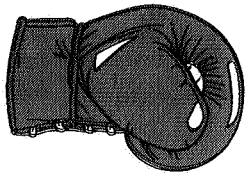


## Handbook



# BOXER

## series high efficiency oil burners

### BURNER CAPACITY

#### Boxer A

14.7kW to 18.3 kW  
50,000 Btu/h to 62,500 Btu/h

#### Boxer B

18.3kW to 25.6kW  
62,500 Btu/h to 87,500 Btu/h

#### Boxer C

24.9kW to 33.0kW  
85,000 Btu/h to 112,500 Btu/h

### THE BOXER RANGE

Nu-Way's Boxer range of pressure jet oil burners sets new standards in efficient and reliable operation. Developed to meet the stringent standards of BS.4876 for domestic oil fired boilers and all popular types of oil fired domestic hot water boilers.

The burners are the result of over 50 years experience and development by Nu-Way in the light commercial market.

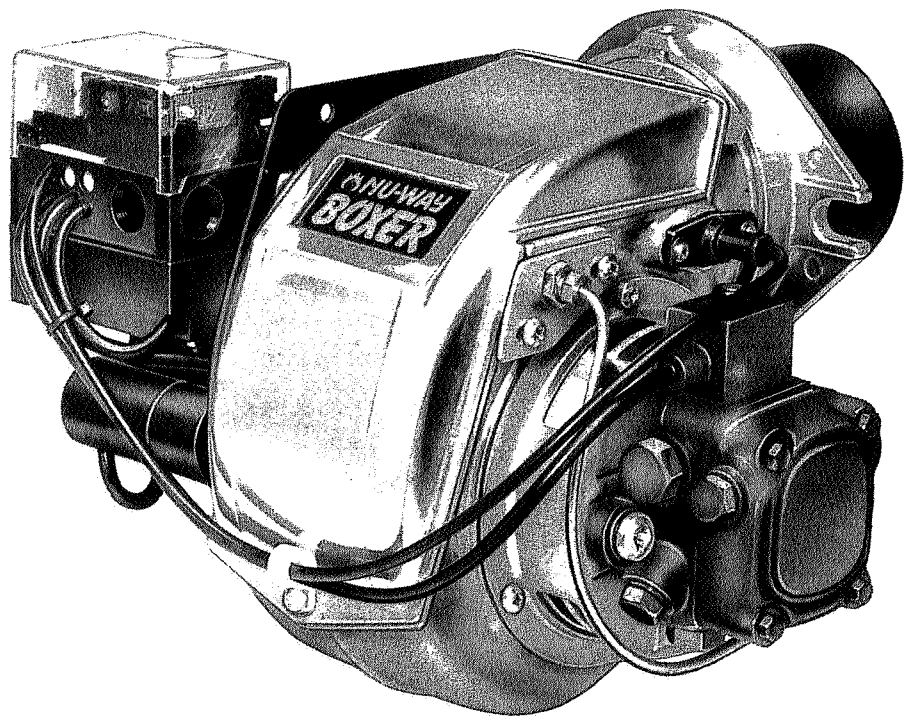
### CONSTRUCTION

A monobloc metric design, using fastenings to ISO Standards. The burner is suitable for flange mounting to the boiler/heater frontplate.

The burner head is a new design based on the successful Nu-Way 'FR' head producing very high levels of combustion performance, together with tight flame patterns. The fan and inner assembly are accessible by removing the burner lid, ensuring ease and speed of servicing.

### AIR REGULATION

Air for combustion can be adjusted to give maximum efficiency. A patented air inlet control device is fitted to ensure smooth start conditions. High static air pressure is maintained within the burner and enhances smooth ignition during boiler start up.



### CONTROLS

Flame supervision by miniature photo electric cell with sequence controller. The burner on/off operation may be controlled by thermostats, time switches etc.

### OPERATION

Single Stage (On/Off) operation only.

### FUEL

Class C2 (1.1 - 2.0cSt @ 40°C)  
Kerosene or Class D (1.5 - 5.5 cSt @ 40°C) Light Gas Oil.

### FUEL SYSTEM

Pump fitted with solenoid cut-off valve, suitable for single pipe gravity feed or two pipe suction lift systems. A flexible oil pipe is provided, fuel connection 1/4" BSP. It is recommended that an in-line fuel filter should always be fitted.

### APPROX. WEIGHT

10 kg

### EXTRAS

Burner Cover  
In-Line Fuel Filter

## BURNER DATA

### Kerosene 10.18 kW/Litre (131,600 Btu/USgal)

Burner Model	Minimum Burner Throughput		Minimum Burner Capacity †			Maximum Burner Throughput		Maximum Burner Capacity †			Nozzle Size USgal/h at 100psi	Standard Nozzle Spray Angle
	Litres/h	USgal/h	kW	kcal/h x 10 <sup>3</sup>	Btu/h x 10 <sup>3</sup>	Litres/h	USgal/h	kW	kcal/h x 10 <sup>3</sup>	Btu/h x 10 <sup>3</sup>		
Boxer A	1.44	0.38	14.7	12.5	50	1.80	0.48	18.3	15.6	62.5	0.4	80°H
Boxer B	1.80	0.48	18.3	15.6	62.5	2.51	0.67	25.6	21.9	87.5	0.55	80°H
Boxer C	2.45	0.65	24.9	21.3	85	3.24	0.86	33	28.2	112.5	0.65	80°H

† To obtain **appliance** output, multiply burner capacity by efficiency;

e.g. max. appliance output for Boxer A @ 80% efficiency =  $18.3 \text{ kW} \times \frac{80}{100} = 14.64 \text{ kW}$

### Gas Oil 10.57 kW/Litre (136,600 Btu/USgal)

Burner Model	Minimum Burner Throughput		Minimum Burner Capacity			Maximum Burner Throughput		Maximum Burner Capacity			Nozzle Size USgal/h at 100psi	Standard Nozzle Spray Angle
	Litres/h	USgal/h	kW	kcal/h x 10 <sup>3</sup>	Btu/h x 10 <sup>3</sup>	Litres/h	USgal/h	kW	kcal/h x 10 <sup>3</sup>	Btu/h x 10 <sup>3</sup>		
Boxer A	1.39	0.37	14.7	12.5	50	1.73	0.46	18.3	15.6	62.5	0.4	80°H
Boxer B	1.73	0.46	18.3	15.6	62.5	2.42	0.64	25.6	21.9	87.5	0.55	80°H
Boxer C	2.36	0.62	24.9	21.3	85	3.12	0.83	33	28.2	112.5	0.65	80°H

NOZZLES AS ABOVE UNLESS OTHERWISE SPECIFIED

## INSTALLATION

**Flue.** Siting of the chimney where installed, should be in accordance with appliance manufacturer's recommendations. Chimney cowls are not recommended.

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

The pressure conditions in the combustion chamber will vary according to the type of appliance, normally +4.0 to -1.3 mm Wg (+0.16 to -0.05 in. Wg). Should resistance be greater than 4.0 mm Wg a blockage in the boiler or chimney may be the cause. Where extremely high draught conditions are experienced, consideration should be given to installing a draught stabiliser which should comply to appliance manufacturer's recommendations.

**Fuel Storage and Handling.** The provisions of BS.2869 will normally ensure that the fuel will be of adequate quality. Class D gas oil is supplied in winter and summer grades, and precautions should be taken to prevent waxing under sustained cold and exposed conditions. Care should be taken to store and supply Class D gas oil to the burner in line with supplier's recommendations.

**Fuel Supply.** Fuel supply pipework (and, where fitted, the return pipe line) should NEVER consist of galvanised steel. The final connection to the pump inlet port being made with the flexible pipe supplied with the burner. Joints should be made with screw joint or compression fittings, not by soldering.

Wherever possible, it is recommended that a gravity feed is used, the maximum head should not exceed 4m. On installations where the fuel tank is situated below the level of the burner a two pipe (supply and return fuel supply system) MUST be used. Information on the maximum suction permitted is available from Nu-Way on request.

The fuel pump is factory set for single pipe installation, at 156 psi (Boxer A), DR 185 psi (Boxer B and C) except where otherwise specified.

**The MS11 pump provides automatic change over from single to two pipe operation.**

## IMPORTANT

When using a two pipe system it is essential for the return line to go direct to tank without obstructions, and a non-return valve should be fitted on the end of the suction line inside the tank.

**Single Pipe System.** 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.** The suction line/pump will require priming before energising the pump mechanically. It is essential to ensure that the return pipe is not obstructed in any way, e.g. by a plug, closed valve etc. Any obstructions will damage the pump.

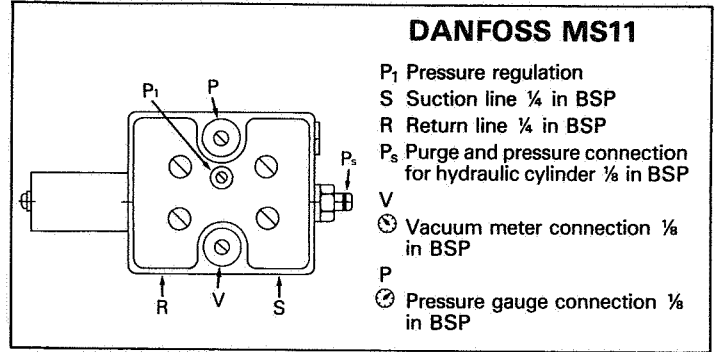
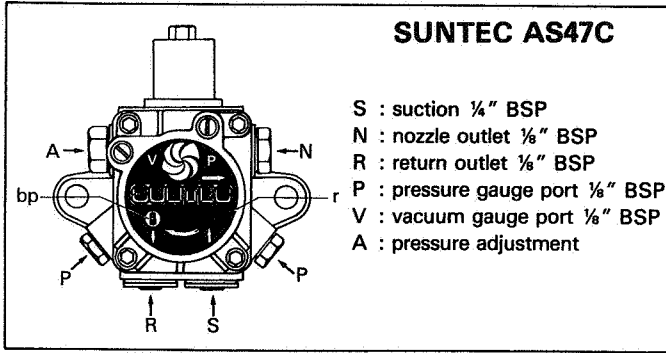
The fuel supply line/pump may need bleeding/priming if the oil storage is allowed to drain completely.

**Electricity Supply.** Connect burner to electricity supply, thermostats, time switches etc., as appropriate.

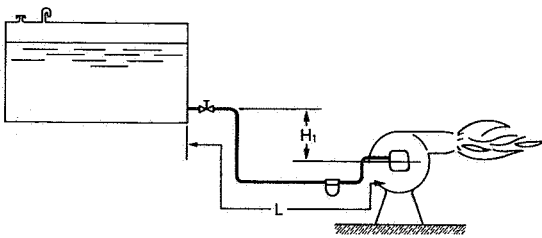
**Air Setting.** The air strap is calibrated 0-10. To attain the correct CO<sub>2</sub> level slacken off the screw on top of the air box and rotate the air strap. Ensure the screw is tightened to secure the setting.

The air strap is factory set as follows (unless otherwise stated):

Boxer A : 1.5  
Boxer B : 1.5  
Boxer C : 3.5



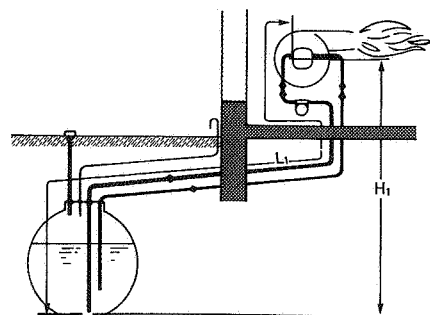
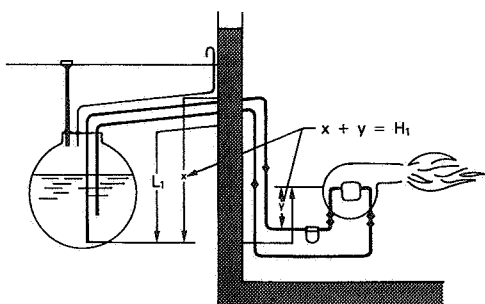
**One-pipe system** - to be used only when there is a positive pressure in the suction line.



H <sub>1</sub>	Pipe Size I/D					
	Class D 4.3 cSt @ (20°C)			Class C <sub>2</sub> 1.8cSt @ (20°C)		
m	ø4 mm	ø5 mm	ø6 mm	ø4 mm	ø5 mm	ø6 mm
4,0	77	100	100	100	100	100
3,5	67	100	100	100	100	100
3,0	56	100	100	100	100	100
2,5	46	100	100	100	100	100
2,0	35	86	100	79	100	100
1,5	24	60	100	55	100	100
1,0	14	35	72	31	76	100
0,5	4	9	19	7	18	36

**Two-pipe system** - to be used when a vacuum may occur in the suction line.

FUEL Class D 4.3 cSt @ (20°C)							
H <sub>1</sub>	Pipe Size I/D			H <sub>1</sub>	Pipe Size I/D		
m	ø6 mm	ø8 mm	ø10 mm	m	ø6 mm	ø8 mm	ø10 mm
4,0	34	100	100	0,0	17	55	100
3,5	32	100	100	-0,5	15	48	100
3,0	30	95	100	-1,0	13	41	100
2,5	28	89	100	-1,5	11	35	85
2,0	26	82	100	-2,0	9	28	68
1,5	24	75	100	-2,5	7	21	52
1,0	22	68	100	-3,0	5	14	35
0,5	20	62	100	-3,5	0	8	19
				-4,0	0	0	0



## NOZZLES

Nozzles on the Boxer series are of fixed sizes (as shown on the Burner Data Tables). In order to vary burner output it is necessary to alter pump pressure (factory set at 156 psi Boxer A, 185 psi Boxer B and C, except where specified).

Assuming appliance output required is known, the pressure required is calculated using the following method:

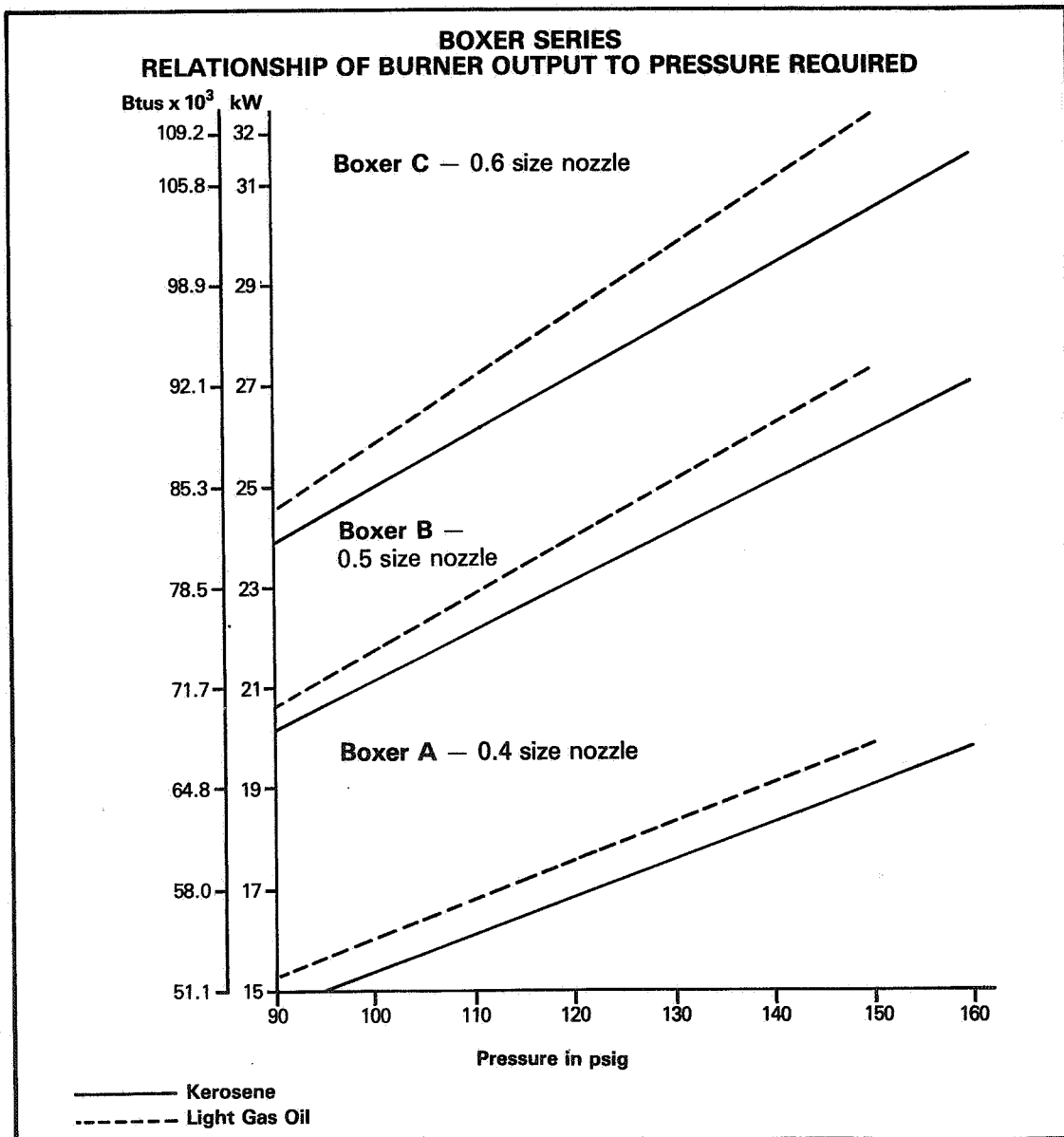
Example: Boxer A Burner (0.4 nozzle) Class C2 (kerosene) fuel, appliance output 14.64 kW appliance efficiency 80%.

- |  |  |
|--|--|
| 1. $\frac{\text{Appliance Output kW} \times 100}{\text{Appliance Efficiency \%}} = \text{Burner Output kW}$      | 1. $\frac{14.64 \times 100}{80} = 18.3 \text{ kW}$ |
| 2. $\text{Burner Output kW} \times 3412 = \text{Burner Output Btu/hr}$   | 2. $18.3 \times 3412 = 62,440 \text{ Btu/hr}$      |
| 3. $\frac{\text{Burner Output Btu/hr}}{* \text{Calorific Value Btu/US gal}} = \text{Throughput Required US gph}$ | 3. $\frac{62,440}{131,600} = 0.474 \text{ US gph}$ |
| 4. $\frac{\text{Throughput Required US gph}}{\text{Nozzle Size Us gph}} = \text{Correction Factor}$              | 4. $\frac{0.474}{0.4} = 1.185$                     |
| 5. $\text{Correction Factor}^2 \times 100 = \text{Pressure Required PSIG}$                                       | 5. $1.185^2 \times 100 = 140 \text{ PSIG}$         |

### \* Calorific Values (Gross)

Class C2 (kerosene) use 131,600 Btu/US gal.

Class D (light gas oil) use 136,600 Btu/US gal.



## OPERATION

To start the burner turn the main electricity isolating switch on. Ensure the appliance thermostat is calling for heat and, where fitted, the burner switch is on.

There is a pre-purge period during which the ignition is switched on, and the motor runs. At the end of this period the magnetic oil valve opens and the burner lights. After a further period the ignition is cancelled and the burner continues to run until it is switched off by:-

- a) The control thermostat contacts opening upon room or water temperature being reached.
- or
- b) Safety or limit thermostat contacts opening.
- or
- c) Burner/appliance is switched off manually.

During start up the photocell will detect if the flame fails to be established and automatically shuts off the burner. The 'lockout' lamp in the sequence control box will then be illuminated.

If during normal running, the flame is extinguished, the oil is cut off but the motor continues to run. The ignition spark is restored within 1 second. After 10-15 seconds the oil valve opens and the burner attempts to light; if it fails the burner goes to 'lockout'.

The manual reset button on the sequence control box should not be operated until at least 30 seconds after the burner has 'locked out'.

During normal operation the photocell should NOT be removed.

## IN AN EMERGENCY

The burner can be stopped by turning the electricity isolating switch off, and where fitted, the burner switch.

## FAULT FINDING

Always ensure there is sufficient fuel in the storage tank and that there is a live electrical supply to the appliance and burner.

### Motor Fails to Start

Check that power is available to the burner, and all fuses in the electrical supply. Check that the contacts of both control and safety limit thermostats on the appliance or in the room are closed and, therefore 'calling for heat'. If the thermostat contacts are not closed check the settings.

### Motor Starts but Burner will not Light

If the flame is not established the burner will stop and 'lockout' after a safety period of 10-15 seconds. The warning light on the sequence control box is then illuminated. The manual reset button should not be operated until at least 30 seconds after the burner has 'locked out'.

Ascertain whether oil is being sprayed by the nozzle. If oil is passing through the nozzle, check that there is a spark at the electrodes. All connections including high voltage leads should be checked.

Check electrode gap and correct if necessary. Ensure that the electrodes are not short-circuited and that the insulator is clean and not cracked.

If there is no oil spray check that there is an oil supply to the burner and that all valves are open. Check that the nozzle filter is not blocked, ensuring that all filters are able to pass oil. Check that the solenoid valve opens when energised and that the fuel pressure delivered by the pump is correct. Do not dismantle the nozzle, replace if necessary.

## Unstable Pump Pressure

On single pipe systems remove the purge plug to ascertain that air-free oil flows out.

On two pipe suction lift system disconnect the return pipe from the pump; air-free fuel should flow out when the pump is run.

Check that all pipework and connections on the suction side are free of leaks and that there are no blockages.

## Burner Starts then Stops after a Short Time

Ensure the photocell is clean and correctly located. Check air damper setting and re-adjust as necessary. Check that the nozzle filter is not blocked.

## Flame Unstable, Burner Stops

Check for fuel supply fault, e.g. partial blockage of fuel supply pipe. Check nozzle atomisation, cleaning nozzle filter or replacing nozzle as necessary.

## Burner Stops after Satisfactory Running Period

If the flame fails during a normal running period, the ignition will be automatically switched on again. If the flame is re-established the ignition is switched off and the burner will continue to operate normally.

If the flame is not re-established after a period the burner stops and is 'locked out', the warning light on the sequence control box is then illuminated.

## MAINTENANCE

Ensure the electricity and oil supply are switched off before carrying out any work on the burner.

### Filters

A filter mesh is fitted within the pump and is accessed by removing the pump end plate. Withdraw filter and clean it in paraffin or other petroleum solvents (e.g. white spirit) using a stiff brush.

Once the filter mesh and pump end plate have been refitted it is necessary to re-prime the pump.

A filter should also be fitted in the fuel supply line. If fitted with a disposable element this should be replaced at least once per year. The frequency will depend on the needs of the installation and the cleanliness of the fuel. If the filter has a washable screen this should be cleaned, at suitable intervals, in exactly the same way as for the pump filter. It is necessary to re-prime the pump.

### Motor

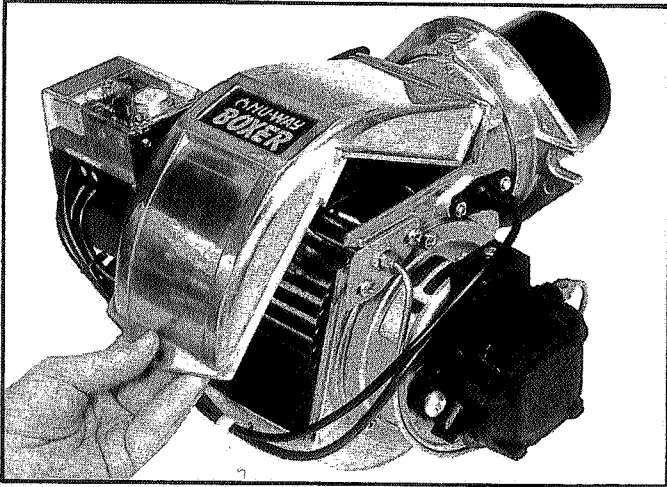
The motor requires no maintenance; it has bearings which are factory lubricated for the life of the motor.

### Fan

If the fan is damaged or becomes loose on the motor shaft the motor must be removed from the burner casing.

## MAINTENANCE

Switch off electricity supply and oil supply to burner.



Cover removed after withdrawal of a single screw at cover base. Ignition electrode lead can then be removed from electrodes.

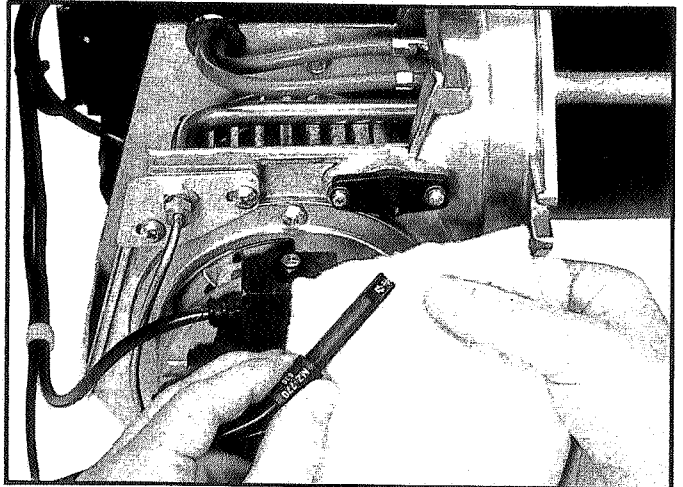
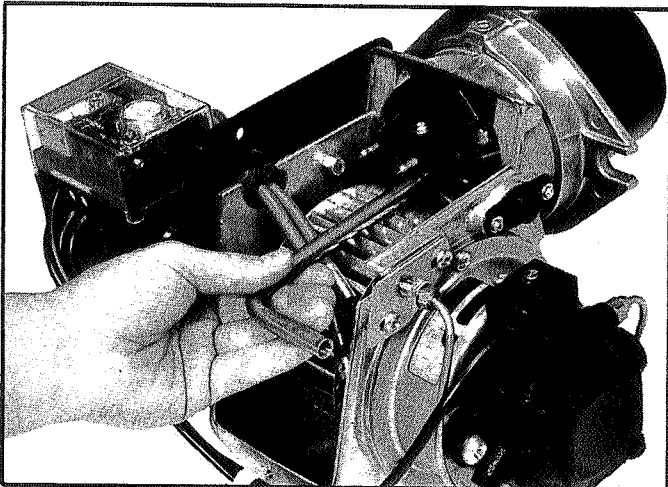
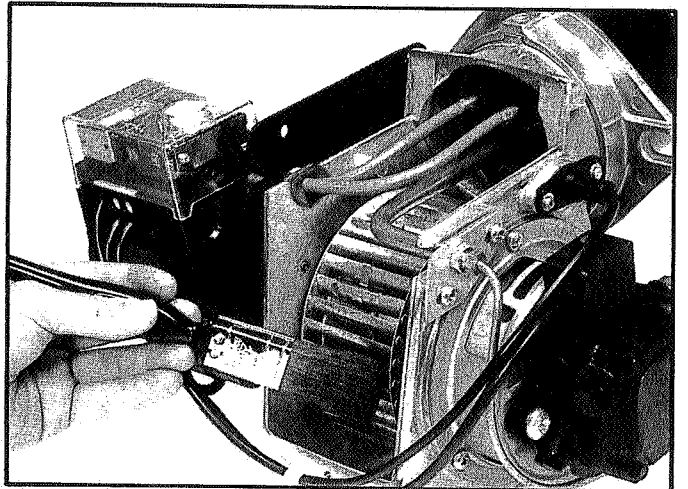


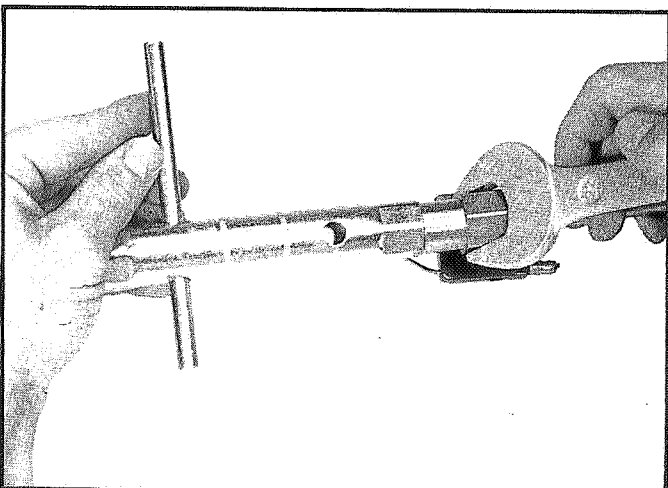
Photo-cell is removed from burner for cleaning. Do not touch cell with the fingers; use only a clean, dry cloth for cleaning. For burners fitted with Satronic TF830N control box you should ensure the 'M.Z.' photo-cell is positioned as indicated by the position label.



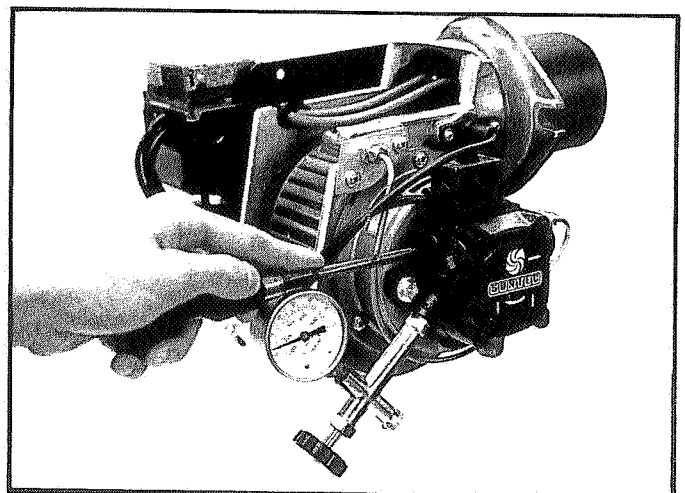
Before attempting to remove inner assembly withdraw photo-electric cell from its housing on right side of burner. Tubing nut and lock nut is fully unscrewed to release inner assembly which can now be withdrawn from burner.



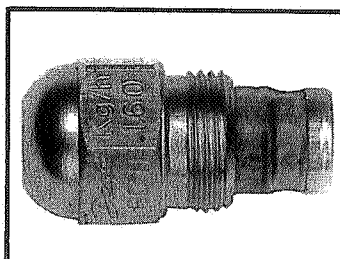
Cleaning the fan runner: use stiff brush.



Remove diffuser before removing the nozzle for changing/cleaning. the nozzle is removed from inner assembly using a box spanner. Fit nozzle to burner inner assembly by hand; use spanner only for final tightening. Handle with care to avoid damage to electrode. REFIT DIFFUSER. See head arrangement drawing on opposite page.



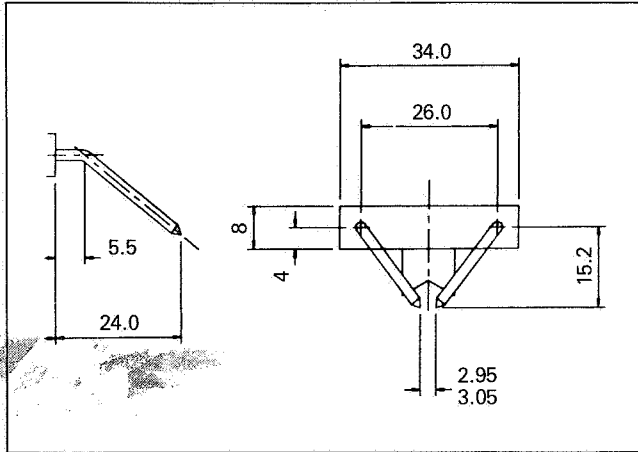
To check pump pressure fit pressure gauge and test manifold. Adjusting pump delivery pressure (factory set at 156 psi Boxer A, 185 psi Boxer B and C unless otherwise stated).



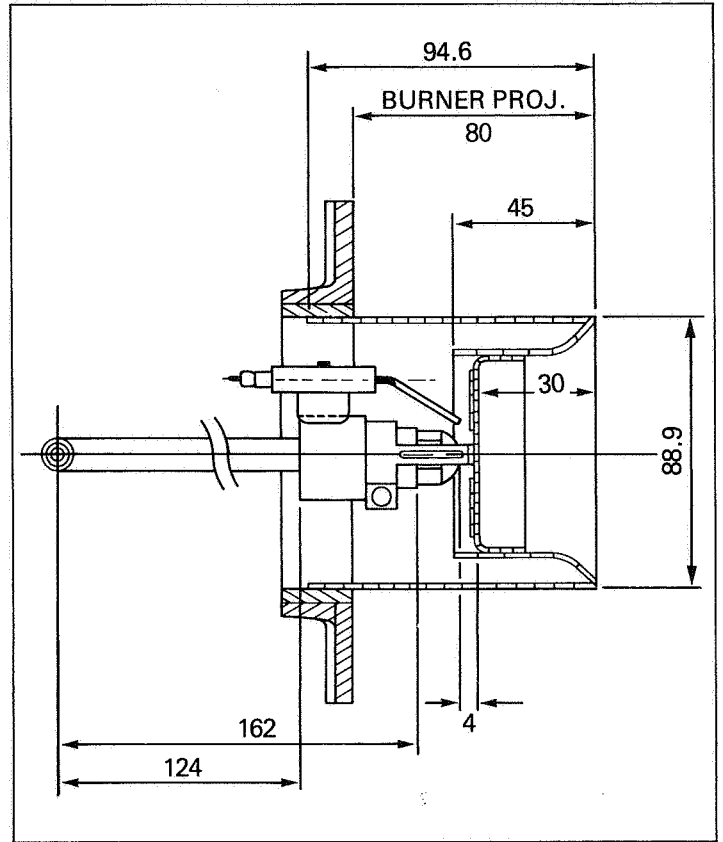
The nozzle should be replaced in preference to cleaning. Care should be taken to use same type, size and spray angle. (Nozzles are calibrated in US gallons/hour.)

Boxer A 0.4 USgal/h, 80°H  
Boxer B 0.5 USgal/h, 80°H  
Boxer C 0.6 USgal/h, 80°H

Nozzle size and type may vary depending on application.



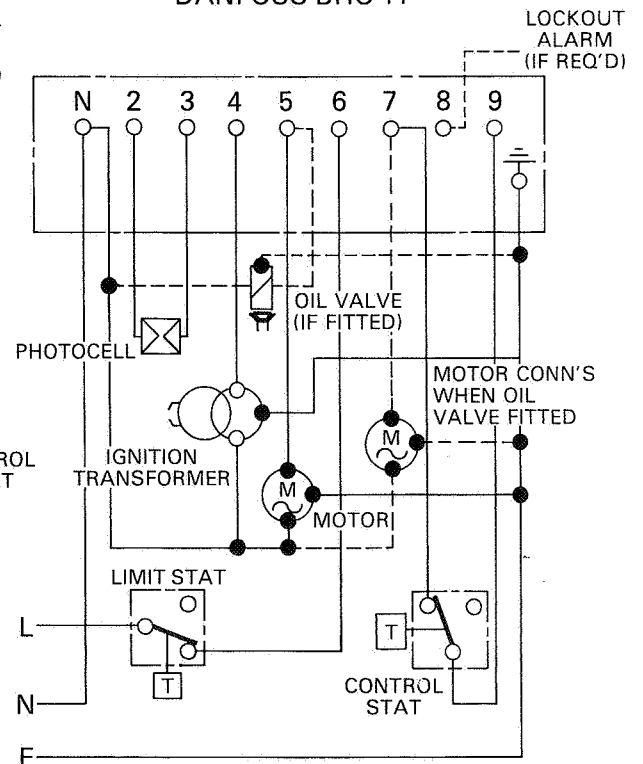
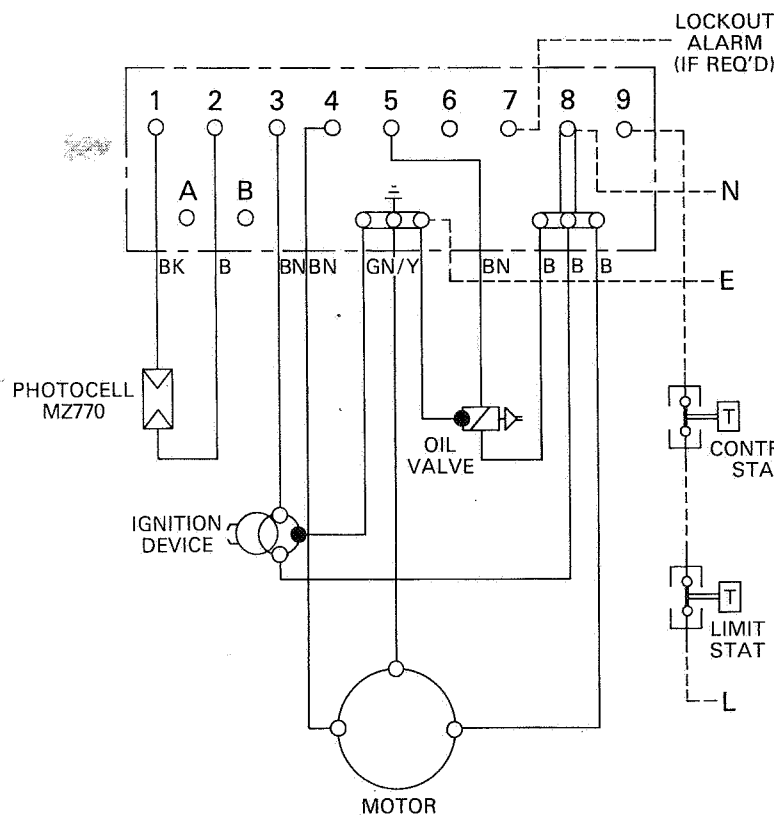
Electrodes should be set to these dimensions to ensure trouble free ignition. Dimensions are in millimetres.

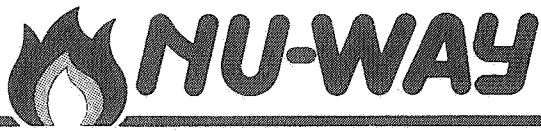


The head arrangement is factory set and is designed as fixed. No adjustments should therefore be necessary. Dimensions are in millimetres.

### SATRONIC TF830N

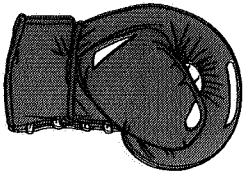
### DANFOSS BHO 11





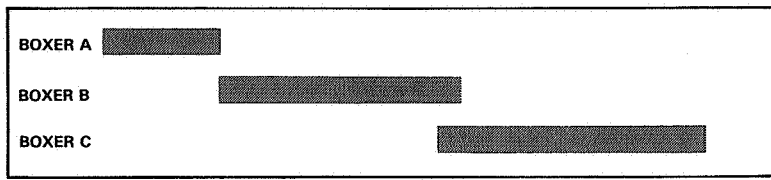
**MODEL**

**BOXER**



**BURNER SELECTION CHART**

10	12.5	15	17.5	20	22.5	25	27.5	30	kcal/h x 10 <sup>3</sup>
11.7	14.7	17.5	20.5	23.5	26.4	29.3	32.3	35.2	kW
40	50	60	70	80	90	100	110	120	Btu/h x 10 <sup>3</sup>

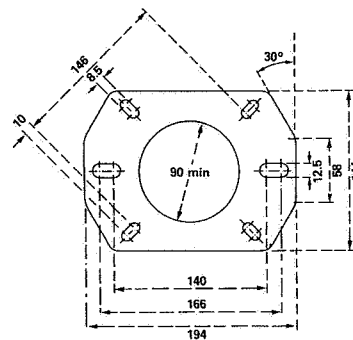
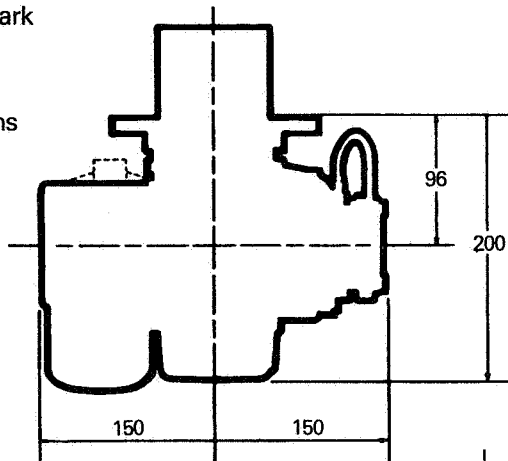


**ELECTRICAL DATA**

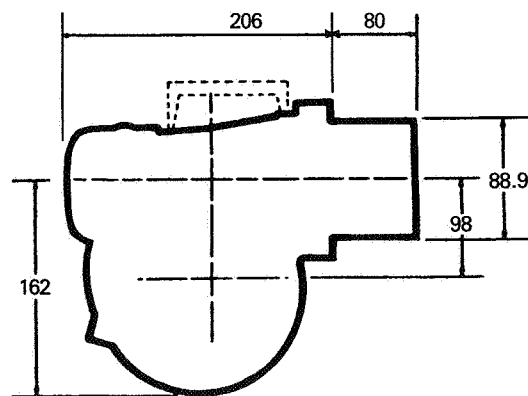
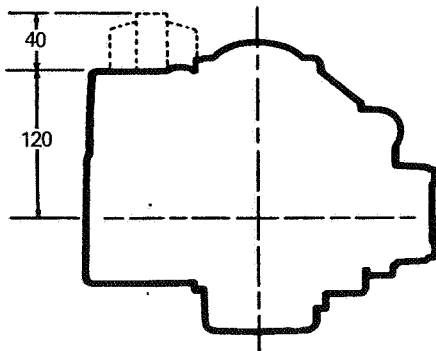
Mains Supply (V) 230/250 + 10%-15%  
 Single phase  
 Frequency (Hz) 50  
 Burner (W) 75 (1/10 hp)  
 2700 rpm  
 Start Current (A) 1.0 Capacitor start  
 Run Current (A) 0.6  
 Ignition by direct HT spark

**DIMENSIONS**

All dimensions are in mms



Appliance Frontplate drilling to D.I.N. standards



NU-WAY LIMITED, P.O. Box 1, Vines Lane, Droitwich,  
 Worcs. WR9 8NA, England.  
 Tel: Droitwich (0905) 794331 & 794242  
 Telex: 338551 Nuway G & 339868 Nuway G.  
 Facsimile: (0905) 794017



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



BS 5750 PART 1  
 CERT No. FM921  
 ISO 9001  
 EN 29001