cover removed) showing position of disengagement lever

Oil Cam View On - A  
Fig. 1.



Rotation for High Flame position

Air Cam View On - B  
Fig. 2.



- Turning to the air cam (fig. 2 opposite), rotate the thumbscrews in or out so that they give a reasonable amount of adjustment in each direction. Adjust the flexible cable (at either end if necessary) until the air inlet damper is fully closed (i.e. until all the slack is taken up on the cable).
- Now adjust the thumbscrews to give a small opening of the air damper at low flame.
- Uncover and replace the photocell. Reset the sequence control and allow the burner to start. Immediately the burner starts, switch the hand/auto selector switch to the 'hand' position and hold low flame until the appliance is ready to accept high flame. During this period, check and adjust the low flame oil throughput.
- Check the flame visually. If the flame is dirty, adjust the air cam thumbscrews until the flame becomes clean.
- After a suitable delay, inch the camshaft to the high flame position (i.e. through 180°) by using the RWF40 control in manual mode (see page 11). Adjust the air cam profile by means of the thumbscrews until the air damper is sufficiently open to give clean combustion. At this stage it will be found that all of the thumbscrews between low and high position will require adjusting so as to avoid over stressing the cam profile band.
- Inch the camshaft back to the low flame position. The oil consumption rate should now be between 35 and 50% of the rated maximum.
- Measure the flue gas composition and adjust the combustion air volume as necessary.
- Check the burner performance throughout the range adjusting the air cam profile as necessary to give a clean and efficient flame.

When a satisfactory setting has been achieved, lock the air cam thumbscrews with the grub screws fitted in the side face of the cam body. Refit the Modulating unit access cover.

If the burner control panel is inclusive of Low – Excess low and High Water interlocks and alarms, test that these function correctly. Ensure that the boiler feed pump switchgear provided in the panel is operating satisfactorily.

Adjust the modulating control to the required pressure/temperature.

Allow the boiler to attain the correct working pressure/temperature and adjust the on/off and limit instruments to the desired values.

Return the RWF40 to automatic mode. The plant is now under the control of the pressure/temperature controllers for modulation and the on/off and high limit instruments for control.

Finally check all ancillary controls and equipment such as damper interlocks etc.

Once this has been done, there should be a fairly smooth profile between low and high positions.

Ensure that the flame is visually clean throughout the modulation range at all times.

Check the oil consumption. If this is not correct for the full burner rating, the oil cam must be adjusted as follows.

- Inch the burner to low flame and note the spill pressure.
- To increase the minimum rate, adjust as shown in fig. 1.
- Adjust the cam to give more eccentricity for more oil at high flame, and visa-versa.
- Return to the minimum setting and compensate for any changes.
- Inch the burner to high flame and again check the oil flow.

Continue to repeat (a) to (d) until the high flame oil rate is correct.

When a satisfactory flame is achieved, again check the line and spill pressures.

## **ROUTINE MAINTENANCE OF NOL MODULATING BURNERS**

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### **General**

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It is vitally important that personnel responsible for the day to day operation and maintenance of the plant are instructed by the commissioning engineer on the basic function of the burner as well as the need for routine maintenance and daily checking of burner operations.

Final adjustments, which will have been made during the commissioning, must be recorded on the *Commissioning Sheet* at the back of this manual and in the appliance **logbook**. A copy of the commissioning data **must** be sent to the appliance manufacturer.

The burner should be kept clean inside and out. It will be more reliable, and if an oil leak occurs it will be spotted more readily.

## Daily Checks

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Inspect the burner daily to check if there is any variation from the correct operating sequence, as follows:

Check the oil pressure on the nozzle line gauge. This should be 27.8 bar (400 psi).

Check the spill pressures. If these are low it may indicate that the oil nozzle filter is clogged.

If there is an inspection window on the appliance through which the ignition spark and flame can be observed, ignition and flame should be inspected and any irregularities that are observed should be rectified i.e. nozzle/electrodes cleaned and any deposits removed from the inside of the flame tube and diffuser.

## Photoelectric Cell

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Remove the photoelectric cell and clean with a soft lint free cloth if necessary. Be careful not to touch the glass bulb of the cell as this can lead to premature failure of the unit.

## Replenishing the Fuel Supply

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It is usual practice to shut boiler(s) off whilst delivery of fuel is being made and allow approximately 30 minutes for any sediment to settle before restarting the burners.

## Boiler Combustion Surface

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Keep the boiler combustion surfaces and flueways clean. Any accumulation of soot will decrease the efficiency of the boiler and increase the flue gas exit temperature. Always cover up the burner during boiler cleaning operations.

## FAULT FINDING

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### If the Burner Fails to Start

---

Make sure that all the thermostats and switches in the control circuit are in the 'made' position. Check that the oil pressure switch is not registering an excess oil pressure in the burner spill return system (switch contact broken).

Check that the electricity supply to the burner is 'live' and that the control and main circuit fuses are intact. If a fuse is found to be 'blown' then the cause should be investigated and rectified before proceeding further.

On steam boilers, check that the 'water level interlocks' are in the 'made' position.

### If the burner is found at lockout (red lockout lamp illuminated)

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Reset the burner and observe the starting sequence. (Make reference to the *Sequence Diagram and Timing Charts* for the Flame Failure controls on page 15 for further information).

Check the fan motor overload and reset if necessary.

### Flame Occurs Followed by Immediate Lockout

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Check the PE cell and the air regulator for correct operation. Check that the oil pressures are correct. Ensure that there is sufficient oil in the storage tank, bleed the oil pump in case it is partially air-locked. Check to ensure that all stop/fire valves in the supply line are fully open.

### The Burner Starts With The Correct Oil Pressure But No Flame Appears

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Check the ignition system, HT lead connections, electrode gap and the condition of the electrode insulators. Check that the air damper cable is not broken or disconnected (the air regulator will be fully open). **It is important to note that continued resetting of the burner should be avoided as this can lead to a dangerous situation.**

### Modulating System

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If malfunction of the modulating controller (RWF 40) is suspected, check that only a compatible pressure/temperature detector has been used. If problems persist then replacement of the unit should be considered.

### Burner Commissioning Sheet

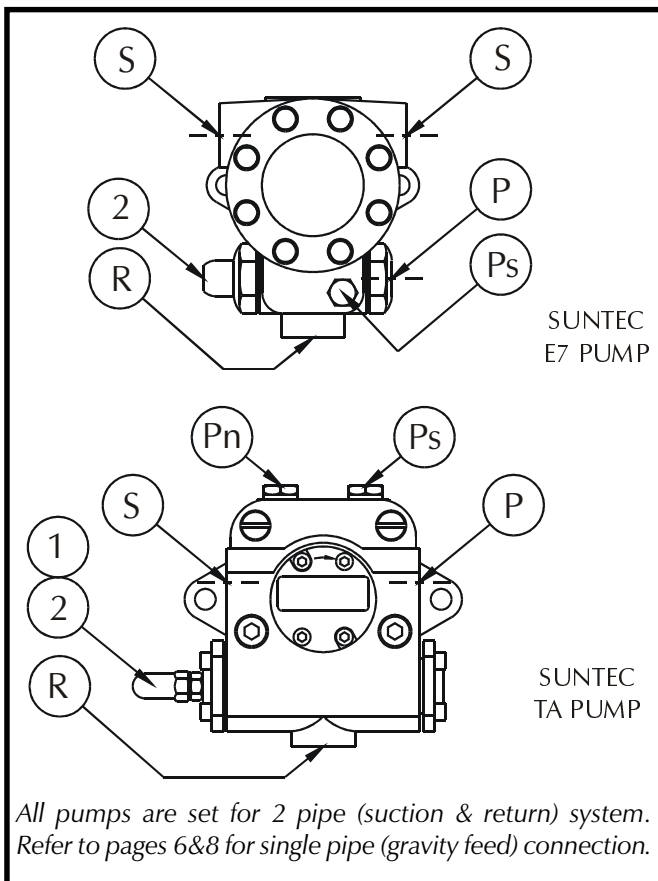
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This manual contains a record of the essential information and will have been completed by the commissioning engineer with individual details of the burner. These details should be verified periodically and adjusted if variations are noted. Commissioning details must also be recorded in the **appliance logbook**.

## FUEL PUMPS

---

On spill-back oil systems, the fuel pump is sized to deliver oil volume at 2.5 times the maximum burner throughput at a pressure of 28 bars (400 psi). Suntec models 'E' and 'TA' are supplied as standard fittment. Pump details are shown in the drawings and table on page 15.



All pumps are set for 2 pipe (suction & return) system. Refer to pages 6&8 for single pipe (gravity feed) connection.

ITEM	PORT	ITEM	PORT
S	Suction Port	Ps	Pressure Gauge
P	Pressure Port	1	Regulator Capnut
R	Return Port	2	Regulator Screw
Pn	Vacuum Gauge		

BURNER MODEL	PUMP UNIT	MAX FLOW
NOL18-34,38	Suntec E7	190 lt/h
NOL30 & 35-25	Suntec TA2	380 lt/h
NOL35 & 50-28,34,38	Suntec TA2	380 lt/h
NOL60 & 85	Suntec TA3	600 lt/h

## FLAME FAILURE & SEQUENCE CONTROL

The standard control box fitted to the NOL Modulating series of burners is the Landis & Staefa type LAL1.

The unit is designed to provide control and supervision for atomising oil burners of medium to large capacity. They are suitable for use on multi-stage and modulating burners.

For safety reasons, at least one controlled shutdown must be provided within each 24-hour period of continuous operation.

When a burner failure is encountered the box goes into lockout mode. This is indicated by an orange neon, which displays within the lockout window of the control and is repeated at the lockout lamp on the panel facia.

If a lockout situation occurs, the burner will not start until it is manually reset by pressing the lockout window on the control. (The control can also be reset by the off/on/reset switch situated on the control panel facia)

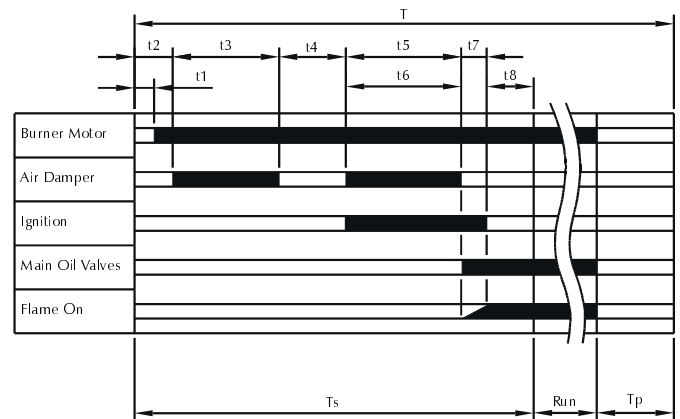
If the burner fails to fire and persists in locking out, **no more than three attempts should be made.** To do so may create a **dangerous situation.**

If a burner becomes troublesome then the assistance of a qualified commissioning engineer should be obtained. To assist in his diagnosis, notes should be made detailing the events leading up to the lockout situation. The symbol appearing in the lockout window should also be noted prior to resetting the burner. (Refer to the Sequence Diagram and Timing Chart below).

**PLEASE NOTE.** When the control box goes to lockout it is generally performing the function it is designed for.

### Burner Control Program

Burner operational sequence based on the Landis & staefa LAL1.25 Control box. Note. Timings are for operation on a 50 hz electrical supply only.



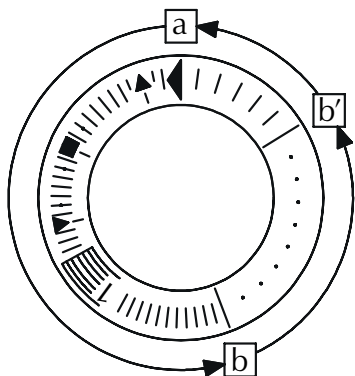
PERIOD	TIME (secs)	DESCRIPTION
t1	2.5	Start up time for fan motor
t2	5	Start up to 'open' signal
t3	54	Modulating servo to 'High flame'
t4	22.5	Full air pre-purge
t5	54	Modulating servo to 'Low flame'
t6	54	Pre-ignition
t7	5	Safety period
t8	15	Release to RWF40 controller
Ts	155.5	Total start up time
Tp	15	Post purge time
T	170.5	Control re-cycle time

## Control Program Under Fault Conditions And Lockout Indication

In the event of fault conditions the sequence switch stops and simultaneously the lockout indicator. The symbol appearing above the reading mark indicates the kind of fault encountered.

- ◀ **No start**, because, e.g., the CLOSE signal has not been supplied to control box terminal 8 by the servo motor limit or auxiliary switch, or a contact has not been closed between control box terminals 12 and 4 or 4 and 5.
- ▲ **Shut down of start up sequence**, because the OPEN signal has not been supplied to control box terminal 8 by the servo motor limit switch. Terminals 6,7 and 15 remain under voltage until the fault is corrected.
- **Lockout** due to a fault in the flame supervision circuit.
- ▼ **Shut down of start up sequence**, because the signal for the low flame position has not been supplied to control box terminal 8 by the servo motor auxiliary switch. Terminals 6,7 and 15 remain under voltage until the fault is corrected.
- 1 **Lockout**, because no flame signal has been received on completion of the safety time.
- | **Lockout**, because the flame signal has been lost during burner operation or an air pressure failure has occurred.
- ◀ **Lockout on completion or after completion of the control program sequence** due to extraneous light (e.g. flame not extinguished, leaking fuel valves) or due to a faulty flame signal (e.g. fault in the flame supervision circuit or similar).

Landis & Staefa  
LAL1. Program  
Sequence Disk.



- a - b** Start up sequence.
- b - b'** idle steps up to the self shut down of the sequence switch.
- b(b') - a** Post purge sequence.

When lockout occurs, the control can be reset immediately. After the resetting (and also after the correction of a fault which resulted in a controlled shut-down, or after each mains failure) the sequence switch always runs through to the start position, whereby **only** terminals 7,9,10 and 11 receive voltage in accordance with the control program. It is only then that the control unit programs a fresh burner start up.

**Note:** Do not press the lockout reset button (or remote reset switch) for more than 10 seconds.

## RWF40 MODULATING CONTROL

### Basic display

The diagram below opposite shows the RWF40 after switching on the supply voltage. This condition is called the basic display. The actual operating value and the currently active set-point will be shown. Manual operation, self-optimization, the operating parameter and the configuration levels can be activated from this display.

### To change the working set point.

The basic display shows the actual pressure/temperature of the boiler in red and the required set point pressure/temperature beneath in smaller green digits.

One quick press of the PGM button, the display changes to show the set point as the larger red digits and the SPI in the lower small green digits.

Alter the red display using the up/down buttons to show the new required set point, press exit or let the unit time out to return to the basic display which should be the new set point figure.

### To enter a new parameter

The parameters dictate the way in which the burner firing rate alters in response to changes in the pressure/temperature of the boiler.

A major factor that determines the need to change the parameters is if the burner is fitted to a steam or hot water boiler. The table below indicates the parameter and its setting for steam and hot water boilers. It must be emphasised that it is only an indication and any departure from these settings should be made in small increments, with time given to see how the burner is reacting to the changed parameter.



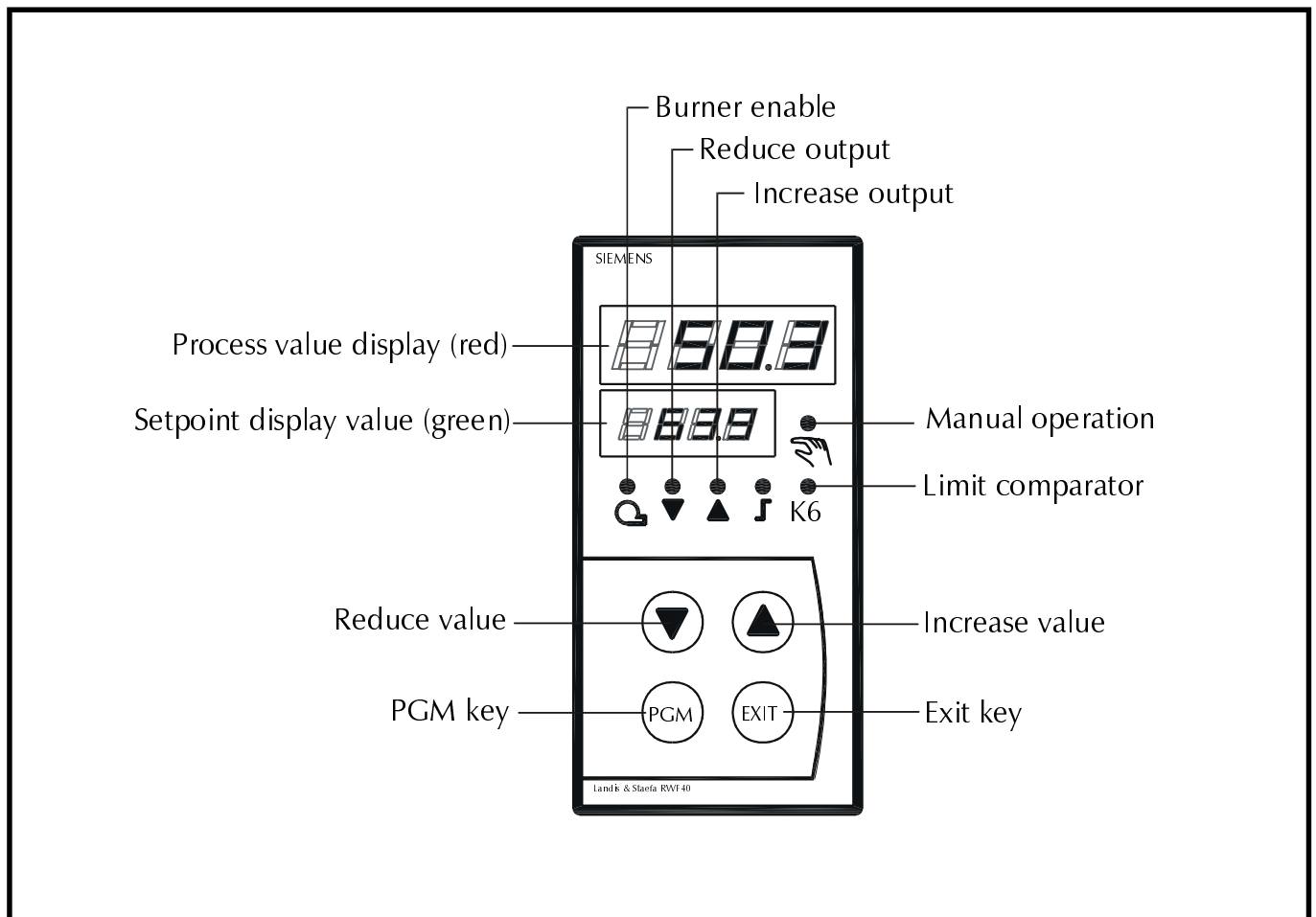
Press and hold the PGM button down until the green set point figure changes to an AL, the larger upper figures show the value. Use the up/down buttons to set the new value, press the PGM button to enter the value and change to the next screen. To cancel an entry press exit. Scroll through the screens, (PGM button) modifying any value found to be in error (up/down buttons). At the last screen the PGM button will return the controller to the original operating display.

At any point in the procedure the original operating display can be obtained by letting the unit time out, the value in the display at the time out will be accepted.

A value can only be altered within the permitted range of that parameter. All other parameters must remain as supplied.

Note: The detector range parameters SCL & SCH are given as °C for Hot Water (temperature) and bar for Steam (pressure).

<b>RWF40 RECOMMENDED SETTINGS</b>			
<b>Parameter</b>	<b>Display</b>	<b>Hot Water</b>	<b>Steam</b>
Proportional band	<b>Pb1</b>	10	1
Derivative time	<b>Dt</b>	10	5
Reset time	<b>Rt</b>	50	20
Actuator time	<b>Tt</b>	Set to the Air Damper running time between low & high flame	
Switch on threshold	<b>Hys 1</b>	0	0
Upper off threshold	<b>Hyst 3</b>	999.9	999.9
Detector: range start	<b>SCL</b>	0	0
Detector: range end	<b>SCH</b>	100	25



## BURNER OIL NOZZLE

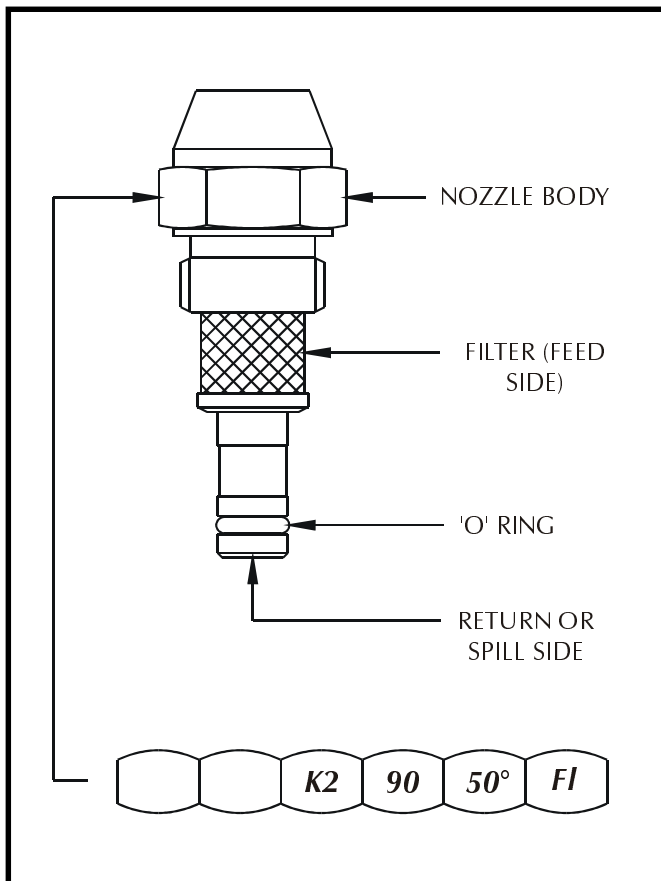
The Burnerlance is designed to operate spill-back atomisers of the non tip shut-off variety, and having a 9/16" x 24 unef fixing thread.

The Fluidics KC2 series atomiser is the preferred type and this will have been sized at the point of order to suit the burner rating and application.

When the nozzle has completed 3000 hours of operation, it should be replaced with the same **Make, Type and Size** as fitted. Failure to do so will alter the characteristics of the burner and may impair the performance and efficiency of the plant. The nozzle identification code is stamped onto the face of the hexagonal nut section of the nozzle body as shown below.

Should any doubts arise concerning the suitability or performance of the burner nozzle, please contact the Nu-way Technical dept. who will be pleased to assist.

## FLUIDICS KC2 ATOMISER



## SERVICE & REPLACEMENT

Nu-way Ltd Parts & Components Division carry a comprehensive stock making up the burner systems described in this handbook. Should it become necessary to order replacement parts, it is important to quote the burner model, specification and serial numbers to ensure correct expedition of your order.

Nu-way Ltd is able to offer 'on site' Commissioning, Service and Repair through its worldwide network of authorised distributors and sales offices. Please contact the Nu-way Service Department for further information.

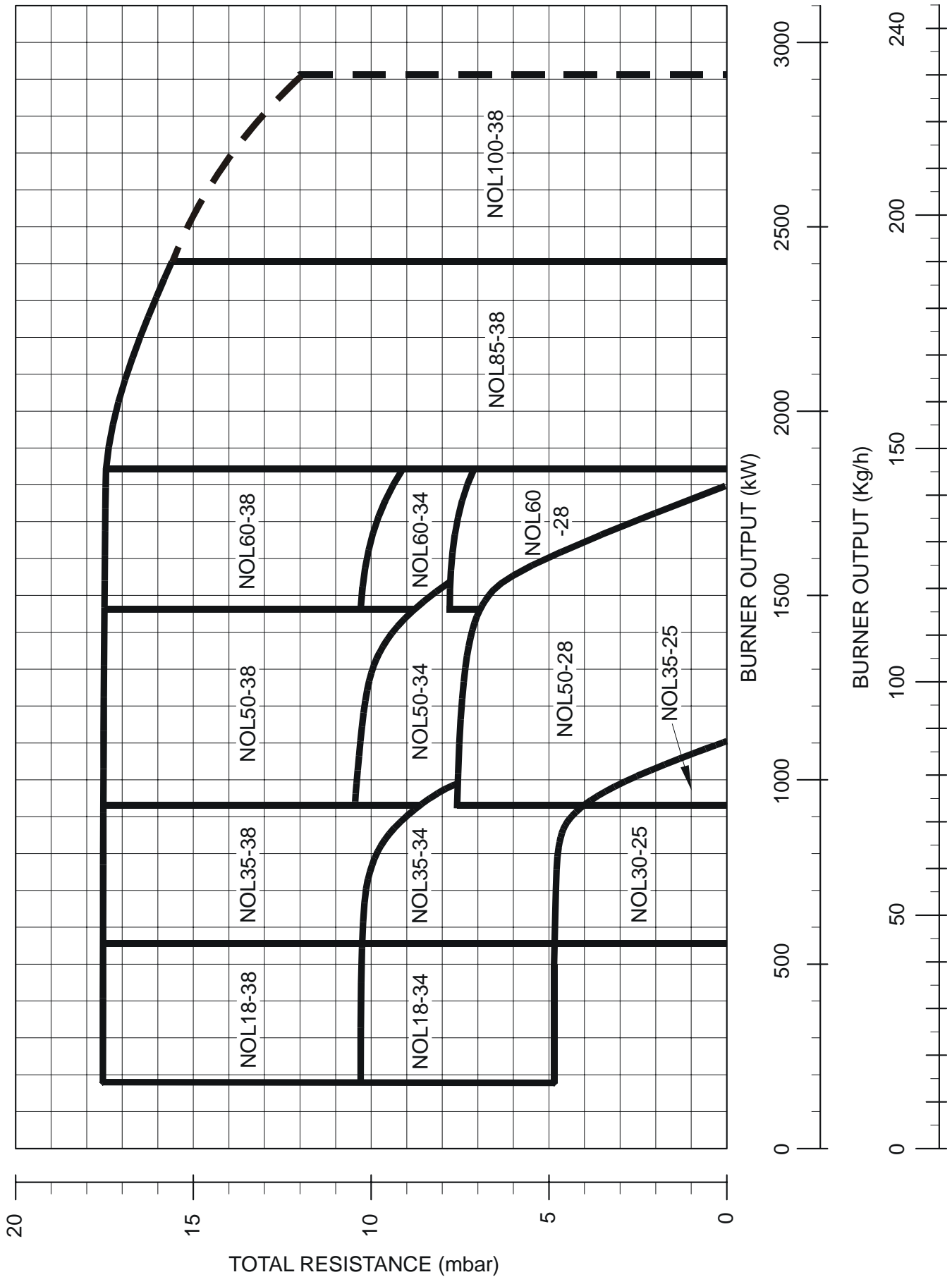
## BURNER PERFORMANCE CURVES

The Performance Graph shown on page 19 plots burner input against the appliance running resistance. The appliance starting resistance is derived from a combination of the combustion chamber shape, volume, start rate and flue conditions. It may be necessary to select a burner with a higher fan static pressure than would normally be chosen, if the appliance has a high starting resistance.

Similarly, when firing a reverse pass boiler up to 2 MW, with a combustion intensity of 2 MW/M<sup>3</sup> and an operating resistance between 40 and 90 mm wg. it is recommended that a burner with a higher fan static pressure is selected, ie. if the graph selects a burner with a 28 cm fan then use the 34 cm fan model for correct combustion.

All outputs quoted are based on gross C.V.

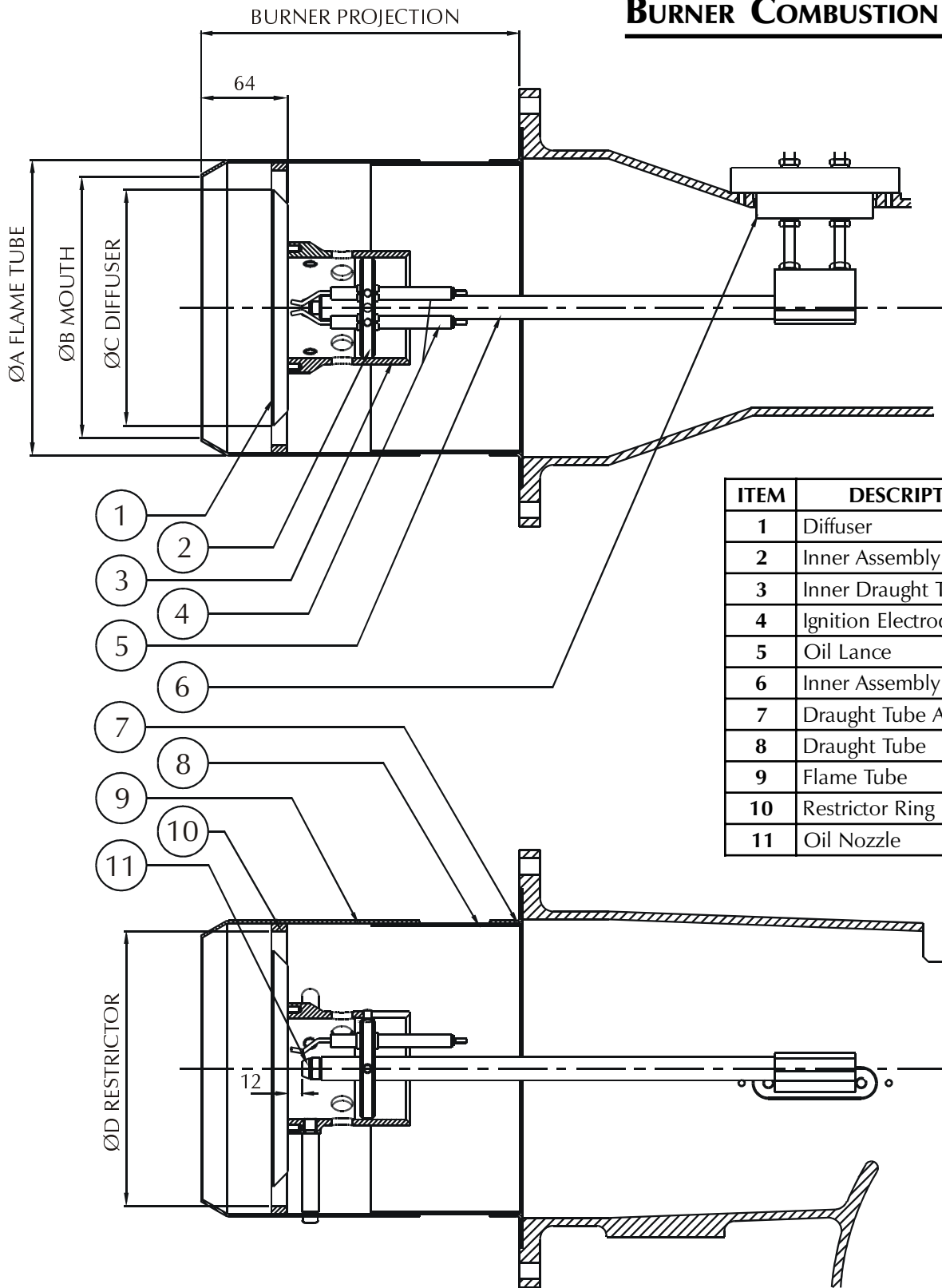
# Burner Performance Curves



Burner outputs are based on a gross calorific value of class D fuel of 12.66 kW/Kg.  
 Graphs produced in accordance with BS EN 267.



# BURNER COMBUSTION HEAD

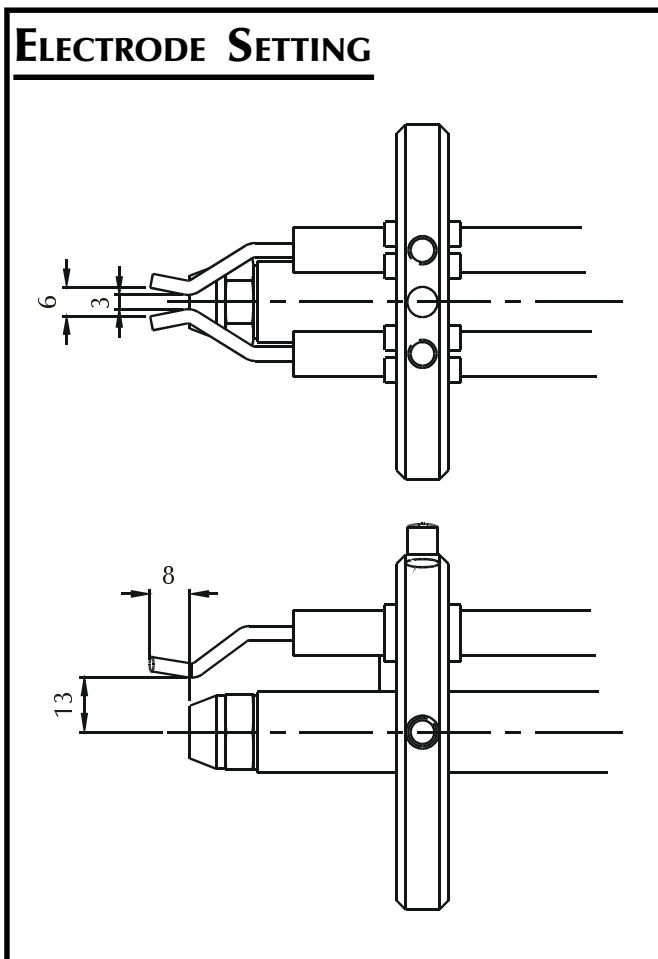


ITEM	DESCRIPTION
1	Diffuser
2	Inner Assembly Disc
3	Inner Draught Tube
4	Ignition Electrodes
5	Oil Lance
6	Inner Assembly Union
7	Draught Tube Adaptor
8	Draught Tube
9	Flame Tube
10	Restrictor Ring
11	Oil Nozzle

BURNER	ØA	ØB	ØC	ØD	BURNER	ØA	ØB	ØC	ØD
NOL18-34	178	165	152	165	NOL50-28	220	197	178	206
NOL18-38	178	165	152	165	NOL50-34	220	197	178	206
NOL30-25	178	165	152	NONE	NOL50-38	220	197	178	206
NOL35-25	178	165	140	NONE	NOL60-28	220	197	178	NONE
NOL35-34	178	165	152	NONE	NOL60-34	220	197	178	NONE
NOL35-38	178	165	152	NONE	NOL60-38	220	197	178	NONE
					NOL85-38	254	234	204	NONE

## ELECTRICAL DATA TABLE - Supply 400-3-50

Burner Model	Motor (kW/rpm)	Start Current (A)	Full Load Current (A)	Main Fuse (A)	Cable Size (mm <sup>2</sup> )
NOL18-34	2.2/2800	25	5.0	16	1.5
NOL18-38	3.0/2800	35	6.6	20	1.5
NOL30-25	1.5/2800	17	3.6	16	1.5
NOL35-25	1.5/2800	17	3.6	16	1.5
NOL35-34	3.0/2800	35	6.6	20	2.5
NOL35-38	4.0/2800	45	8.5	25	2.5
NOL50-28	3.0/2800	35	6.6	20	2.5
NOL50-34	4.0/2800	45	8.5	25	2.5
NOL50-38	5.5/2800	57	11.3	32	2.5
NOL60-28	4.0/2800	45	8.5	25	2.5
NOL60-34	4.0/2800	45	8.5	25	2.5
NOL60-38	5.5/2800	57	11.3	32	2.5
NOL85-38	7.5/2800	76	15.2	40	4.0



# COMMISSIONING SHEET

The details below are to be completed by the Commissioning Engineer

Installer's Name : \_\_\_\_\_

Address : \_\_\_\_\_

Site Address : \_\_\_\_\_

Appliance : Type : \_\_\_\_\_ Rating : \_\_\_\_\_ Serial No. : \_\_\_\_\_

Burner : Type : \_\_\_\_\_ Rating : \_\_\_\_\_ Spec No. : \_\_\_\_\_

Serial No.: \_\_\_\_\_ Nozzles : \_\_\_\_\_ Oil Pump : \_\_\_\_\_

Commissioning date : \_\_\_\_\_ Guarantee Expiry Date : \_\_\_\_\_

Oil type : \_\_\_\_\_

Combustion Details	Low Flame	Point 2	Point 3	Point 4	Point 5	High Flame
CO <sub>2</sub> %						
Smoke N <sup>o</sup> .						
Ambient Temp. °C						
Flue Gas Temp. °C						
Efficiency. %						
C.C.P. mm/wg						
Flue Draught. mm/wg						
Fan Static. mm/wg						
Oil Pressure. bar						
Spill Pressure. bar						
Oil Temperature. °C						
Oil Consumption. us/gph						
Air Control. % Open						
Motor FLC. Amps						

Engineers Name : \_\_\_\_\_

Signature : \_\_\_\_\_ Date : \_\_\_\_\_

# BURNER SERVICE RECORD

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The details below are to be completed by the Servicing Engineer

*This sheet to be completed and signed following each service / adjustment*

Date	Details Of Service	Signature



BS EN ISO 9001  
CERT No. FM00921



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