

Installation & Maintenance Manual

Series NOL forced draught oil burner Models NOL20/NOL25

Oil Burner

Handbook

Series NOL automatic oil burners Models NOL20/NOL25

The Nu-way NOL20 and NOL25 pressure jet burners are designed to meet the requirements of all international markets and have a maximum output of 735 kW. Available for high/low operation only, they are able to fire at reduced thermal output, appliances having resistances as listed under the burner selection chart. The units can also fire appliances having a maximum draught in the combustion chamber of 125 Pa (12mm wg=0.5 in wg.)

AIR REGULATION

Hydraulically operated damper for high/low operation. Burner fitted with patented air control device producing smooth starting conditions.

CONTROLS

Flame supervision by photo-electric cell with the option of thermal or synchronous sequence controllers to comply with relevant standards. The NOL20/25 burners may be controlled by suitable thermostats, time switches, etc.

FUEL

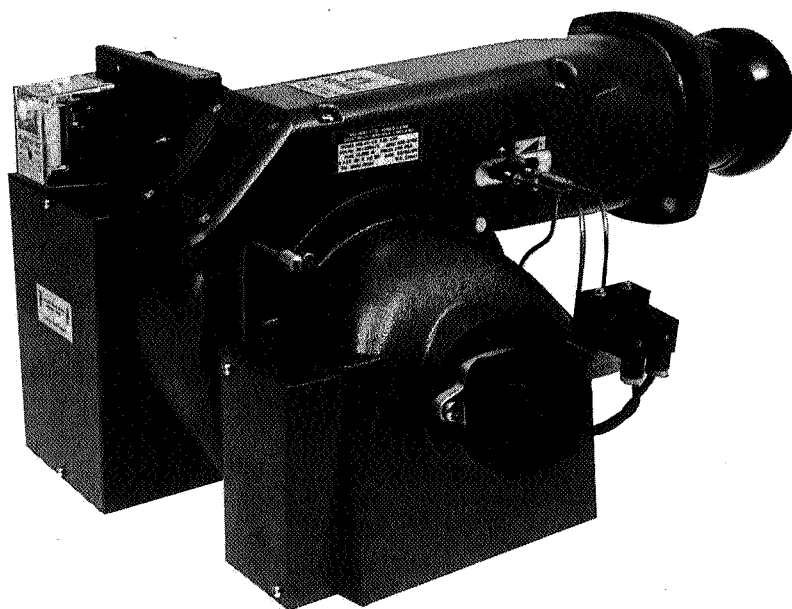
Light distillate oil Class D
(1.5-5.5 cSt @ 40°C).

BURNER OUTPUTS

Based upon Gross CV of 45.5 MJ/kg.

FUEL SYSTEM

Suitable for single pipe gravity or two pipe systems. Twin nozzle operation with turndown of 1.5:1 up to 381 kW and 2.0:1 above. Fuel filter and flexible oil pipe are supplied having a fuel connection 1/4" BSP female thread. For fuel storage and handling temperature requirements please consult the Burner Manual.



CONSTRUCTION

Monobloc metric design using fasteners to ISO standards. Designed for flange mounting. Fan and inner assembly accessible by removal of top cover plate. Adjustable burner head maintains high air velocity and gives maximum combustion efficiency throughout burner range.

APPROX. WEIGHT

36 kg.

ELECTRICAL DATA

	1 phase	3 phase
Main Supply (V)	230	400
Frequency (Hz)	50	50
Motor (W)	750	750
(HP) 2 Pole	1.0	1.0
Burner Start Current (A)	22	9
Main Fuse (A)	15	6
Ignition by direct spark from 10 kV transformer; secondary winding centre earth connected.		

BURNER DATA

BURNER MODEL	Minimum Burner Capacity			Maximum Burner Capacity			Diffuser diameter mm.	Minimum Burner Throughput*			Maximum Burner Throughput*			Nozzle Spray Angle
	kW	Kcal/h x 10 ³	Btu/h x 10 ³	kW	Kcal/h x 10 ³	Btu/h x 10 ³		kg/h	Ltrs/h	USg/h	kg/h	Ltrs/h	USg/h	
NOL 20	176	151	600	585	500	2000	120	13.9	16.7	4.4	46.4	55.6	14.7	60°
NOL 20	382	325	1300	732	625	2500	100	30.2	36.0	9.5	57.8	69.0	18.2	60°

INSTALLATION

Flue. The top of the chimney should be above all roofs within a radius of 10m.

Ensure that the flue pipe from the appliance finishes flush with the inside wall of the chimney.

When installed on appliances with draught in combustion chamber, the draught should not exceed 125 Pa (112mm wg: 0.5 in wg). However it is recommended that the burner is set to operate under a draught of 12.5 Pa (1.25mm wg: 0.05 in wg) or at a figure shown in appliance manufacturer's instruction manual. If necessary a draught stabiliser should be fitted in a suitable position to maintain the above figures.

Boilerhouse Ventilation. It is most important that the boilerhouse has an adequate supply of fresh air for both ventilation and combustion purposes.

1.004m²/litre: 0.2ft²/imp gph).

Fuel Supply (and, where fitted, return) pipes should consist of metal tube (never galvanised steel), the final connection to the burner pump inlet port being made with the length of flexible pipe supplied with the burner. Joints should be made with compression fittings, not by soldering.

When a gravity feed is used, the maximum head should not exceed 4m (equivalent to a pressure of 35 kPa). On installations where the fuel tank is situated below the level of the burner the maximum suction permitted can be determined from tables in oil pump manufacturer's chart. On multiple appliance applications individual suction pipes must be used from the tank, with a suitable sized common return. It is recommended that suitably spring loaded non-return valves are fitted in suction and return lines (see pump detail). Both should be in vertical lines - suction as near to tank outlet as possible - return as near to pump outlet as possible. Note that the pump is factory set for single pipe installation. If it is to be used in a two pipe system, plug (supplied with the burner) must be inserted as shown in the sketch, (see oil pump manufacturer's details). The return pipe is to be connected to return port, (see oil pump manufacturer's details).

With two pipe installation systems it is essential that the return pipe is not obstructed in any way, eg. by a plug, closed valve, etc. Any obstruction may damage the pump.

Pump Priming. Remove the vent plug, connect purge port to suitable container and bleed until air free oil flows, then fit pressure gauge to port. For further details of oil line systems and pump facilities see oil pump information sheet.

On single pipe (gravity fed) systems, the pump should be primed under gravity from the tank and by running the pump mechanically in short bursts. If a two-pipe system is used, the suction line may require priming before energising the pump mechanically.

The pump may need bleeding also, in the event the oil storage tank is allowed to drain completely.

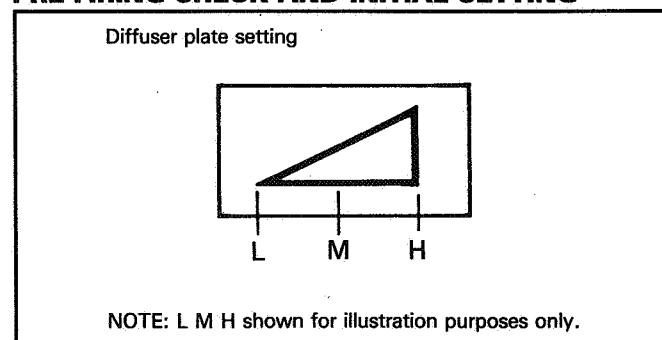
Electricity supply. Connect burner to electricity supply, thermostats, time switches etc., as appropriate. Check to ensure fuses are of correct rating.

INTRODUCTION

There are two atomising nozzles arranged vertically above each other, controlled by two magnetic valves. The top nozzle only sprays on low flame whilst both nozzles spray together on high flame. The air inlet control is operated by a hydraulic ram, which is internally spring loaded to the low flame position and hydraulically extended for high flame. Manual adjustment screws facilitate air control setting (see Fig.10). At commencement of the firing cycle, there is a pre-purge with forced air and ignition. After a time delay, the low flame solenoid valve is energised and allows oil to flow to the low flame (top) nozzle. Burner lights on low flame. After a further delay the high flame solenoid valve is energised, allowing oil to flow to the high flame nozzle and operate the high flame air control to the high flame position.

During the running cycle the high flame solenoid valve is energised via the high/low controlling instrument, but is always de-energised at each burner start, thus giving a low flame light up. On reaching operating temperature the controlling thermostat will open and the sequence controller will shut-off the motor and close solenoid valve/s. A limit instrument (hand reset) is normally fitted to the appliance also.

PRE-FIRING CHECK AND INITIAL SETTING



To determine burner setting the following instruction should be carried out:

1. Remove nozzle assembly by taking off cover and carrying out instructions shown in maintenance photograph (Figs. 3 & 5).
2. Check or fit nozzles of correct size for appliance.
3. Check electrode setting is as sketch (Fig. 11).
4. Replace nozzle assembly.

Important: Always ensure the four support legs on the electrode bracket are correctly adjusted to locate the inner assembly centrally in the flame tube.

5. The setting of the burner diffuser plate, which has an adjustment of 20mm, is carried out by loosening retaining screw between the oil inlet pipes and sliding to desired position.

This screw must be firmly secured when setting is completed, (replace plastic cover).

NOL20

- a. 176-234 kW (150,000 - 200,000 kcal/h: 600,000 -800,000 Btu/h) adjust to position 'L' in sketch (diffuser fully back). Air control slightly open low flame - 1/2 open high flame.
- b. 234-293 kW (200,000 - 250,000 kcal/h: 800,000 -1,000,000 Btu/h) adjust to position 'M' in sketch (diffuser mid-position). Air control slightly open low flame - fully open high flame.
- c. 293-585 kW (250,000 - 500,000 kcal/h: 1,000,000 -2,000,000 Btu/h) adjust to position 'H' in sketch (diffuser fully forward). Air control 1/3rd open low flame - fully open high flame.

NOL25

- a. 381-498 kW (325,000 - 425,000 kcal/h): 1,300,000 -1,700,000 Btu/h) adjust to position 'L' in sketch (diffuser fully back). Air control slightly open low flame - 1/2 open high flame.
- b. 498-615 kW (425,000 - 525,000 kcal: 1,700,00 -2,100,000 Btu/h) adjust to position 'M' in sketch diffuser mid-position). Air control slightly open low flame - fully open high flame.
- c. 615-732 kW (525,000 - 625,000 kcal/h: 2,100,000 -2,500,000 Btu/h) adjust to position 'L' in sketch (diffuser fully forward). Air control 1/3rd open low flame - fully open high flame.

GENERAL

The air control should be used as a final adjustment with the diffuser set in the appropriate position. Obviously adjustments to both settings will be necessary to cater for all appliances. Optimum combustion results are obtained by using the maximum air pressure available across the diffuser plate and adjusting air damper to obtain acceptable CO² and smoke values.

OPERATION

Set the appliance high/low instrument to the required operating temperature (or pressure). Set the on/off instrument to a temperature some 5°C above this. Set the limit instrument 5°C above the on/off instrument setting.

Ensure air control and diffuser are set as described in pre-firing check.

Switch normal/low flame switch to 'Low Flame' position (located in/on panel). To start burner turn main isolating switch to 'ON'. Move burner ON/OFF switch to 'ON' position (located on side of panel).

Check that fan motor rotates in direction of arrow i.e. clockwise viewed from motor shaft end.

At commencement of firing sequence there is a pre purge period during which the ignition and motor are switched on. At the end of this period the low flame solenoid oil valve opens and the burner lights on low flame.

After a fixed delay period with the burner working on low flame, the ignition is switched off automatically. If during start up, the flame fails to be established, the photo resistor will not receive the proper signal and the burner will shut down, the LOCK-OUT lamp on the control box being automatically illuminated.

The oil pump pressure should be adjusted if necessary to the requirements indicated for the burner or the appliance manufacturer's recommendations, (for Adjustment procedure see pump manufacturers details).

With the burner held in the Low Flame position adjust the air settings to give visible clean combustion. Check that the photo resistor reacts to loss of flame by removing from the burner and excluding all light. The burner will travel to the Lock-Out condition, the sequence depending on type of control fitted (see a or b following). Reset the burner by pushing in and releasing the button on the control box. Switch to 'NORMAL' operation. After the initial light up on low flame the burner will go automatically to high flame within 10-20 seconds.

Adjust the diffuser and air control high flame stop, to give clean combustion. When normal running conditions are obtained, check by means of combustion testing equipment for acceptable combustion figures on high and low flame.

NB Under normal circumstances CO² figures of 11-12% high flame and 10-11% low flame, should be achieved with acceptable smoke numbers (or figures specified by appliance manufacturer). If appliance manufacturers specify combustion performance their recommendations should be followed. The burner operating sequence may vary depending on the type of control box fitted:

a. Spark Restoring Control

When the flame is extinguished during normal running both solenoid valves will close immediately and ignition will be restored for a trial restart. After a delay of approximately 5-10 seconds, the low flame solenoid valve will be energised and fuel released to the combustion chamber in an attempt to re-light on low flame. If burner fails to light the control will travel to lock-out within approximately 10-15 seconds.

b. Cyclic Control (non spark restoring)

The sequence of this box will give an air pre-purge period of up to 30 seconds where ignition and motor are energised simultaneously at the start of the pre purge. The low flame solenoid valve will then be energised resulting in low flame light up. If the flame is not established within 5 seconds the control will lock-out.

NB The pre-purge period may vary depending on the type of control box used.

If the flame is extinguished during normal running the photo resistor will react within 1 second giving burner shut-down. There will then be a short natural ventilation period before a re-start is attempted.

FAULT FINDING

Motor fails to start. Check that power is available to the burner and that the motor overloads have not tripped. Check all fuses in the supply to the burner. Check that the contacts of control and safety limits thermostats on the appliance, time switches etc., are closed and therefore calling for heat.

Motor starts but burner will not light. If the flame is not established the burner will stop and 'lock-out' after a preset safety period. A warning light will be illuminated on the control box. The manual reset button, mounted on the sequence controller, should not be operated until at least 30 seconds after the burner has been 'locked out'.

Check that air setting is correct.

Ascertain whether oil is being sprayed by the nozzle. If oil is passing through nozzle, check that there is an arc at the electrodes. Check all connections including high voltage leads, with mains switched off. Check electrode gap and correct if necessary (see electrode setting sketch).

Ensure that electrodes are not short circuited and that their insulators are not cracked or soiled.

If there is no oil spray check that there is an oil supply to the burner (including tank) and that all isolating valves are open. Check that nozzle is not blocked and that atomisation is correct. Ensure that all filters are able to pass oil. Check that the solenoid valve opens. Check that fuel pressure delivered by the pump is correct. The nozzles should be replaced after approximately 2000 hours operation.

Unstable pump pressure. Check that the pump has been correctly primed by disconnecting return pipe from pump (on two-pipe systems); air-free fuel should flow out when the pump is run. On single pipe systems remove the purge plug to ascertain that air-free oil flows out (do not run motor).

On installations where the burner pump has to lift fuel from the tank check that all pipework and connections on the suction side are free of leaks and that there are no blockages. Also check internal by-pass plug is fitted to pump, that suitable spring loaded non-return valves are fitted and that there is a return line to the tank. On suction lift installations check that all pipework is as recommended under oil pump details.

Burner fires then locks-out. Check that photo-resistor is clean and correctly located. Check air damper and burner head setting are correct and re-adjust as necessary.

Flame unstable. Check for fuel supply fault, eg. partial blockage of fuel supply pipe, nozzle atomisation coarse.

Burner will not change to high flame. Check the settings and operation of the H/L thermostat (or pressure switch) - H/L magnetic valve failing to open. Faulty valve, no high flame signal from control box, or high flame switch not in correct operating position.

Flame failure on changing to high flame (or small 'sparky' high flame). High flame nozzle blocked/excess air condition.

Large smokey flame on changing to high flame. Air shutter sticking in the low flame position. The diffuser has not been adjusted to allow sufficient air to pass. Check high flame nozzle.

Burner will not change to low flame (except on initial start). Check setting and operation of H/L control instrument.

Burner starts on high flame. Faulty control unit/high flame solenoid valve.

Burner locks-out without attempting to light. If photo cell detects light during pre-purge period, burner will lock-out or fail safe; cause could be leaking solenoid, illumination from combustion chamber, faulty photo resistor, extraneous light illuminating photo-resistor, etc.

MAINTENANCE

Before carrying out any work on the burner ensure that the incoming electricity supply to the burner is switched OFF.

Filters. A filter is fitted within the pump. To gain access remove pump end-plate as illustrated (see pump manufacturers details). Withdraw filter and clean it in paraffin, or similar solvent. Replace filter and pump end plate.

A filter should also be fitted in the fuel supply pipe. If fitted with a disposable element this should be replaced at least once per year, the frequency depending on the needs of the installation and the cleanliness of the fuel.

If the filter has a re-usable element this should be cleaned at suitable intervals.

It will be necessary to remove air from system after the above operations by bleeding the pump.

Motor. The motor requires no maintenance: it has bearings which are factory lubricated for the life of the motor.

Fan. If the fan is damaged or becomes loose on the motor shaft access can be obtained by removal of air inlet casting.

Correct position of fan is such that a clearance of approximately 3mm exists between blade of air control device and backplate of fan.

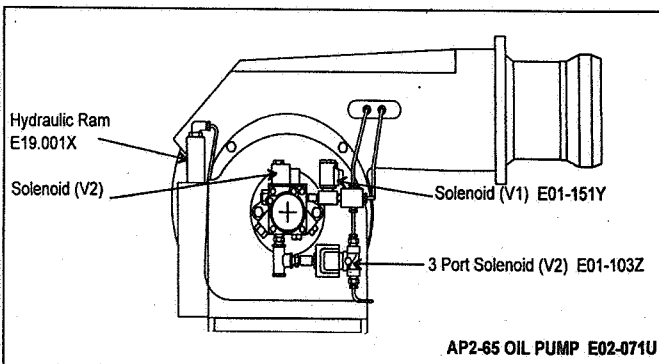
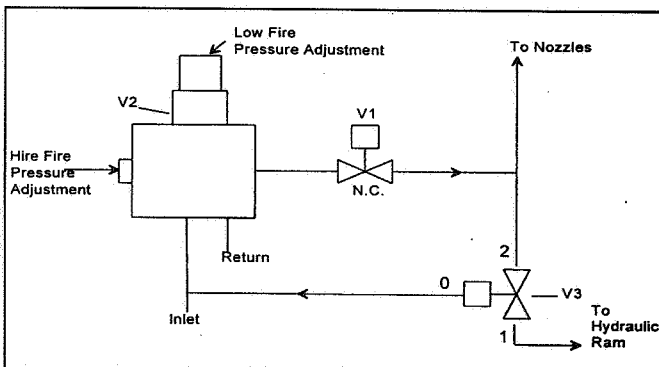
HANDBOOK SUPPLEMENT for NOL 20-23 High/Low Oil Burner with pressure variation oil pump and air control via hydraulic ram.

The burner operates with two nozzles to obtain two-stage firing incorporating a pressure variation system using an AP2-65 pump with high and low adjustments of the oil pressure.

Pump solenoid (V2) has low flame pressure adjustment through the centre.

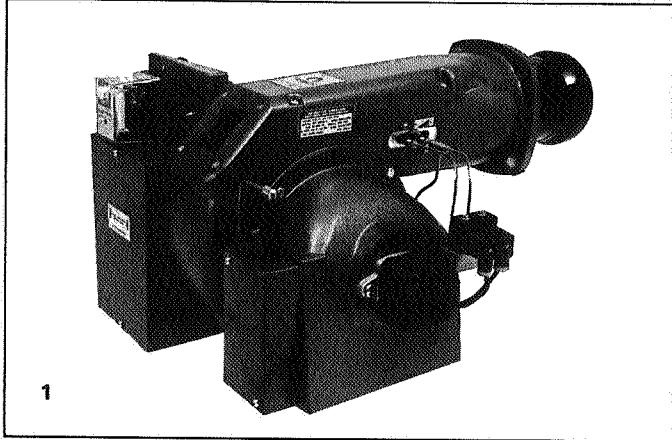
The oil line consists of safety solenoid valve (V1) and a three-way solenoid valve (V3). The latter controls the oil flow to the hydraulic ram which, when energised, relieves pressure back to the inlet of the pump to give low fire air and de-energised to give high fire.

When low fire is established solenoid (V2) is energised via the appliance high/low controlling instrument and gives high fire condition.

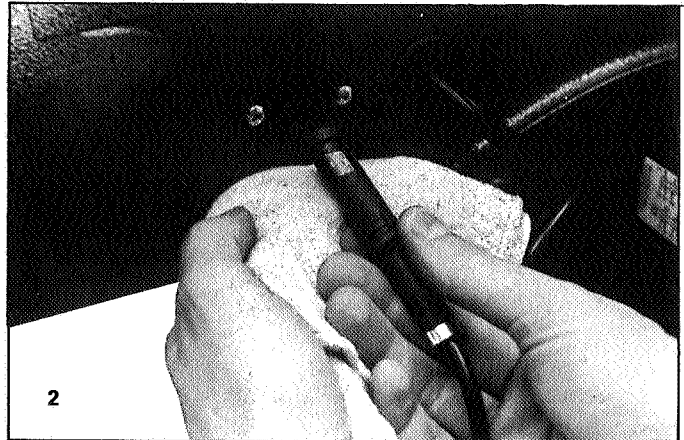


AP2-65 OIL PUMP E02-071U

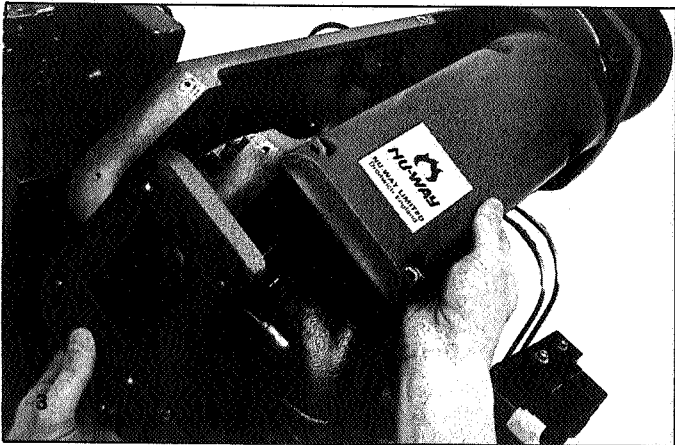
MAINTENANCE



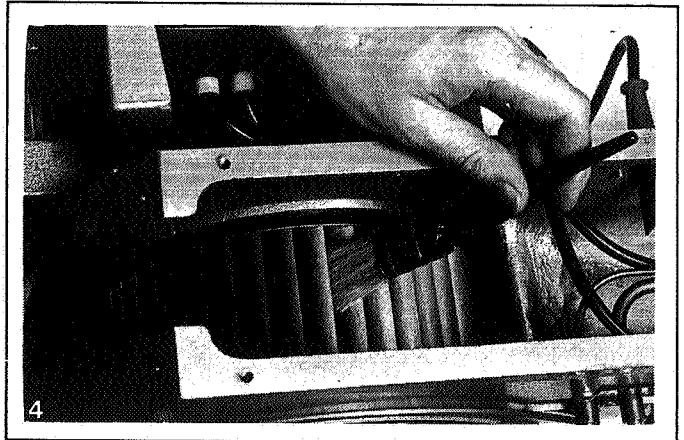
General view of burner. The adjustable inner assembly with setting scale is clearly shown with solenoid oil valves positioned below. The air control adjustment is contained inside the cover on the left hand side of the air inlet.



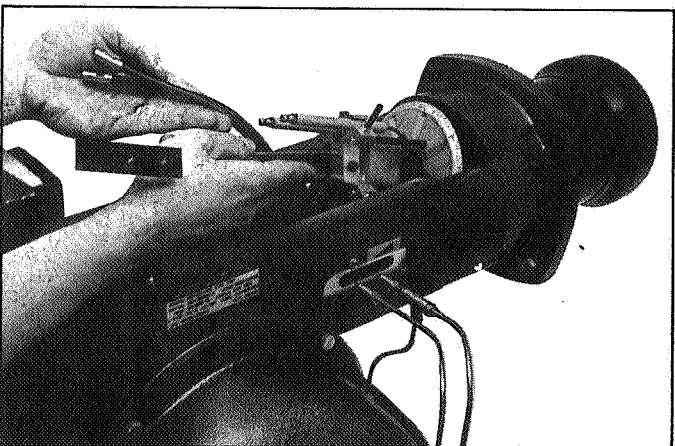
The photo cell is removed from burner for cleaning. Do not touch cell window with the fingers and use only a clean dry cloth. Ensure viewing face points towards burner combustion head when replacing.



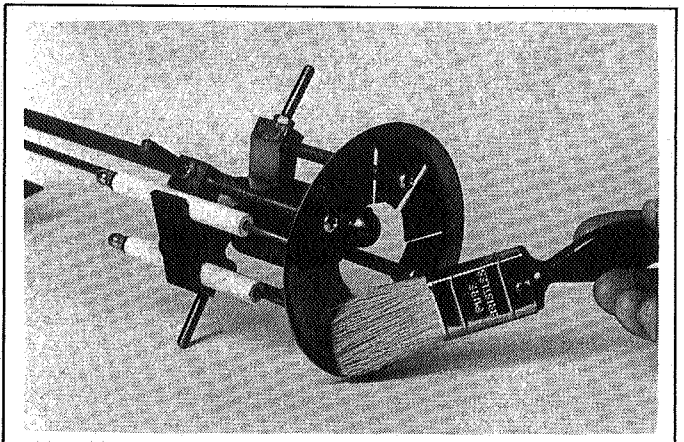
Remove top cover by undoing four screws. It may also be necessary to slacken the four screws on the inspection window cover. To gain complete access to the fan it is advisable to remove the latter item.



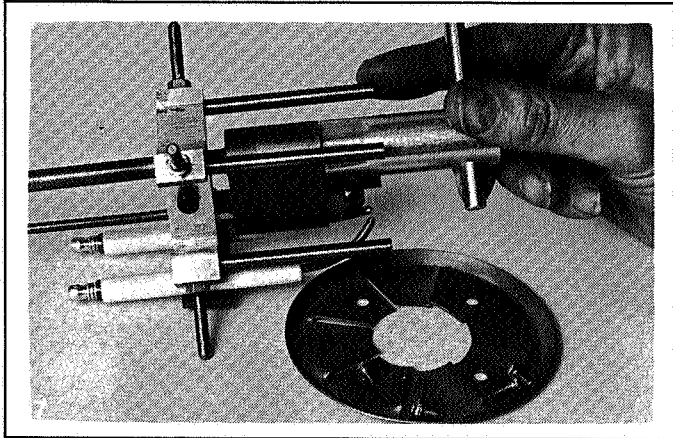
Cleaning the fan runner; use a stiff brush.



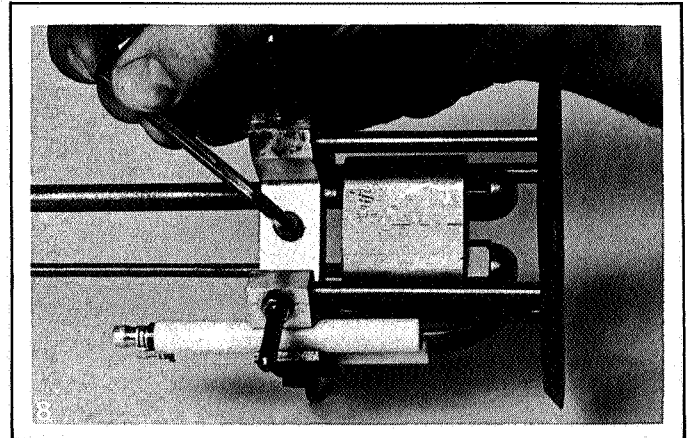
For nozzle assembly withdrawal, the top cover must be removed. electrode HT connectors must then be disconnected, the photo resistor removed and the tubing nuts retaining the inner assembly disconnected. After undoing the two outer retaining screws the assembly can be lifted clear. **DO NOT REMOVE OR ADJUST CENTRAL SCREW** as this locates diffuser assembly.



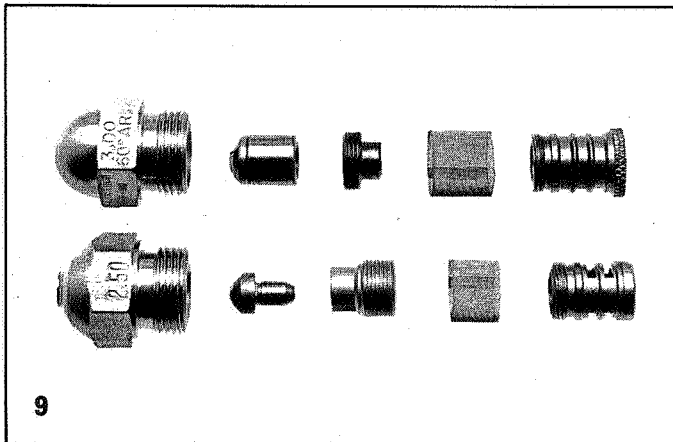
The The air diffuser should be cleaned using a stiff brush.



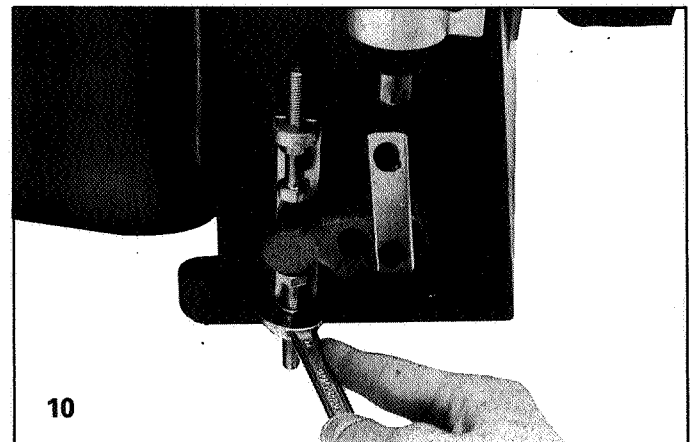
It is necessary to dismantle the diffuser from the nozzle assembly before nozzle removal, by undoing four retaining screws. To facilitate removal and fitting of nozzle, the electrode bracket may be moved (see following photograph). Nozzles are removed using a nozzle spanner. Fit nozzle by hand using a spanner only for final tightening. Re-assemble diffuser and check in correct position.



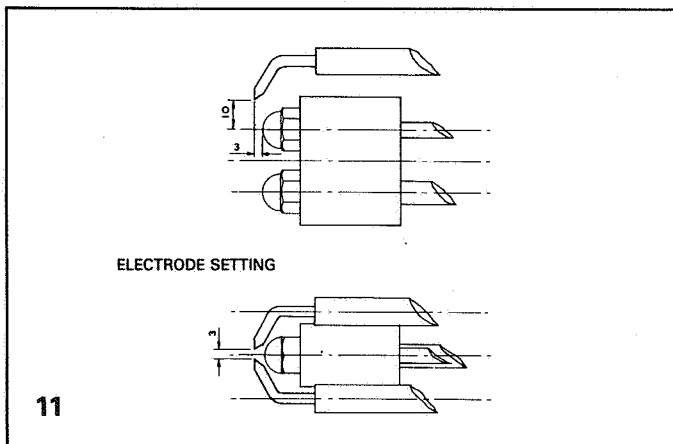
Set nozzle/diffuser gap by loosening cap head screw and sliding diffuser assembly to correct position. Re-lock screw when set.



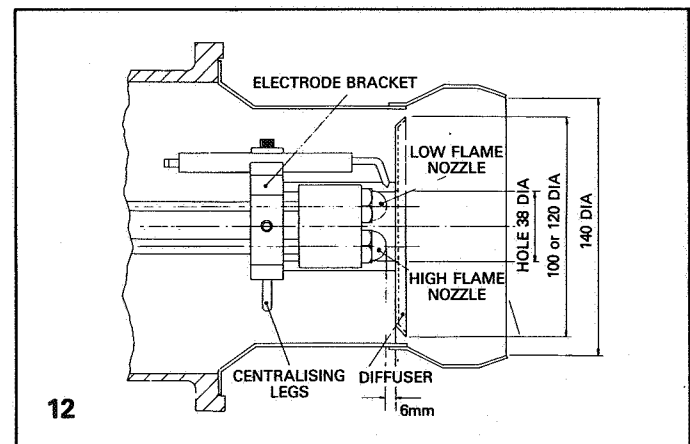
Dismantle nozzle itself to enable internal filters to be cleaned. Do not use any metal or wood to remove deposits. Wash in solvent. Wipe off any remaining dust using a clean lint-free rag. Illustration shows correct assembly for (above) Monarch and (below) Steinen nozzles. Replace after 2000 hours operation.



Air control adjustment. To obtain access undo two retaining screws holding cover in situ. Replace after adjustment is completed.



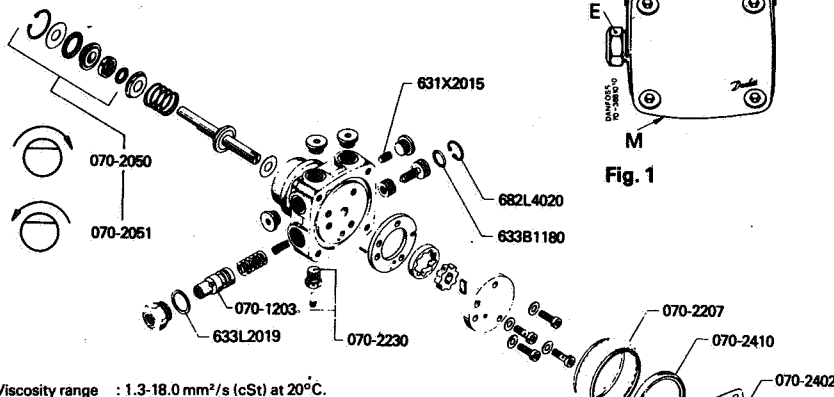
Electrode setting.



Adjustable burner head arrangement.

OIL PUMP

Danfoss RSA60 pump



Viscosity range : 1.3-18.0 mm²/s (cSt) at 20°C.

Speed RSA 28 : 2400-3600 min (rev/min)

Speed RSA 40, 60 : 1400-3600 min (rev/min)

Pressure range : 5.5-12.0 bar (p_g) (kp/cm²)

(1.3-1.8 mm²/s)

5.5-21.0 bar (p_g) (kp/cm²)

(1.8-18.0 mm²/s)

Factory setting : 10 bar (p_g) (kp/cm²)

Connections (Fig. 1)

The pump to be connected as follows:

1-pipe systems at open bypass (G - Fig. 7).

2-pipe systems at closed bypass (G - Fig. 8).

E = Nozzle line 1/8 in BSP. RSA can be used for both one- and

multistage operation with a solenoid valve in the nozzle line.

K = Suction line 1/4 in-BSP

B = Return line 1/4 in-BSP

M = Pressure gauge connection, venting, 1/8 in BSP

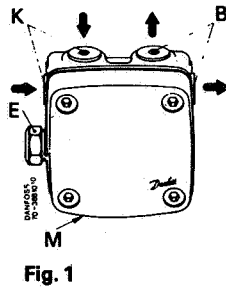


Fig. 1

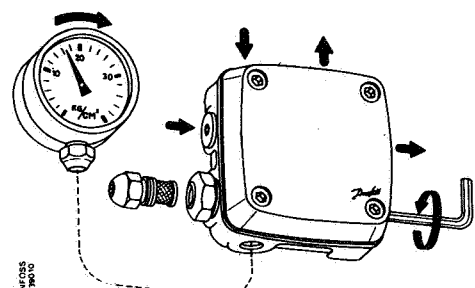


Fig. 3

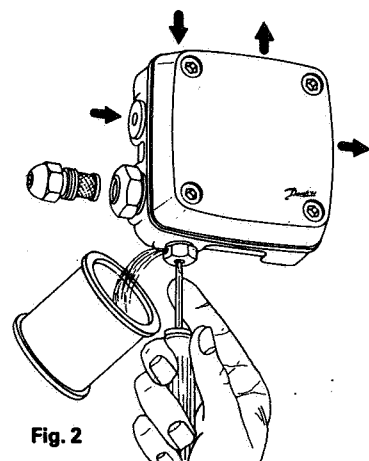


Fig. 2

Venting (Fig. 2)

Venting is only necessary in the case of 1-pipe systems. 2-pipe

systems have automatic venting through the return line.

Pressure setting (Fig. 3)

Suction line tables

H = suction head in metres. Positive H-value = superjacent tank

(Fig. 4) (Fig. 5). Negative H-value = subadjacent tank (Fig. 6).

L = length of suction line in metres.

One pipe system to be used only
when there is a positive pressure
in the suction line.

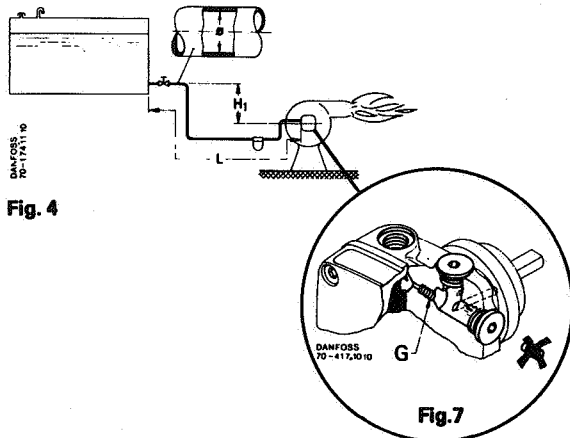


Fig. 4

Fig. 7

Two pipe systems to be used when a
vacuum may occur in suction line.

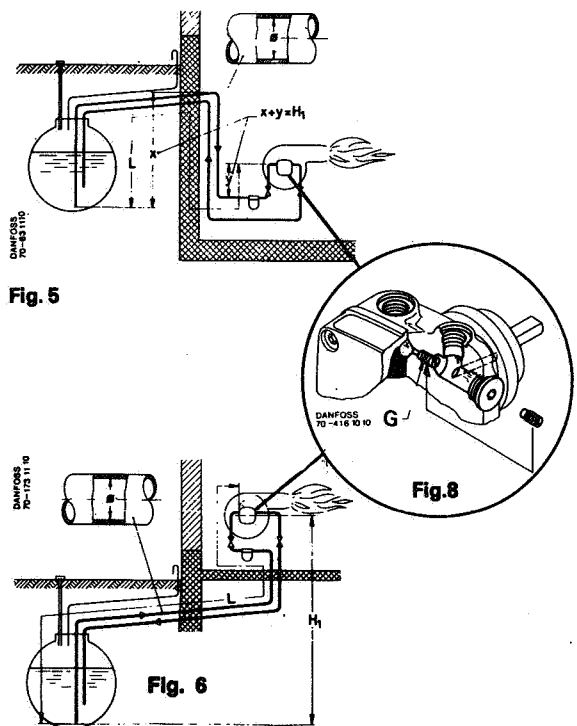


Fig. 5

Fig. 8

H	1.8 mm ² /s (cSt)								4.3 mm ² /s (cSt)							
	ø4	ø6	ø8	ø10	ø12	ø14	ø16	ø18	ø4	ø6	ø8	ø10	ø12	ø14	ø16	ø18
4.0	100	100	67	100	56	100	44	100	77	100	39	100	32	100	19	96
3.5	100	100	76	100	48	100	38	100	67	100	21	100	21	100	17	85
3.0	100	100	84	100	40	100	32	100	56	100	28	100	18	91	14	71
2.5	100	100	92	100	33	100	26	100	46	100	23	100	15	74	11	58
2.0	79	100	40	100	25	100	20	100	35	100	18	89	11	57	9	45
1.5	56	100	28	100	18	86	14	70	24	100	12	83	8	40	6	31
1.0	31	100	15	79	10	50	8	40	14	72	7	38	5	23	4	18
0.5	7	36	4	18	2	12	2	9	4	19	2	9	1	6	1	5

H	RSA 60 2800 min ⁻¹			
	ø6	ø10	ø12	ø18
4.0	47	100	100	100
3.5	41	100	100	100
3.0	34	85	100	100
2.5	28	70	100	100
2.0	22	55	100	100
1.5	16	40	83	100
1.0	10	25	52	100
0.5	4	10	21	100
0	0	0	0	0

NOTES

a) Pump Pressure of 1250 kPa (12.7 kg/cm² = 180 p.s.i.) is factory-set standard.

b) Turndown on units is 1.5 = 1 up to 293 kW (250,000 kcal/h = 1,000,000 Btu/h and 2:1 above.

c) When using kerosene fuel (28 secs Redwood No 1 = 1.4 cSt — both at 38°C) the working pressure should be reduced to 1,000 kPa (10.2 kg/cm² = 145 p.s.i.).

* Based on gross calorific value of 10.6 kW / litre (43,100 Btu / kg = 137,500 Btu / USgal).

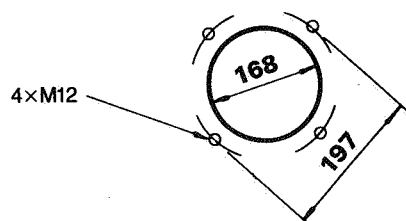
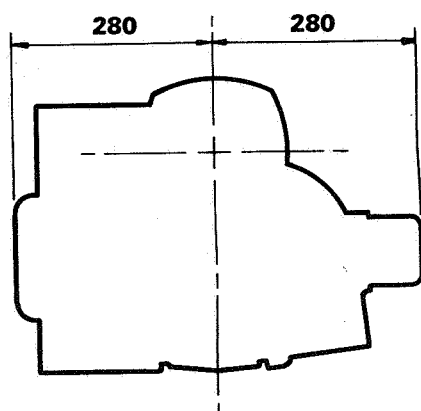


MODEL

NOL20 NOL25

DIMENSIONS

All dimensions are in mm's.



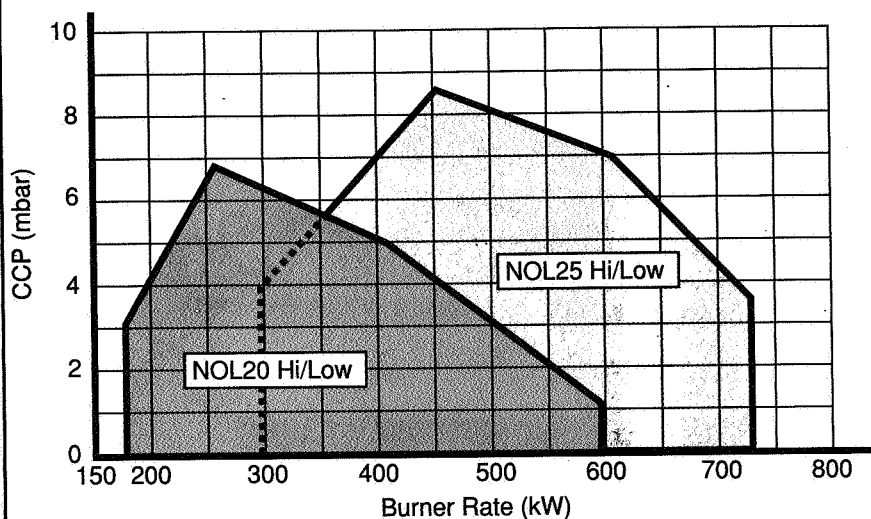
TYPICAL BURNER
DESIGNATION NOL 20 T3S 150



Nu-way Limited, P.O. Box 1 Vines Lane, Droitwich,
Worcestershire. WR9 8NA, England.

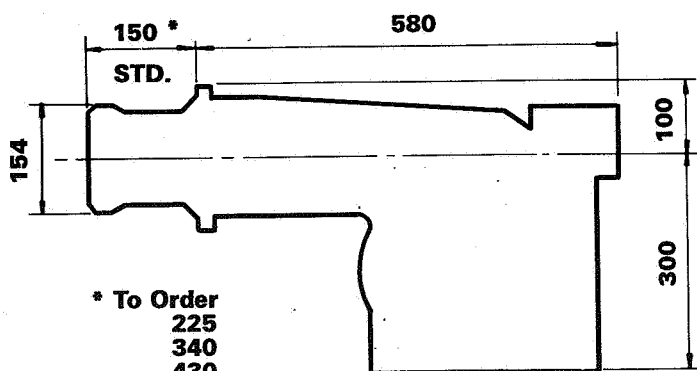
Tel: Droitwich (01905) 794242 (Direct Dial) & 794331
Facsimile: (01905) 794017 & Spares (01905) 795829
Email: info@nu-way.co.uk

BURNER SELECTION CHART



BURNER OUTPUT

Burner outputs shown are based upon an air temperature of 20°C and an altitude of 500m.



FULL BURNER DESIGNATION - NOL20 - NOL25

BURNER TYPE	NO	L	(20/25)	(T)	(1/3)	(S/L)	150
OIL TYPE							
NOMINAL OUTPUT (in 100,000's Btu/hr)							
OPERATION T= 2 stage only							
ELECT. SUPPLY 1PH or 3PH							
CONTROL MAKE - Satronic or Landis and Gyr							
PROJECTION (mm)							

Nu-way policy is one of continuous improvement. The right to change prices and specifications without notice is reserved.



BS EN ISO 9001
CERT No. FM00921
ISSUE 7/99

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