



**INSTRUCTION MANUAL FOR OIL BURNER MODELS**

**X400**

**X500**

**X600**





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### IMPORTANT NOTE

The contents of the manual must be read and followed prior to the fitting and commissioning of the burner.

Any work on this burner must be carried out by a suitably qualified, and experienced, engineer.

Any electrical or fuel supply must be isolated before any work is carried out.

The installation must be carried out in accordance with current Electrical Regulations and all relevant Building Regulations.

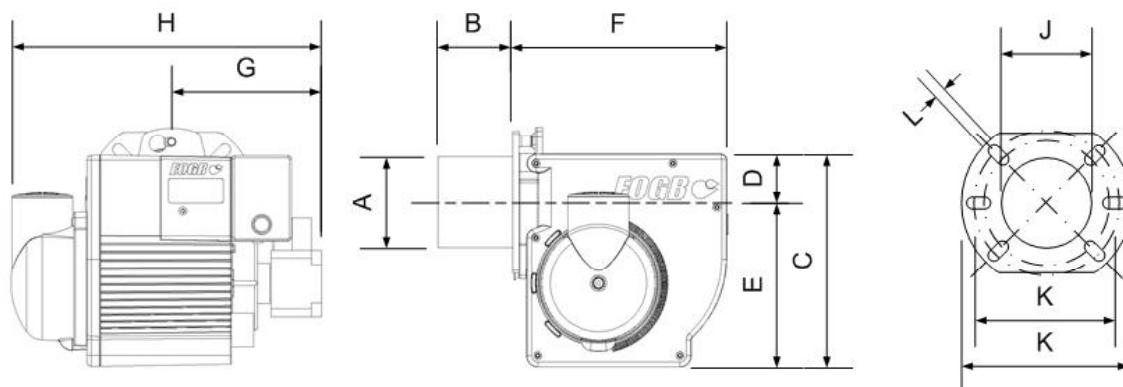
Failure to meet with these requirements could lead to damage or injury, and could invalidate any guarantee.

# TECHNICAL SPECIFICATIONS

## Technical Data

Model		X400	X500	X600
Burner output	Min kW	14	30	58
	Max kW	50	70	130
Fuel Flow rate	Min Kg/h	1.2	2.5	4.8
	Max Kg/h	4.2	5.8	10.8
Fuel	Kerosene	Max viscosity 5.5cst @ 20°C		
	Gas Oil			
Electrical supply	V	230V ±10% 50Hz 1 phase		
Motor	W	90	90	130
Transformer		40mA (rms) 15kV		
Current	Start A	1.60	1.60	2.20
	Run A	0.53	0.53	0.87
Weight	kg	9.2	9.2	9.5
Mode of operation		On/off		

## Burner Dimensions (mm)

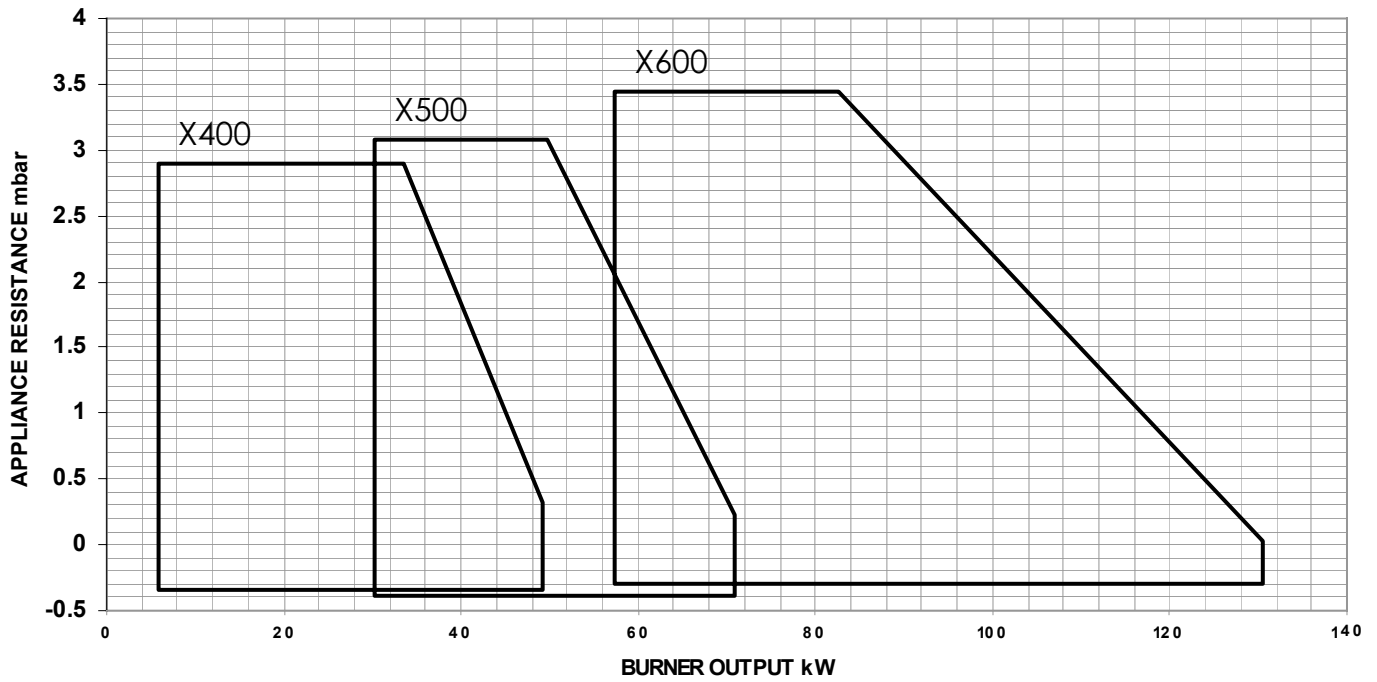


Model	AØ root	AØ max	B*	C	D	E	F	G	H	J	K	L
X400-1N	89	89	73	231	50	161	194	138	268	90	125-150	10
X400-2N	89	89	73	231	50	161	194	138	268	90	125-150	10
X400-1	89	89	73	231	50	161	194	138	297	90	125-150	10
X400-2	89	89	73	231	50	161	194	138	297	90	125-150	10
X500-1	89	89	73	231	50	161	204	204	318	90	125-150	10
X500-2	89	89	80	231	50	161	204	204	318	90	125-150	10
X600-1	89	89	80	231	50	161	204	204	360	90	125-150	10
X600-2	89	109	120	231	50	161	204	204	360	90	125-150	10

\*Standard lengths only - other lengths are available.

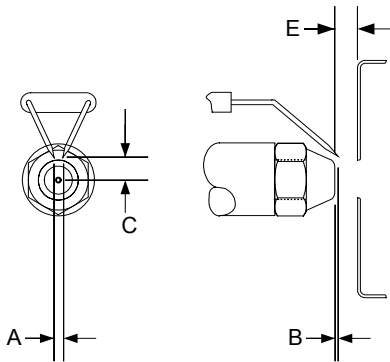
# TECHNICAL SPECIFICATIONS

## Working Field



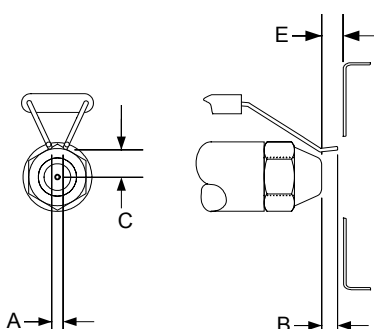
## Head / Electrode settings

X500-2  
X600-1

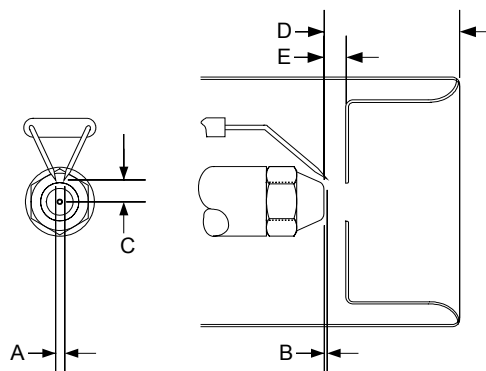


Model	mm				
	A	B	C	D	E
X400-1	2.5	0	9.0	43	4
X400-2	2.5	0	9.0	43	4
X500-1	2.5	0	9.0	43	4
X500-2	3.5	2.0	4.5	43	6
X600-1	3.5	2.0	4.5	—	6
X600-2	3.5	4.0	8.5	—	6

X600-2

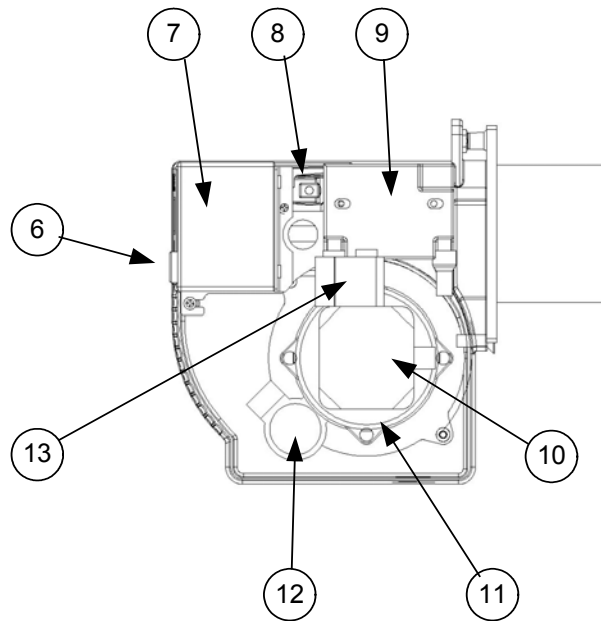
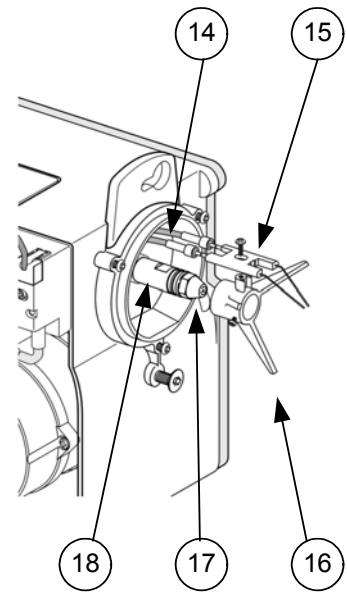
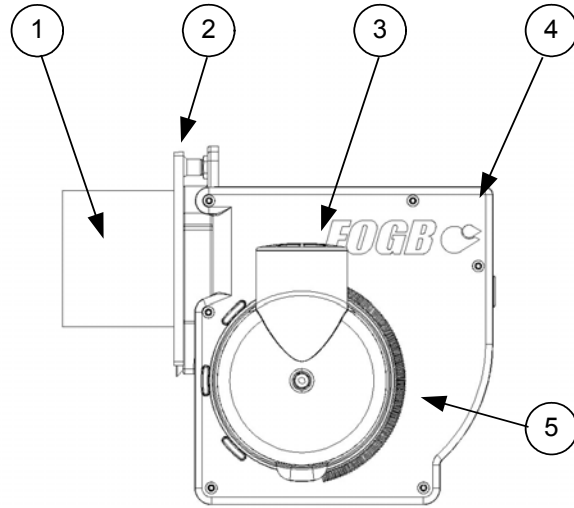


X400-1  
X400-2  
X500-1



# TECHNICAL SPECIFICATIONS

## Components



- ① Blast tube
- ② Mounting flange
- ③ Air intake
- ④ Fan housing
- ⑤ Air adjustment
- ⑥ Lockout reset button

- ⑦ Control box
- ⑧ Photocell
- ⑨ Ignition transformer
- ⑩ Fuel pump
- ⑪ Motor
- ⑫ Capacitor

- ⑬ Solenoid valve
- ⑭ HT leads
- ⑮ Ignition electrodes
- ⑯ Electrode holder
- ⑰ Nozzle
- ⑱ Nozzle assembly

# BURNER INSTALLATION

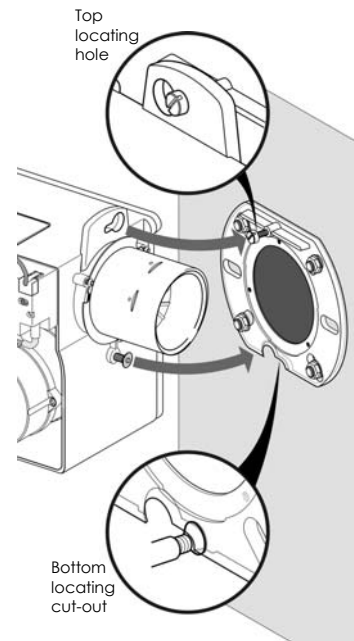
## Mounting onto the appliance

The burner is mounted onto the appliance by means of a removable 6-bolt flange.

The gasket needs to be put in place before the flange is fixed onto the appliance. The burner tube is then inserted through the centre hole.

With the burner rotated a few degrees clockwise the flange bolts will pass through the locating holes. When the burner is twisted into position the top bolt can then be tightened to secure the burner. If necessary the lower screw can be adjusted to give a more secure fixing.

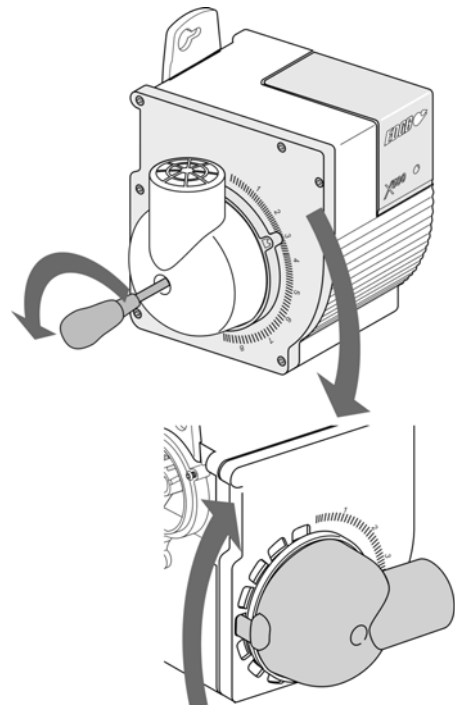
If required the burner can be mounted in any position. It is important though to ensure that the solenoid valve on the oil pump is not inclined below horizontal.



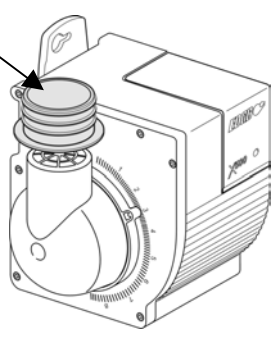
## Air Intake Device

The burner is supplied with an air intake device that can be rotated through 180° to allow the air to be taken from a position suitable within the appliance housing.

The intake has a 60mm diameter entry to allow a snorkel tube, as used on some balanced flue units, to be connected. There is a grill fitted to the entry that can be removed if required.



Tube Adapter



An intake adapter is available for applications equipped with 70mm diameter air tubes.

For the part number see pages 10 and 11 for details.

# BURNER INSTALLATION

## Electrical Connection

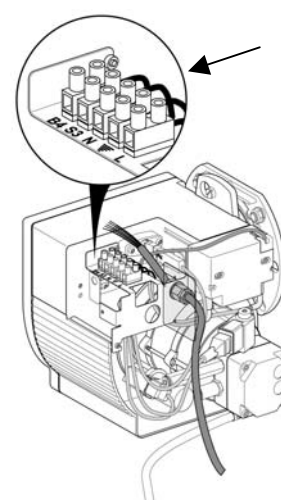
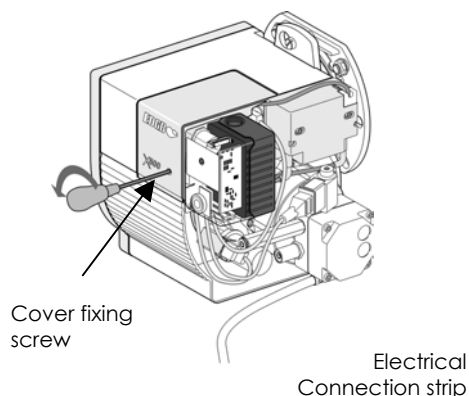
The electrical connections to this burner must be carried out by a suitably qualified engineer.

**All Electrical connections to the burner must be carried out in accordance with all current applicable IEE Wiring Regulations.**

All connections should be made according to the wiring diagram shown on the supplementary page - page 20 within the manual.

If the burner is fitted with a 7-pin socket and supplied with the matching plug then all connections therefore are made within the 7-pin plug.

To gain access to the electrical connection strip the cover must be removed by means of undoing the 3mm Allen screw. Once undone the cover can be removed exposing the connection strip.



## Fuel Supply

The burner is usually supplied for one-pipe operation but if required can be converted for a two-pipe system (see page 10 for details). When used in conjunction with a gravity feed supply the inlet pressure to the pump **MUST NOT** exceed 2 bar.

When using a two-pipe system the return line has to be fed back into the tank. Alternatively, a de-aeration device could be incorporated for ease of installation.

Oil lines must be completely air-tight and constructed in accordance with current standards.

The final connection to the oil pump must be made with the flexible oil line provided.

## Air Supply

Combustion air and ventilation requirements are detailed in BS5410:Part1. It requires that combustion air must be provided through purpose-made non-closeable openings, having a total free area of 550mm<sup>2</sup> per kW of the appliance maximum output rating above 5kW.



# BURNER OPERATION

## Before start-up

Check that the correct nozzle is fitted. Reference should be made to the instructions of the appliance manufacturers.

If the burner is firing Kerosene the nozzle must be sized for a maximum pump pressure of 10 bar (145 psi). If Gas Oil is being used then a smaller nozzle must be selected to allow a pump pressure of approx 14 bar (200 psi). This is necessary to give better fuel atomisation and therefore better combustion.

Fit a pressure gauge to the oil pump (as shown in the diagram below).

## Start-up procedure

Close the main switch and the thermostats to allow the burner to start up.

The burner motor and ignition transformer are both powered during the pre-purge period.

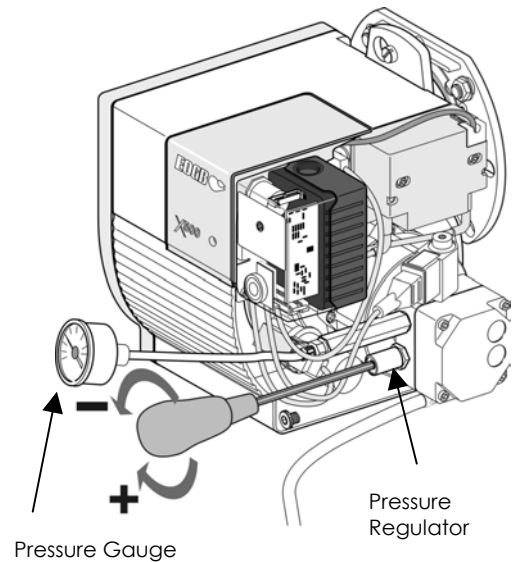
During pre-purge the oil pressure can be set, as the pressure will register before the solenoid valve is opened (see diagram). If necessary the oil supply can be de-aerated from the pump through the pressure gauge manifold.

During this pre-purge period checks are made for 'stray-light' onto the photocell and the integrity of the solenoid coil of the pump. If 'stray-light' is detected, or if the coil is faulty, then the coil will not receive full voltage and therefore will not release any fuel.

If checks are ok then power is fed to the solenoid coil and the valve will open. Fuel is then released to the nozzle. The spark will ignite the fuel spray.

If a flame is formed this will be detected by the photocell and the control box will turn off the ignition and assume normal run mode.

If a flame is not formed, or detected, then the control box will go to a lockout condition and the indicator lamp on the control box will be illuminated. The control box will need to be reset to enable the burner to re-attempt a start up.



## Normal operating mode

Check the oil pressure on the gauge and adjust if necessary for the required burner output.

From a suitable test point on the boiler, or in the flue, a smoke reading should be taken to ensure clean smoke-free combustion.

With the aid of a flue gas analyser, and by making adjustments to the air damper control, the combustion can be set for maximum efficiency (see diagram).

The air control rotates around a central fixing screw that passes through both the control device and air inlet housing. This spring loaded screw is pre-tensioned in the factory but if the adjustment appears too loose or tight then it can be pre-tensioned to suit.

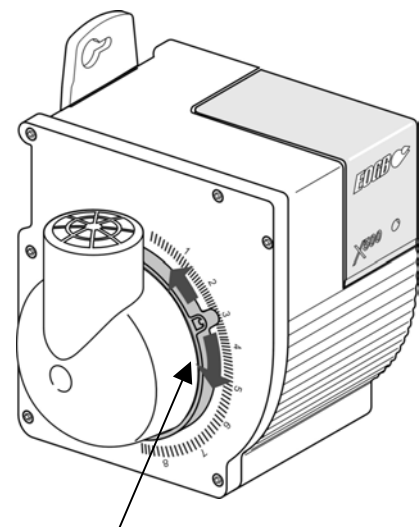
A CO<sub>2</sub> level of around 11.0% - 12.0% should be achievable.

If at any point during normal operating mode the photocell loses sight of the flame the control box will attempt to re-establish the flame. The oil valve will close and the ignition transformer will be powered. A pre-purge will be carried out before the valve is re-opened and the fuel is released. If successful the burner will continue in operating mode; if not the control box will go into lockout mode.

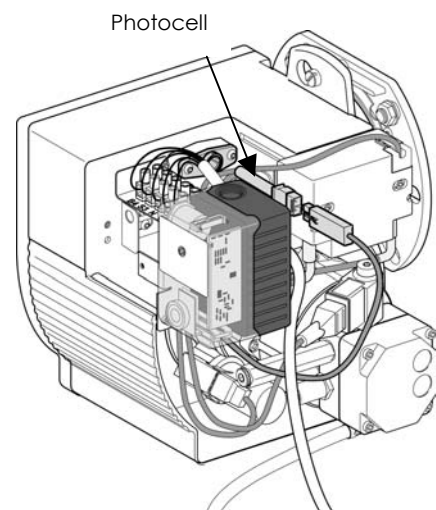
After commissioning a safety check must be carried out to ensure the correct operation of the flame detection.

During normal operation the photocell is to be removed and either covered with a clean rag to prevent any light from being sensed, or for the cell to be unplugged. As soon as this happens the burner will attempt to re-establish the flame

**IMPORTANT: The photocell side opening must be pointing at the flame for reliable operation.**



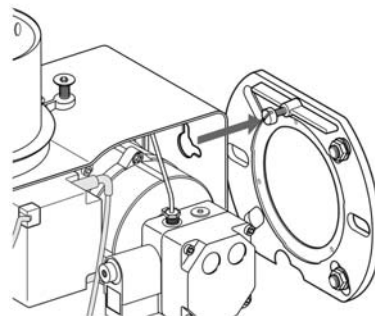
① Turn air control ①  
CLOCKWISE for MORE AIR  
or  
ANTI-CLOCKWISE for LESS AIR



## BURNER SERVICING

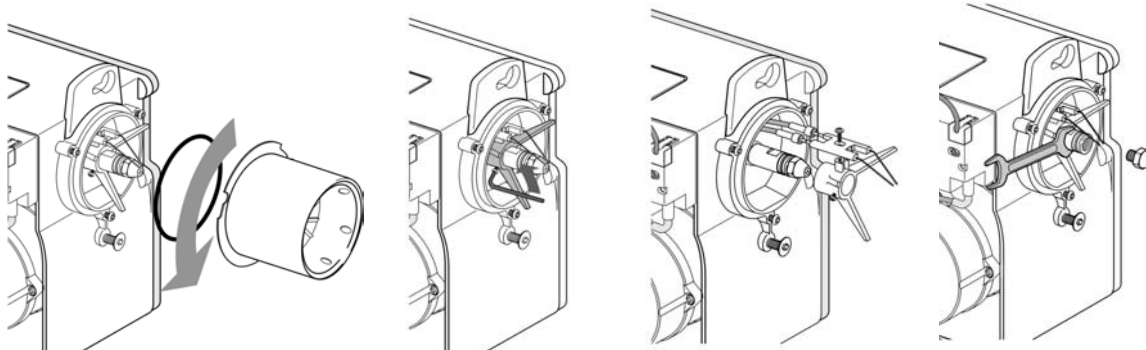
For ease of servicing and access to the burner components the burner has, on the bottom face, a keyhole cut-out. This allows the burner to be hung from the mounting flange in a more convenient position.

After loosening the fixing bolt the burner can be extracted from the flange, turned around and then the keyhole can be located onto the bolt.



The burner service requires that all of the components are cleaned and checked for correct operation, or signs of damage. A check must be carried out on all safety devices i.e. photocell, solenoid valves, etc. The nozzle should be replaced every 12 months, or sooner if worn or dirty. Filters and fuel lines must be inspected and replaced if necessary.

Below are a series of diagrams showing the removal of the combustion head components from the burner. This gives access for the nozzle to be replaced and the electrodes to be inspected. As shown below the electrode assembly is to be removed from the nozzle holder before the nozzle is replaced. This will prevent any accidental damage.

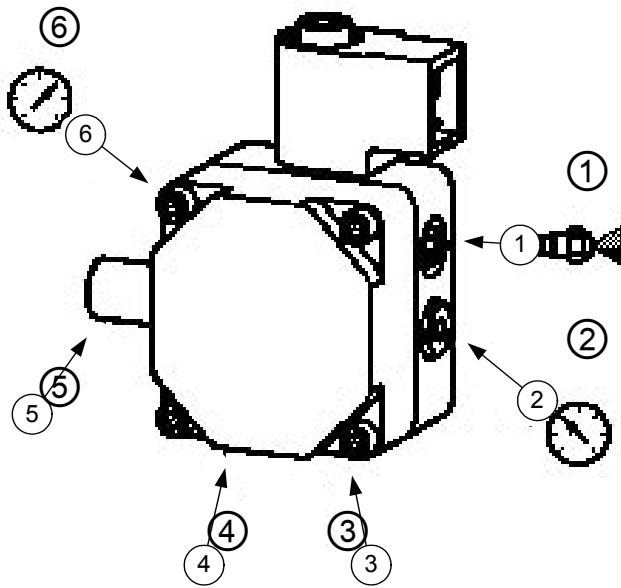


Once the burner has been re-fitted a smoke check and combustion analysis must be carried out. Once the burner has been commissioned on the appliance and all settings are correct the figures should then be recorded.

The burner and all other related equipment must be left in a safe and reliable working order.

# FUEL PUMP TYPE DANFOSS BFP11 L3

## Technical Data

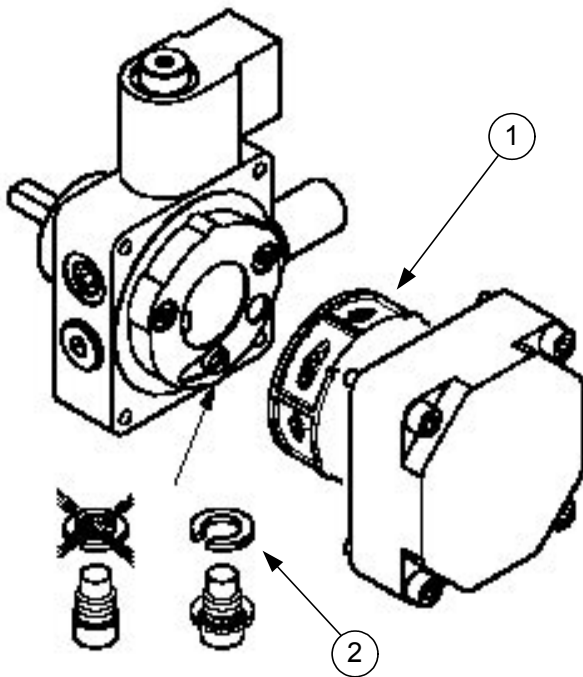


Oil Viscosity range: 1.3 – 12.0 cSt  
Pressure range: 7 – 15 bar  
Oil temperature: -10 - +70°C

- 1 - Nozzle port 1/8"
- 2 - Vacuum gauge port 1/8"
- 3 - Suction line port 1/4"
- 4 - Return line port 1/4"
- 5 - Pressure adjustment (4mm allen key)
- 6 - Pressure gauge port 1/8"

## 1 or 2 pipe operation

- 1 - Filter
- 2 - Bypass Washer



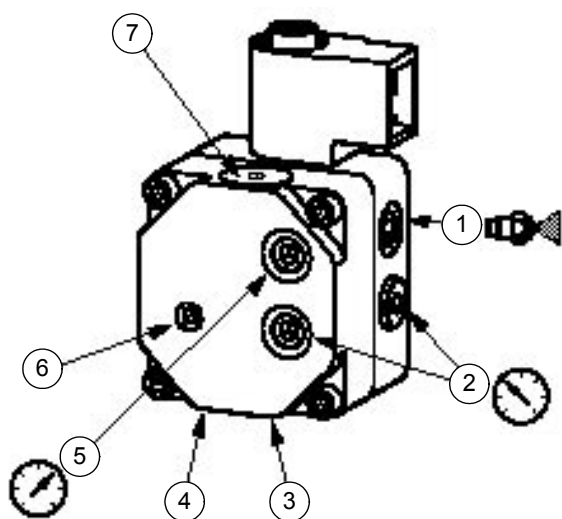
The fuel filter and bypass washer are located within the pump housing. By removing the 4 fixing screws the housing can be removed allowing access.

The bypass washer is located under the bottom of the 3 internal screws.

In case of one-pipe operation the horseshoe-shaped copper washer will be mounted under the screw head, and in case of two-pipe operation, the horseshoe-shaped copper washer will be removed.

# FUEL PUMP TYPE DANFOSS BFP21 L3

## Technical Data

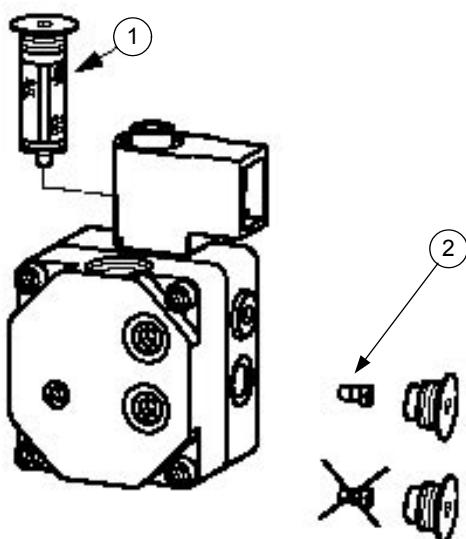


Oil Viscosity range: 1.3 – 12.0 cSt  
Pressure range: 7 – 15 bar  
Oil temperature: -10 - +70°C

- 1 - Nozzle port 1/8"
- 2 - Vacuum gauge port 1/8"
- 3 - Suction line port 1/4"
- 4 - Return line port 1/4"
- 5 - Pressure gauge port 1/8"
- 6 - Pressure adjustment (4mm allen key)
- 7 - Filter

## 1 or 2 pipe operation

- 1 - Filter
- 2 - Bypass plug



The fuel filter is located within the pump housing in front of the solenoid valve. By unscrewing the filter it can then be removed by lifting out.

The bypass plug is located inside the vacuum gauge port.

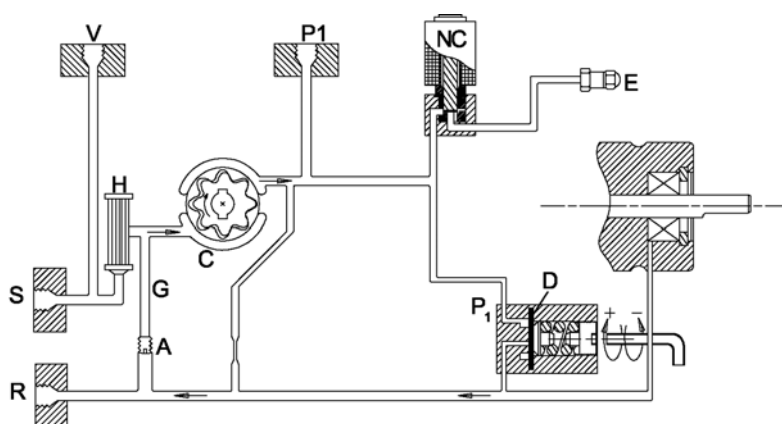
In the case of one-pipe operation the bypass plug should be removed and in the case of two-pipe operation, the plug should be fitted.

## FUEL PUMP TYPE DANFOSS BFP....

### Function

As the oil pump turns it draws oil from the suction line connection **S**, through the filter **H** and into the suction side of the gear set **C**. Any suction generated before the gear set can be measured with an appropriate vacuum gauge at connection **V**.

The gear set then pumps the oil through and puts it under pressure. The pressure is measured at connection **P1**. No oil will be released to the nozzle port **E** until the normally closed solenoid valve **NC** is opened.



The pressure is controlled and kept constant by means of the diaphragm **D** behind the pressure regulator **P1**. The pressure regulator **P1** distributes the oil quantity supplied by the gear set between the nozzle port **E** and the return side of the pump **R**.

The oil quantity supplied is determined by the setting of the pressure regulator **P1** and the size of the oil nozzle in the nozzle line **E**.

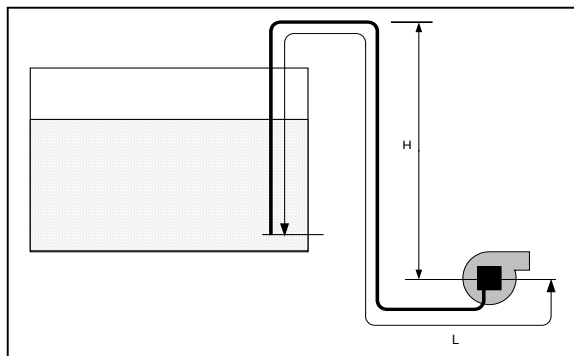
When the opening pressure has been reached, the passage to the return side of **P1** opens. The diaphragm and the spring keep the pump pressure constant at the set value.

When used in a one-pipe installation connection **R** is closed and **A** must be removed to allow internal recirculation of the fuel. If **A** is not opened then damage to the pump seals will occur.

If a two-pipe system is required then a return line must be fitted into connection **R** and **A** must be fitted to divert the recirculating oil out through the return line.

# OIL SUPPLY LINE TABLES

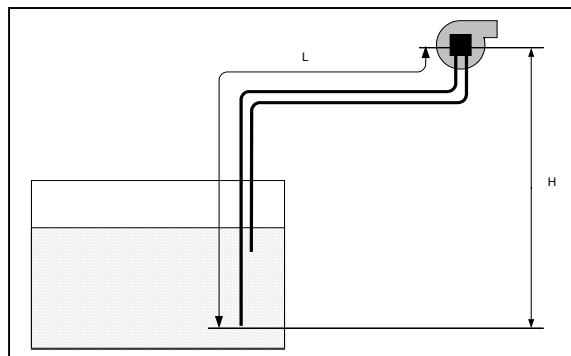
## One-pipe system



### Kerosene 2.15 mm<sup>2</sup>/s (cSt)

H m	Ø4 mm	Ø5 mm	Ø6 mm	Ø5 mm	Ø6 mm	Ø8 mm
4.0	66	100	100	33	80	100
3.5	57	100	100	29	70	100
3.0	49	100	100	25	60	100
2.5	41	100	100	20	50	100
2.0	33	80	100	16	40	83
1.5	25	60	100	12	30	62
1.0	16	40	83	8	20	41
0.5	8	20	41	4	10	20
Nozzle capacity	5.0 kg/h			10.0 kg/h		

## Two-pipe system



### Kerosene 2.15 mm<sup>2</sup>/s (cSt)

H m	Ø6 mm	Ø8 mm	Ø10 mm
-0.0	54	100	100
-0.5	48	100	100
-1.0	42	100	100
-1.5	36	100	100
-2.0	30	94	100
-2.5	24	75	100
-3.0	18	55	100
-3.5	11	36	88
-4.0	5	16	40

### Gas Oil 6.00 mm<sup>2</sup>/s (cSt)

H m	Ø4 mm	Ø5 mm	Ø6 mm	Ø5 mm	Ø6 mm	Ø8 mm
4.0	26	60	100	31	62	100
3.5	22	51	100	27	55	100
3.0	19	44	94	23	47	100
2.5	16	37	78	20	39	100
2.0	13	30	62	16	31	98
1.5	10	22	47	12	23	74
1.0	6	15	31	8	15	49
0.5	3	7	15	4	7	24
Nozzle capacity	5.0 kg/h			10.0 kg/h		

### Gas Oil 6.0 mm<sup>2</sup>/s (cSt)

H m	Ø6 mm	Ø8 mm	Ø10 mm
-0.0	17	53	100
-0.5	15	47	100
-1.0	13	41	99
-1.5	11	34	84
-2.0	9	28	68
-2.5	7	22	53
-3.0	5	15	37
-3.5	—	9	22
-4.0	—	—	6

These tables are shown merely as guidance for the suitability of the oil supply line installation. The typical pipe system used for the calculations comprises – 1 x check valve, 1 x cut off valve, 1 x in-line filter and 4 x 90° elbows



# NOZZLE TABLE

Pump Pressure - bar

Gph	8		9		10		11		13		14		15	
	kg/h	Mcal/h	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW
0,40	1,33	16	13	14	1,49	18	15	16	1,63	19	17	1,76	21	18
0,50	1,66	20	17	18	1,86	22	19	20	2,04	24	21	2,20	26	22
0,60	2,00	24	20	22	2,23	26	23	24	2,45	29	25	2,64	31	27
0,65	2,16	26	22	23	2,42	29	25	26	2,65	31	27	2,86	34	29
0,75	2,49	29	25	27	2,79	33	28	30	3,08	36	31	3,30	39	34
0,85	2,83	33	29	31	3,16	37	32	34	3,47	41	35	3,74	44	38
1,00	3,33	39	34	36	3,72	44	38	40	4,08	48	42	4,40	52	45
1,10	3,66	43	37	38	4,09	48	42	44	4,48	53	46	4,84	57	49
1,20	3,99	47	41	43	4,47	53	46	48	4,89	58	50	5,29	63	54
1,25	4,16	49	42	45	4,65	55	47	50	5,10	60	52	5,51	65	56
1,35	4,49	53	46	48	5,02	59	51	54	5,50	65	56	5,95	70	61
1,50	4,98	59	51	54	5,58	66	57	60	6,11	72	62	6,60	78	67
1,65	5,49	65	56	59	6,14	73	63	66	6,73	80	69	7,27	86	74
1,75	5,82	69	59	63	6,51	77	66	70	7,14	85	73	7,71	91	79
2,00	6,65	79	68	72	7,45	88	76	80	8,18	97	83	8,81	104	90
2,25	7,49	89	76	81	8,38	99	85	89	9,18	109	94	9,91	117	101
2,50	8,32	99	85	90	9,31	110	95	99	10,19	121	104	11,01	130	112
2,75	9,15	108	93	99	10,24	121	104	109	11,21	133	114	12,11	144	123
3,00	9,98	118	102	108	11,16	132	114	119	12,23	145	125	13,21	157	135
3,50	11,65	138	119	126	13,03	154	133	139	14,27	169	145	15,42	183	157
4,00	13,31	158	136	144	14,89	176	152	159	16,31	193	166	17,62	209	180
4,50	14,97	177	153	162	16,75	198	171	179	18,35	217	187	19,82	235	202
5,00	16,64	197	170	180	18,62	221	190	199	20,39	242	208	22,03	261	225
5,50	18,30	217	187	198	20,48	243	209	219	22,43	266	229	24,23	287	247
6,00	19,97	237	204	216	22,34	265	228	239	24,47	290	249	26,43	313	269
6,50	21,63	256	220	234	24,20	287	247	259	26,51	314	270	28,63	339	292
7,00	23,29	276	237	252	26,06	309	266	279	28,55	338	291	30,84	366	314
7,50	24,96	296	254	270	27,92	331	285	298	30,59	363	312	33,04	392	337
8,00	26,62	316	271	288	29,79	353	304	318	32,63	387	333	35,25	418	359
8,50	28,28	335	288	306	31,65	375	323	338	34,66	411	353	37,45	444	382
9,00	29,95	355	305	324	33,59	398	342	358	36,71	435	374	39,65	470	404

Nozzle capacity – usg/h

Figures shown are for an oil of Viscosity 4.4mm<sup>2</sup>/s (cSt), Density 830 kg/cm<sup>3</sup>.



## FAULT FINDING

Below is a list of some scenarios that may lead to a failure causing the burner to go into lockout mode. There are also some relevant tests and solutions to hopefully overcome any problem that may occur.

Push the reset button to re-start the burner. If the burner then functions correctly the control has simply responded to a temporary fault. If the burner still fails then a further investigation will be required to correct any fault.

Fault	Probable cause	Useful Test	Solution
The burner will not start	1) Lack of voltage.	1) If there is 240V onto terminal 9 of the control box but it is not responding then the box is at fault. 2) If there is no voltage onto terminal 9 then there is an external fault.	1) Replace control box.  2) Check any thermostats, switches, fuses, etc to trace fault.
The burner starts but no flame is present and the burner goes to lockout	1) No fuel to burner.  2) No fuel to the nozzle. a) No voltage to solenoid coil  b) Voltage to coil but not energizing. c) Coil energized but no oil at pump outlet. d) Oil at pump outlet but none through the nozzle. 3) No spark	1) Check if there is oil present at the pump inlet  2) a) i) Cover photocell. If burner fires up ok then photocell must be detecting a light source during pre-purge. ii) If there is still no flame disconnect photocell. If now ok then cell must be faulty.  3) Check electrodes, HT leads and voltage to igniter. If all ok then igniter is faulty.	1) Check fuel tank, valves, etc for problems.  2) a) i) Identify source, spark, etc and remedy.  ii) Replace photocell  b) Replace coil.  c) Check valve opening. Replace if necessary. d) Replace nozzle, or check line for blockage.  3) Replace igniter.
The burner starts, a flame is established but the burner goes to lockout	1) Check burner wiring.  2) Flame recognition.	2) Expose photocell to good ambient (or torch) light. a) If the problem disappears then the problem is with the flame picture b) If the problem does not disappear then the photocell must be at fault	1) Remedy wiring connections. 2)  a) Reset combustion.  b) Replace photocell.

Flame is pulsating	1) Faulty or dirty nozzle 2) Excessive flue draught.	2) Measure draught.	1) Replace nozzle. 2) Reset combustion or adjust draught stabilizer (if fitted).
Smoking Flame	1) Faulty nozzle. 2) Combustion not set correctly. 3) Insufficient air. 4) Fuel pressure too low	2) Check combustion. 3) Check combustion. 4) Check fuel pressure.	1) Replace nozzle. 2) Reset combustion 3) Increase air setting. Check ventilation. 4) Increase fuel pressure.
Burner keeps bringing ignition back on	1) Flame recognition.  2) Low sulphur fuel.	1) Expose photocell to good ambient (or torch) light. a) If the problem disappears then the problem is with the flame picture b) If the problem does not disappear then the photocell must be at fault 2) As above.	1)  a) Reset combustion.  b) Replace photocell.  2) Reset combustion to give a higher CO <sub>2</sub> level.

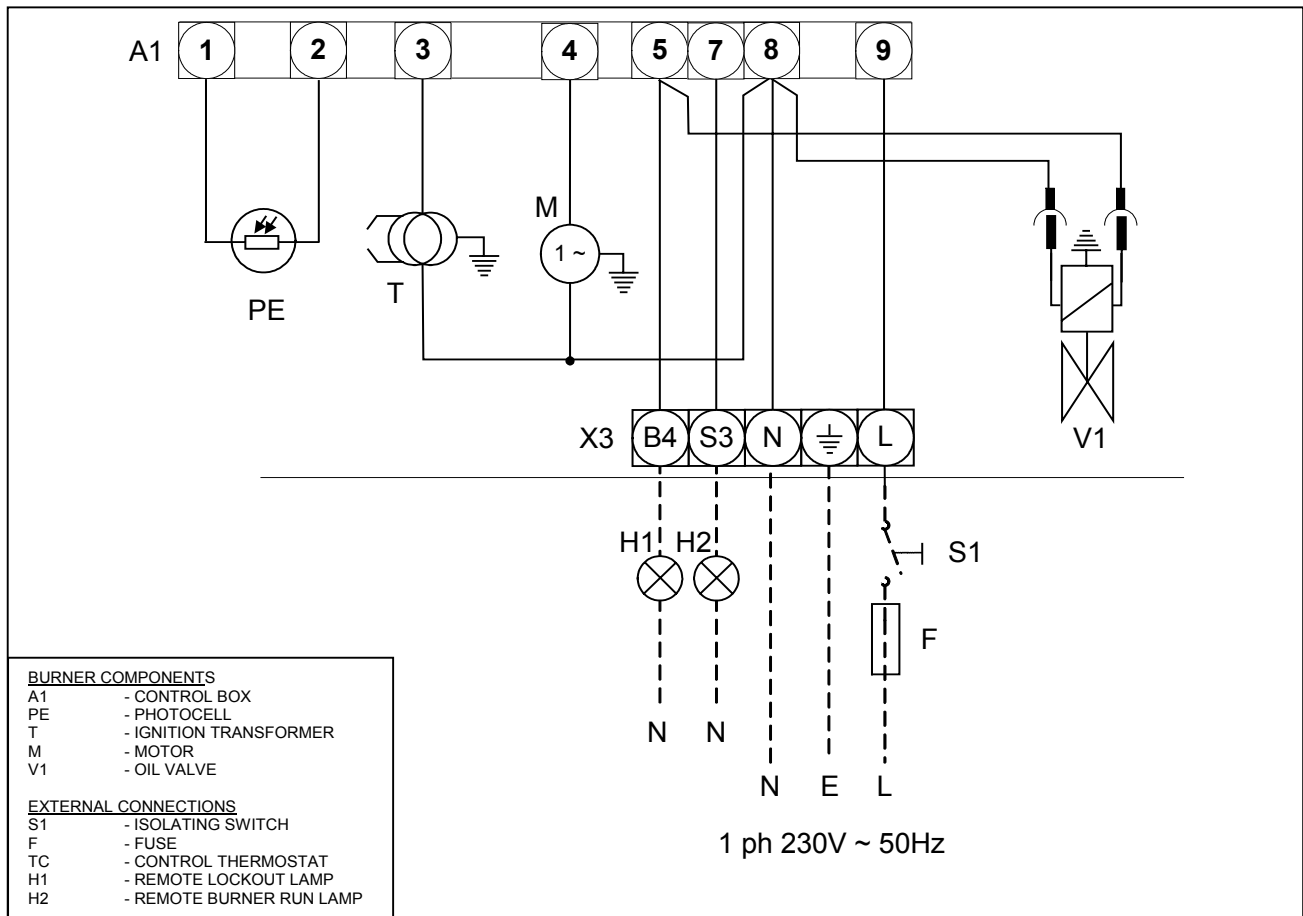
Please note: The information given above is provided to assist the engineer with any problems they may encounter. This is not a definitive list.

If further problems are encountered then please contact EOGB Energy Products Ltd for advice.

**Technical Helpline – Tel: 08703 899499**

# ELECTRICAL INFORMATION

**Fig B1 Wiring Diagram – (E03-002)**



## Technical Data

Burner Control	TF830.3
Operating voltage	220/240 V (-15% - +10%) 50 Hz
Fuse rating	10 A fast, 6 A slow
Power consumption	5 VA
Pre-purge time	12 sec
Pre-ignition time	12 sec
Post ignition time	20 sec
Lockout safety time	10 sec
Reset time from lockout	90 sec
Flame detector	MZ770S
Light sensitivity	>6 Lux
Sensor operating current	min. 30µA
Protection class	IP44
Ambient temperature	0°C ..... +60°C
Approval standard	EN 230



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