



Providing sustainable energy solutions worldwide

Installation- and maintenance instruction  
**BF1 RME**



## Table of contents

<b>GENERAL</b>	
<b>1. GENERAL INSTRUCTIONS</b>	<b>4</b>
1.2 Manual	4
1.3 Safety directions	4
1.1 General rules	4
1.1 Model BF1 FUV 63-16	6
1.1.1 Burner output/ Basic settings	6
1.2 Model BF1 KV 76-26	7
1.2.1 Burner output/ Basic settings	7
<b>2. TECHNICAL DATA</b>	<b>8</b>
2.1 Dimensions BF1	8
2.1.1 Dimensions, flanges	8
2.2 Recommended nozzles and pressures	9
2.3 Nozzle table, 8-15 bar	9
2.3.1 Burner with preheater	9
2.4 Description	10
2.4.1 Components	11
<b>3. INSTALLATION</b>	<b>12</b>
3.1 Delivery checks	12
3.2 Preparations for installation	12
3.3 Oil supply	12
3.4 Electrical connection	12
3.5 Choice of nozzle	12
3.6 Brake plate and airflow setting	12
3.7 Burner installation	13
3.7.1 Hole pattern	13
3.7.2 Burner installation	13
3.7.3 Oil pipes	13
3.7.4 Electrical connection	13
<b>4. BASIC SETTINGS</b>	<b>14</b>
4.1 Example of basic setting	14
4.1.1 Choice of nozzle	14
4.1.2 Basic setting	14
4.1.3 Nozzle assembly adjustment	15
4.1.4 Air intake adjustment	15
4.1.5 Method of adjusting air quantity	15
4.1.6 Inlet cone, air adjustment	15
4.1.7 Air intake rotation	16
4.1.8 Air duct	16
<b>5. BURNER SERVICING</b>	<b>17</b>
5.1 Warning	17
5.1.1 Service position	17
5.1.1.1 Service position 1	17
5.1.1.2 Service position 2	17
5.1.1.3 Service position 3	18
5.1.2 Combustion assembly service	18
5.1.3 Preheater replacement	19
5.1.4 Oil pump replacement	20
5.1.5 Fan motor replacement	21
5.1.6 Air intake and intake cone service	22
5.1.7 Fan wheel checks	22
5.1.7.1 Inspection	22
5.1.7.2 Cleaning, alternative 1	23
5.1.7.3 Cleaning, alternative 2	24
5.1.8 Electrical module	24
5.1.8.1 Replacement of complete electrical package	25
5.1.8.2 Replacement of individual electrical components	25
<b>6. PUMP INSTRUCTIONS</b>	<b>26</b>
6.1 Suntec ANV47C	26
6.1.1 Technical data	26
6.1.2 Components	26
6.1.3 Filter replacement	27
6.1.4 One-pipe system	27
6.1.5 Two-pipe system	27
6.1.6 Solenoid valve	27
6.1.7 Function ANV47C	28
6.1.8 Suction pipe tables ANV47C	29
6.1.8.1 Overhead Tank	29
6.1.8.2 Underlying Tank	29
<b>7. PREHEATER</b>	<b>30</b>
7.1.1 Function FPHE 5	30
<b>8. ELECTRICAL EQUIPMENT</b>	
<b>LMO1..2..4..</b>	<b>31</b>
8.1 Wiring diagram	31
8.1.1 Component list	32
8.1.2 Function LMO1..2..4..	32
8.1.3 Technical data	33
8.1.4 Colour codes LMO14/24	34
8.1.5 Fault codes LMO14/24	34
<b>9. FAULT LOCATION</b>	<b>35</b>
9.1 Burner will not start	35
9.2 Burner will not start after normal use	35
9.3 Delayed ignition, burner starts; pulsation	35
<b>10. DECLARATION OF CONFORMITY</b>	<b>36</b>
<b>11. OIL BURNERS MAINTENANCE INSTRUCTIONS</b>	<b>37</b>

# 1. GENERAL INSTRUCTIONS

## 1.2 Manual

- The contents of this manual are to be observed by all who work for any reason on the unit and its appertaining system parts.
- This manual is intended especially for authorised personnel.
- This manual is to be regarded as part of the burner and shall always be available near the place of installation.

## 1.3 Safety directions

The electrical installation shall be made according to valid regulations for heavy current and in a professional way, so that the risk of leaking oil, fire or personal injury is avoided.

Care should be taken by the installer to ensure that no electrical cables or fuel/gas pipes are trapped or damaged during installation or service/ maintenance.

## 1.1 General rules

This is a burner designed for FAME (RME) fuel. The fuel must meet the requirements of standard EN 14214 for FAME. The equipment on the burner is, however, of such a quality that it is possible to use EO1 type oil without modification, although with appropriate adjustments to the combustion values after each change of fuel type.

The installation of an oil burner should be carried out in accordance with local regulations. The installer of the burner must therefore be aware of all regulations relating to oil and combustion.

Only oil suitable for the burner must be used and then in combination with a suitable oil filter designed for FAME (RME) and installed before the burner's oil pump.

If the burner is replacing an existing burner, ensure that the oil filter is changed to a filter designed for FAME (RME). Installation may only be performed by qualified personnel.

Care should be taken by the installer to ensure that no electrical cables or fuel/gas pipes are trapped or damaged during installation or service/ maintenance.

Burners which are fuelled by FAME (RME) are and must be equipped with parts designed for this fuel. This applies in particular to oil-related parts such as the pump, solenoid valve, oil filter and hoses. It is very important when carrying out a service to replace old parts with new parts of the same quality.

## Adjustment of burner

The burner is from the factory preset to an average value that must then be adjusted to the boiler in question.

All burner adjustments must be made in accordance with boiler manufacturers instructions. These must include the checking of flue gas temperatures, average water temperature and CO<sub>2</sub> or O<sub>2</sub> concentration.

To adjust the combustion device, start by increasing the air volume and the nozzle assembly somewhat. When the burner starts it is burning with excess air and smoke number 0. Reduce the nozzle assembly adjustment until soot occurs, and then increase the adjustment to make the soot disappear again. Then the volume of air is reduced until soot occurs and increased again to reach a combustion free of soot.

By this procedure an optimum adjustment is obtained. If larger nozzles are used the preadjustment of both the air volume and the nozzle assembly must be increased.

A whistling sound may be heard which can be eliminated or reduced as follows: Increase the nozzle assembly adjustment somewhat. The CO<sub>2</sub>-content and consequently the air volume will then be reduced.

## Condensation in chimney

A modern burner works with less excess air and often also with smaller nozzles than older models. This increases the efficiency but also the risk of condensation in the chimney. The risk increases if the area of the chimney flue is too large. The temperature of the flue gases should exceed 60°C measured 0,5 metres from the chimney top.

- Measures to raise the temperature:
- Insulate the chimney in cold attics
- Install a tube in the chimney
- Install a draught regulator (dilutes the flue gases during operation and dries them up during standstill)
- Increase the oil quantity
- Raise the flue gas temperature by removing turbulators, if any, in the boiler.

## Pump adjustment

See separate description.

## Maintenance

The boiler/burner should be examined regularly for any signs of malfunction or oil leakage. Any boiler/burner that uses FAME (RME) as fuel must be serviced at least twice a year.

## Installation instructions

General installation instructions accompany the burner and should be left in a prominent place adjacent to the burner.

## Oil supply

The oil line should be dimensioned in accordance with the pump manufacturer's instruction. A filter designed for FAME (RME) that prevents any particles in the oil from reaching the burner is mounted in the burner's suction pipe. If the installation consists of several burners each one should have its own suction line from the tank or a circulation system should be used.

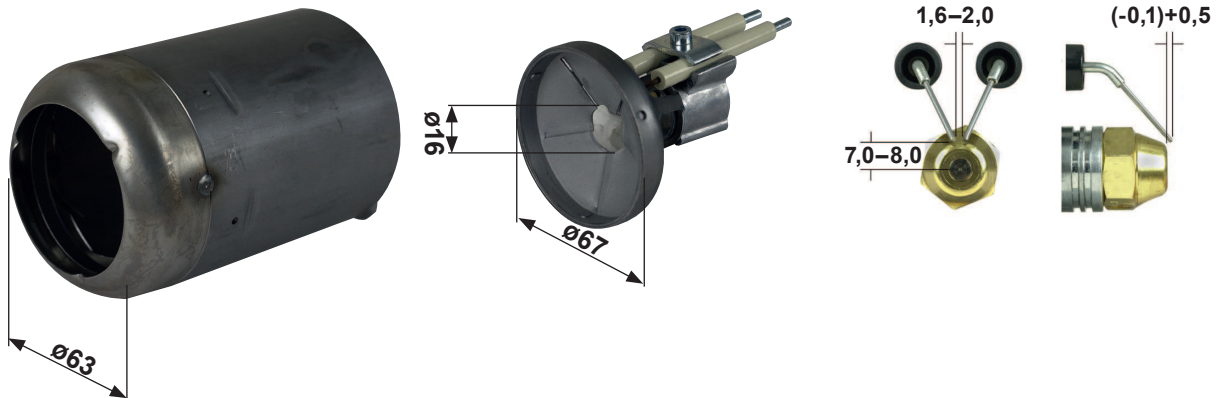
The temperature in the oil line should be kept as constant as possible. Avoid exposing the line to excessive cold which may cause blockages.

The oil pipe and electric cable should be fitted so that the burner can be placed on the floor for inspection of the combustion device.

Oil hoses must be of a quality designed for FAME (RME).

**Detailed ecodesign information can be downloaded at:**  
**[www.bentone.com/ecodesign](http://www.bentone.com/ecodesign)**

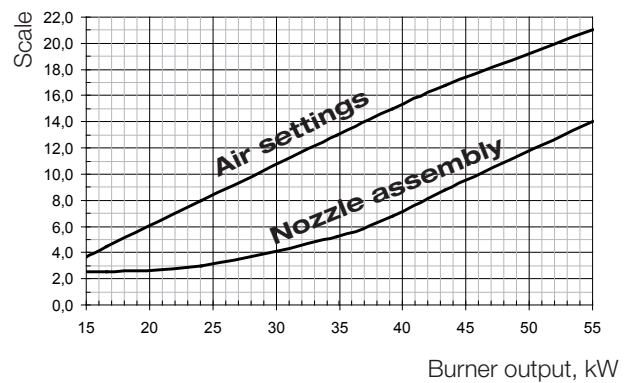
## 1.1 Model BF1 FUV 63-16



Length of blast tube	Protrusion from flange, measurement B			
	Flange			
	1	2	3	4
103	68	81	89	88
133	98	111	119	118
183	148	161	169	168

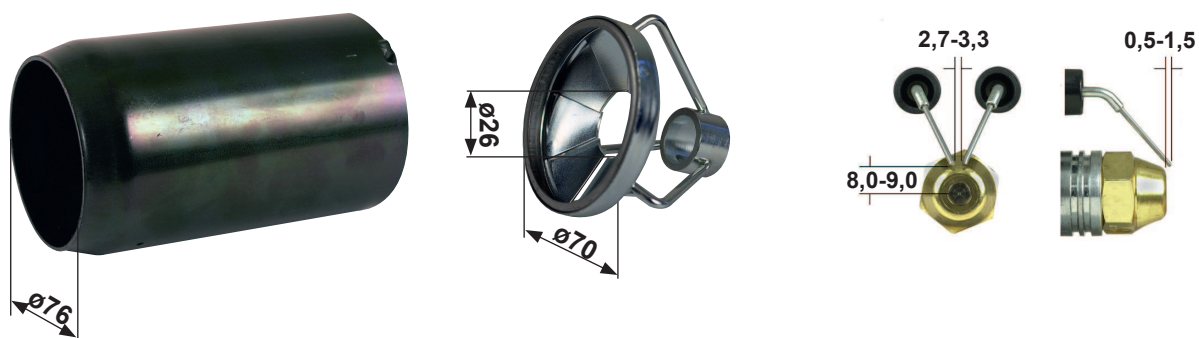
### 1.1.1 Burner output/ Basic settings

1,3 - 4,6 kg/h  
15 - 55 kW



Scale value applies to 0 mbar furnace pressure.

## 1.2 Model BF1 KV 76-26

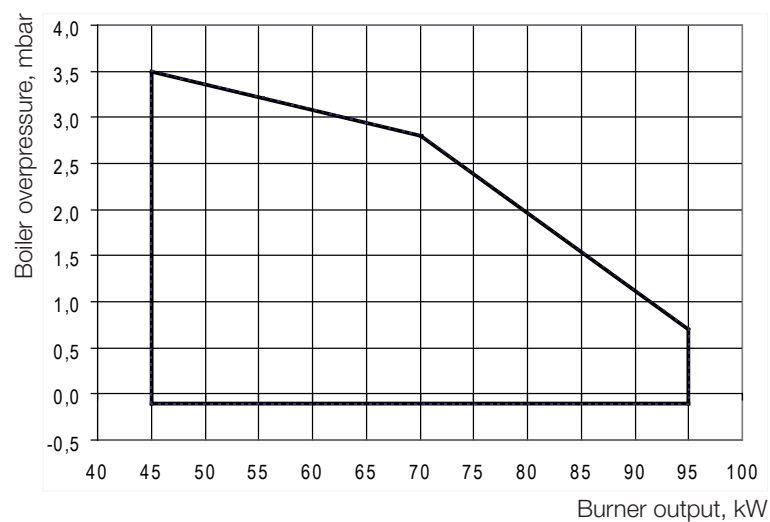


Length of blast tube	Protrusion from flange, measurement B			
	Flange			
	1	2	3	4
117	82	95	103	102
147	112	125	133	132
197	162	175	183	182

### 1.2.1 Burner output/ Basic settings

3,8 - 8,0 kg/h

25 - 75 kW

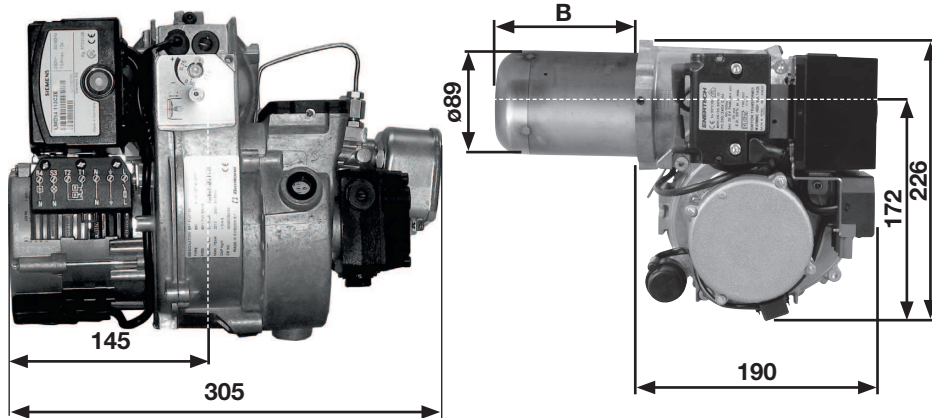


Scale value applies to 0 mbar furnace pressure.



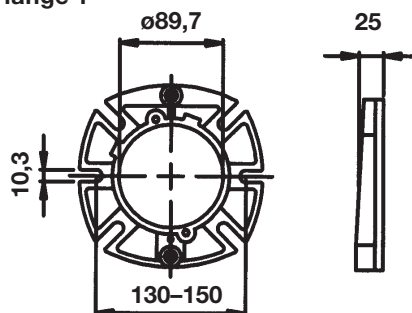
## 2. TECHNICAL DATA

### 2.1 Dimensions BF1

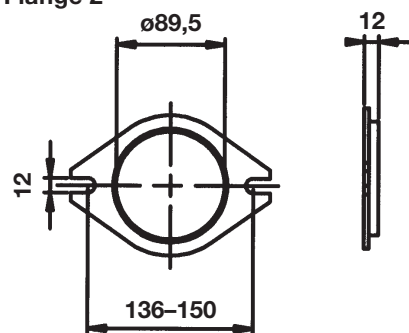


#### 2.1.1 Dimensions, flanges

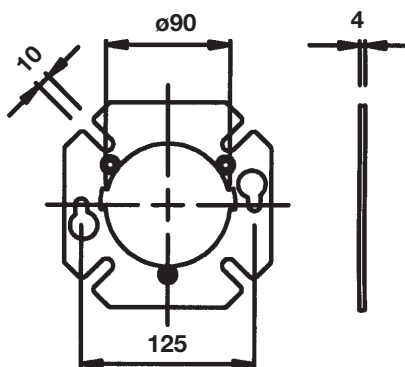
Flange 1



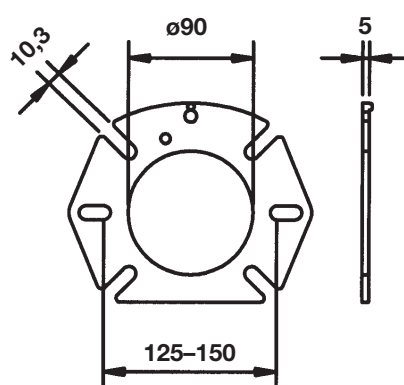
Flange 2



Flange 3



Flange 4



Scale value applies to 0 mbar furnace pressure.



## 2.2 Recommended nozzles and pressures

Because of the different types of boiler in existence, with varying furnace geometries and furnace loads, it is not possible to commit to any given spray angle or spray pattern. Note that spray angles and spray patterns change with pump pressures.

Nozzle	60° Solid/Hollow cone
	80° Solid/Hollow cone
Pump pressure	10 bar (8–14 bar) Fuel oil 1, RME
Kerosene	

## 2.3 Nozzle table, 8-15 bar

Pump pressure, bar																
Gph	8		9		10		11		12		13		14		15	
	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW
0,40	1,33	16	1,41	17	1,49	18	1,56	18	1,63	19	1,70	20	1,76	21	1,82	21
0,50	1,66	20	1,76	21	1,86	22	1,95	23	2,04	24	2,12	25	2,20	26	2,28	27
0,60	2,00	24	2,12	25	2,23	26	2,34	28	2,45	29	2,55	30	2,64	31	2,73	32
0,65	2,16	26	2,29	27	2,42	29	2,54	30	2,65	31	2,75	33	2,86	34	2,96	35
0,75	2,49	29	2,65	31	2,79	33	2,93	35	3,08	36	3,18	38	3,30	39	3,42	40
0,85	2,83	33	3,00	36	3,16	37	3,32	39	3,47	41	3,61	43	3,74	44	3,87	46
1,00	3,33	39	3,53	42	3,72	44	3,90	46	4,08	48	4,24	50	4,40	52	4,56	54
1,10	3,66	43	3,88	46	4,09	48	4,29	51	4,48	53	4,67	55	4,84	57	5,01	59
1,20	3,99	47	4,24	50	4,47	53	4,68	55	4,89	58	5,09	60	5,29	63	5,47	65
1,25	4,16	49	4,40	52	4,65	55	4,88	58	5,10	60	5,30	63	5,51	65	5,70	68
1,35	4,49	53	4,76	56	5,02	59	5,27	62	5,50	65	5,73	68	5,95	70	6,15	73
1,50	4,98	59	5,29	63	5,58	66	5,85	69	6,11	72	6,36	75	6,60	78	6,83	81
1,65	5,49	65	5,82	69	6,14	73	6,44	76	6,73	80	7,00	83	7,27	86	7,52	89
1,75	5,82	69	6,18	73	6,51	77	6,83	81	7,14	85	7,42	88	7,71	91	7,97	94
2,00	6,65	79	7,06	84	7,45	88	7,81	93	8,18	97	8,49	101	8,81	104	9,12	108
2,25	7,49	89	7,94	94	8,38	99	8,78	104	9,18	109	9,55	113	9,91	117	10,26	122

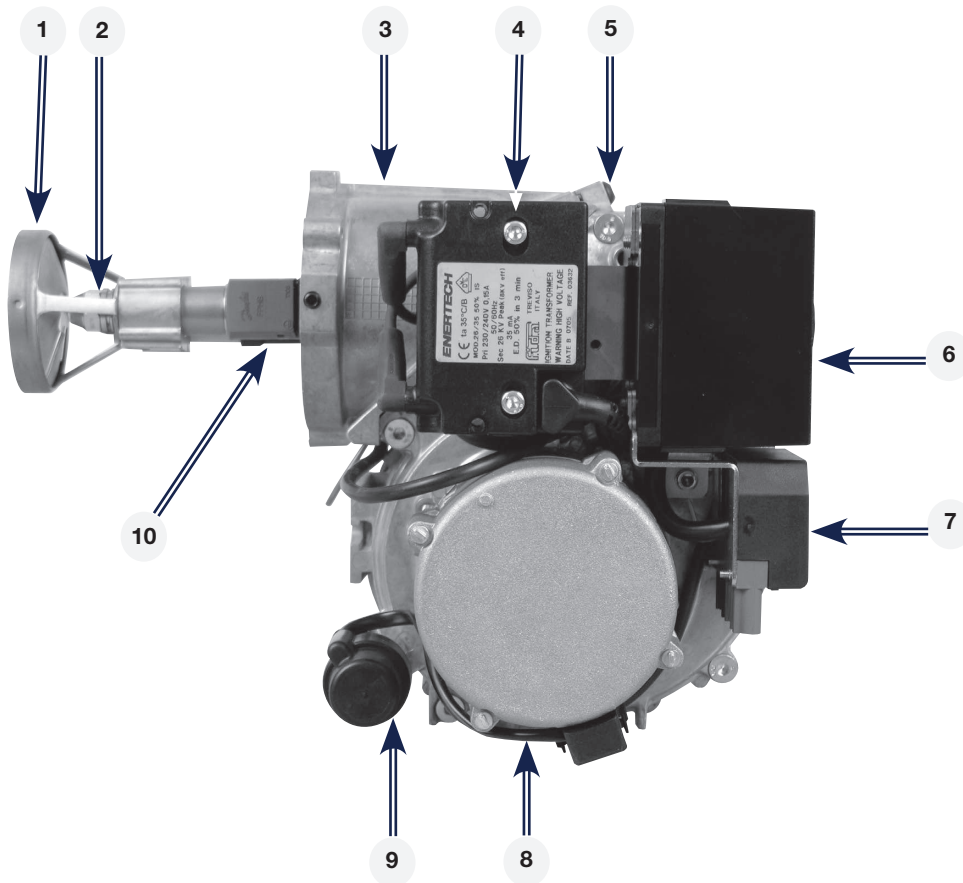
The table applies to oils with a viscosity of 4.4 mm<sup>2</sup>/s (cSt) at a density of 830 kg/m<sup>3</sup>.

### 2.3.1 Burner with preheater

Allow for a reduction in oil quantity of 5–20% with preheating owing to:

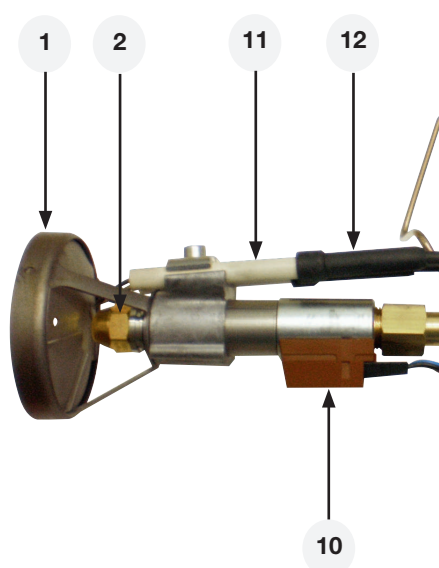
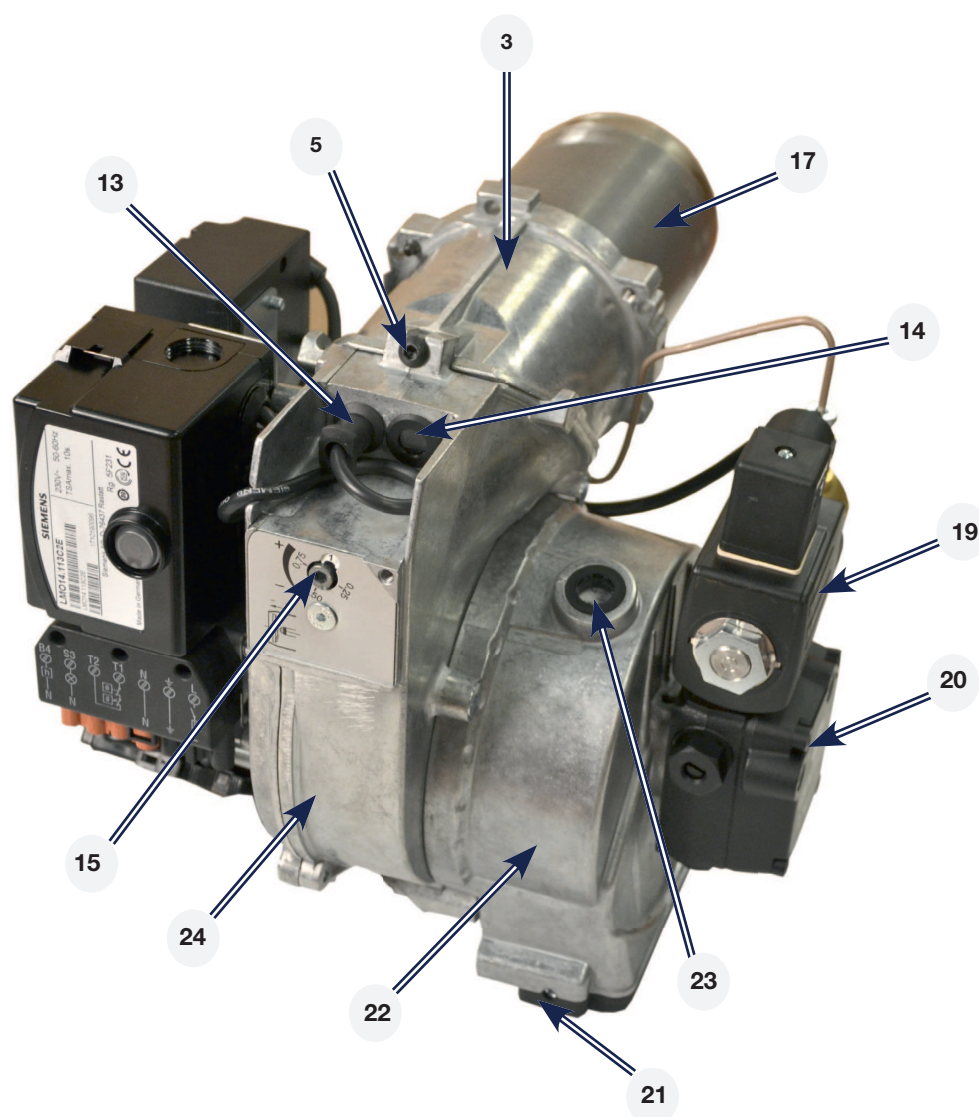
- Temperature increases at the nozzle.
- Nozzle design.
- Capacity (the higher the capacity the lower the difference).

## 2.4 Description



### 2.4.1 Components

- |  |                                |
|--|--------------------------------|
| 1. Brake plate                                     | 13. Photoresistor              |
| 2. Nozzle  | 14. Inspection glass           |
| 3. Fan housing, front                              | 15. Nozzle assembly adjustment |
| 4. Ignition transformer                            | 16.                            |
| 5. Separating screw                                | 17. Blast tube                 |
| 6. Oil burner control                              | 18. Grid                       |
| 7. Electrical contact X3 (refer to wiring diagram) | 19. Solenoid valve             |
| 8. Motor   | 20. Oil pump                   |
| 9. Capacitor                                       | 21. Air regulator              |
| 10. Preheater, where fitted                        | 22. Air intake                 |
| 11. Ignition electrode                             | 23. Air flow indicator         |
| 12. Ignition cable                                 | 24. Fan housing, rear          |



## 3. INSTALLATION

### 3.1 Delivery checks

Check that everything has been delivered and that the goods are not transport damaged. Any delivery faults must be reported to the supplier. Transport damage must be reported to the forwarder.

### 3.2 Preparations for installation

Check that the burner's measurements and capacity range is suitable for the boiler in question. The power information on the data plate refers to the burner's max. and min. power.

### 3.3 Oil supply

In order to achieve good operational reliability it is important that the oil supply system is laid out correctly.

Observe the following:

- Choice of pipe diameters, pipe lengths and height differences (refer to pump instructions).
- Piping should be run with a minimum of joints/compression fittings.
- Pipework must be laid out so that oil hoses are not subjected to tension or overbending when the burner is swung out or removed for service.
- The oil filter should be installed so that the filter cartridge can easily be replaced

### 3.4 Electrical connection

Before electrical installation is begun, electricity must be switched off at the main switch. If the boiler has a 7-pole or a 4-pole Eurostecker (only on 2-stage burners), these often fit directly to the burner. Otherwise use the connectors supplied. The operating thermostat, the max. thermostat and the inspection hatch (where fitted) interlock can then be wired in series on the incoming phase connected to L1 or connected between T1 and T2. In the first mentioned case a jumper is installed between T1 and T2. (Refer to connection in the section Electrical equipment).



If any electrical connection is used other than that recommended by Enertech, there may be a risk of equipment damage and personal injury.

### 3.5 Choice of nozzle

(Technical data): Recommended nozzle and nozzle table.

### 3.6 Brake plate and airflow setting

Before operations basic burner setting may be made according to the diagram. (Refer to basic settings). Note that this only refers to the basic setting; the setting must be adjusted after the burner has been started. At this time flue gas analysis and soot measurement must be carried out.

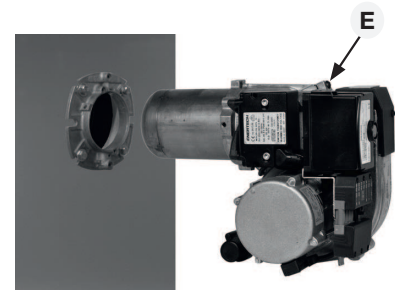
## 3.7 Burner installation

### 3.7.1 Hole pattern

Check that the hole pattern matches the flange supplied.  
(Refer to Technical data.)

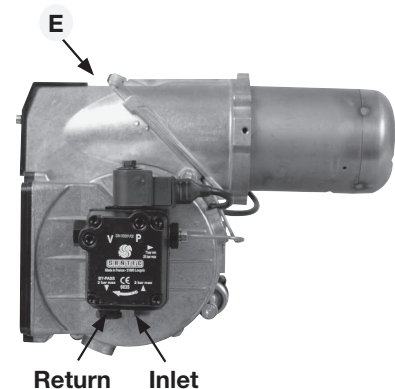
### 3.7.2 Burner installation

1. Install the flange and the gasket on the boiler.
2. Attach the front piece to the flange.
3. Insulate between the burner register and the boiler cover for reduced heat radiation.
4. Install the selected nozzle. (Refer to Technical data.)
5. Install the brake plate and check the ignition electrodes (refer to Burner service.).
6. Install the burner body to the front piece and lock with screw (E).



### 3.7.3 Oil pipes

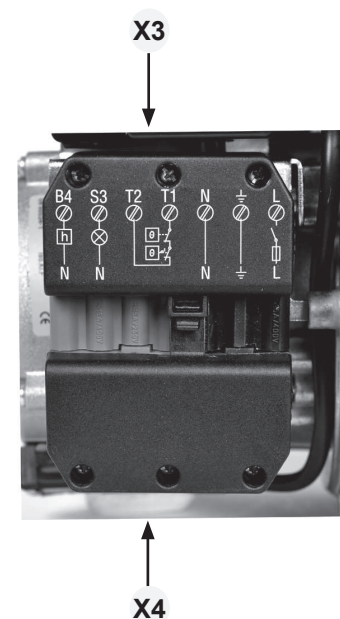
1. Check the oil pipe dimensions. (Refer to Pump Instructions.)
2. The oil filter should be installed in the oil supply line. If an air separator is fitted, the oil filter should be installed before the air filter to increase the life span of the filter.
3. For one-pipe systems the return plug must be removed. (Refer to Pump Instructions.)
4. When installing oil hoses, check that the supply and return hoses are connected to the correct connections on the oil pump. The hoses must be run so that they are not bent or tensioned.
5. Purge the oil system. The oil pump will be damaged if it is run dry.
6. The vacuum should not be lower than 0.3 bar depression in the suction line at start up.



### 3.7.4 Electrical connection

If the boiler lacks ready-connected plugs, connect using the supplied plug, X4 in accordance with the wiring diagram.

1. Disconnect the power at the main switch.
2. Wire the Eurostecker X4 as in alt. 1–3 (refer to Electrical equipment).
3. Connect the Eurostecker X4 to the burner.
4. Switch on the power at the main switch.



## 4. BASIC SETTINGS

### 4.1 Example of basic setting

#### 4.1.1 Choice of nozzle

##### BF1 FU 63-16/BF1 K 76-26

Burner output	30 kW
Estimated nozzle output:	$30 / 11,86^* = 2,53 \text{ kg/h}$

Choice of nozzle according to table. (Refer to Technical data.)

According to the nozzle table, the following nozzle is indicated:

Nozzle:	0,65 Gph
Pump pressure:	11,0 bar

##### BF1 FUV 63-16/BF1 KV 76-26

Burner output	30 kW
---------------	-------

Because of preheater, output is adjusted upward for choice of nozzle according to table. (Refer to Technical data 2.6.)

Estimated nozzle output:	$30 \times 1,06 = 31,8 \text{ kW}$
	$31,8 / 11,86^* = 2,68 \text{ kg/h}$

Choice of nozzle according to table. (Refer to Technical data.)

According to the nozzle table, the following nozzle is indicate

Nozzle:	0,75 Gph
Pump pressure:	9,5 bar

* Caloric value Light oil	$= 11,86 \text{ kWh/kg}$
---------------------------	--------------------------

#### 4.1.2 Basic setting

Setting values for 30 kW according to basic settings tables.

(Refer to Technical data FUV 63-16).

Air setting	$= 11,0$
Insert setting	$= 4,0$

### 4.1.3 Nozzle assembly adjustment

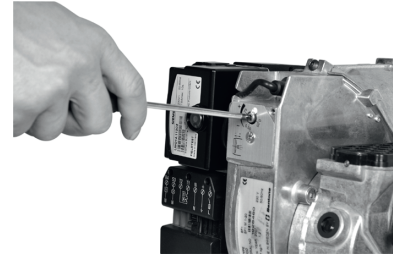
The burner is fitted with a regulator which changes the brake plate position in the blast tube. This is used to set the correct pressure drop across the combustion assembly and thereby achieve good combustion without pulsation.

The setting to be chosen is dependent among other things on set output and furnace pressure.

#### Brake plate setting

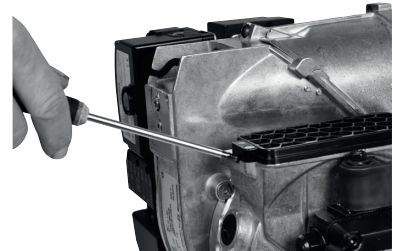
- Less diffusion: turn screw to left.
- More diffusion: turn to right.

Setting brake plate position affects air flow. It is therefore always necessary to adjust the air with the burner air regulator afterwards.



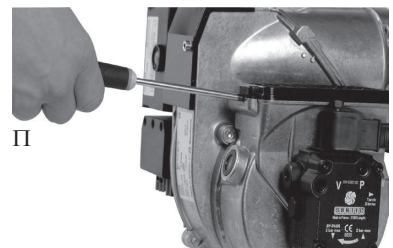
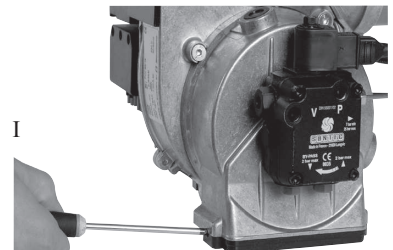
### 4.1.4 Air intake adjustment

Air settings are very important for achieving good combustion with neither too much, nor too little, air. Adjustment of combustion airflow is carried out by turning the air regulator with an Allen key. How far open the air regulator must be is determined by output, furnace pressure and other burner settings such as blast tube position.



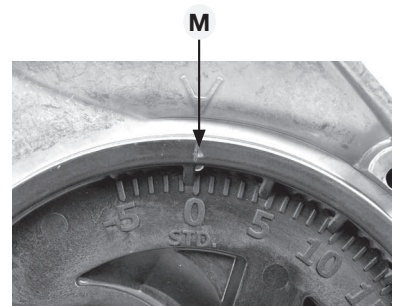
### 4.1.5 Method of adjusting air quantity

Setting the air regulator is dependent on how the screw (with which air regulation is adjusted) is installed. If the air intake is installed underneath as shown in illustration I, turning the screw clockwise will reduce airflow, and anticlockwise increase it. If the air intake is installed on top as shown in illustration II, clockwise adjustment increases airflow, and anticlockwise reduces it.



### 4.1.6 Inlet cone, air adjustment

Airflow is also affected by the position of the inlet cone. However, it is extremely rare that this needs to be adjusted; it should be left in the standard STD position to achieve good starts and operations. (A cast-in arrow on the fan housing indicates the position of the inlet cone. In addition to the scale on the inlet cone casting, there is also a mark (M) indicating the factory setting.)



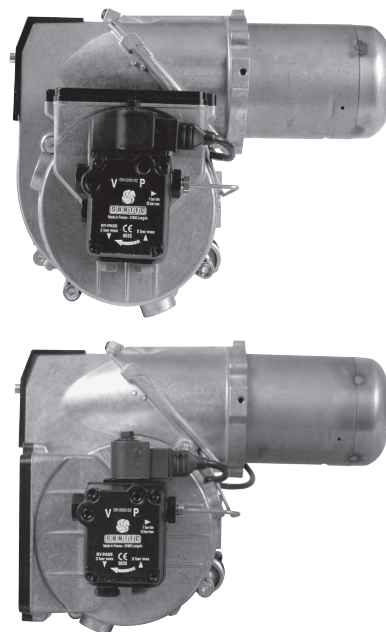


### 4.1.7 Air intake rotation

It is possible to rotate the air intake to adapt the burner to different surroundings. It is possible to rotate the air intake to a number of positions, not just the positions shown to the right.

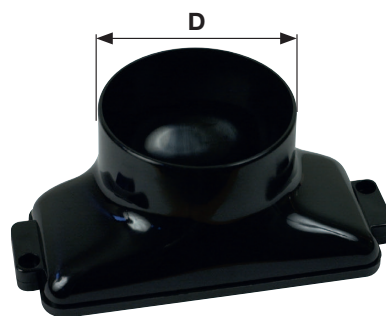
To rotate the air intake, undo the three screws that fasten the air intake and the two screws which retain the pump. Then rotate the air intake to the desired position and tighten the screws. The position of the air intake affects the airflow through the burner somewhat.

The position which provides best airflow is with the air intake pointing downwards.



### 4.1.8 Air duct

A hose connection air duct is available in three different dimensions: 48, 68, and 78 mm outer diameter (D). The air duct is installed on the air intake at the place where the grille is attached in the standard model



## 5. BURNER SERVICING

### 5.1 Warning

Service must be carried out after 3,000 operating hours, or at least once per year.

Only authorized personnel may perform service.

Before any type of service work is begun, switch of the power at the main switch and shut off the oil.

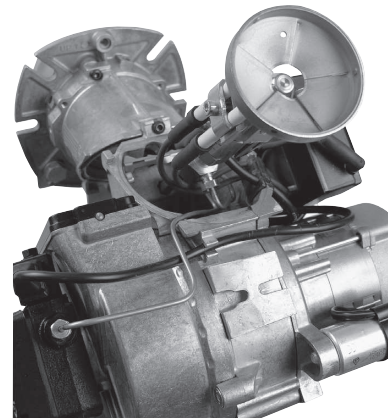
Exercise caution as parts which are exposed when the burner is taken apart can be hotter than 60°C. The installation engineer must be especially careful to ensure that no electrical wiring or oil lines are pinched or damaged during installation or service.



#### 5.1.1 Service position

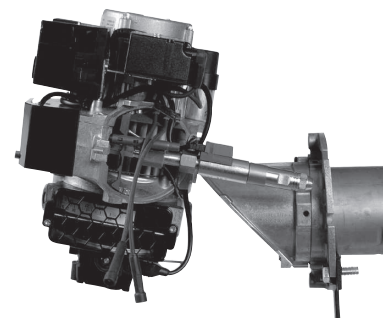
##### 5.1.1.1 Service position 1

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. Undo the screw which fastens the burner front piece to the fan housing, but only so much as to allow the fan housing to be removed from the burner front piece.
3. Remove the fan housing from the burner front piece and pull it backwards until the combustion assembly is free of the burner front piece.
4. Suspend the fan housing by the fan housing attachment point (for joining the front piece to the fan housing) on the screw (for joining the front piece to the fan housing) as illustrated. If necessary, tighten the screw somewhat to ensure that the burner is suspended safely.



##### 5.1.1.2 Service position 2

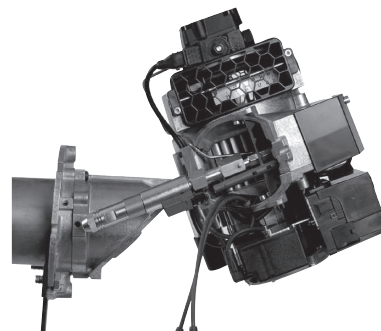
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. Undo the screw which fastens the burner front piece to the fan housing, but only so much as to allow the fan housing to be removed from the burner front piece.
3. Remove the fan housing from the burner front piece and pull it backwards until the combustion assembly is free of the burner front piece.
4. Turn the screw into the front piece until there is a gap of approx. 5 mm between the metal and the screw head.
5. Suspend the fan housing by the fan housing service attachment on the screw used for joining the front piece to the fan housing, with the motor upwards, as shown in the illustration.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

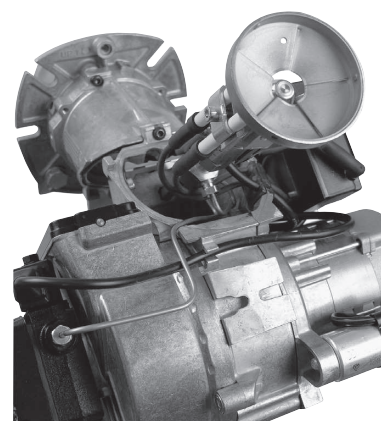
### 5.1.1.3 Service position 3

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. Undo the screw which fastens the burner front piece to the fan housing, but only so much as to allow the fan housing to be removed from the burner front piece.
3. Remove the fan housing from the burner front piece and pull it backwards until the combustion assembly is free of the burner front piece.
4. Turn the screw into the front piece until there is a gap of approx. 5 mm between the metal and the screw head.
5. Suspend the fan housing by the fan housing service attachment on the screw used for joining the front piece to the fan housing, with the air intake upwards, as shown in the illustration.



### 5.1.2 Combustion assembly service

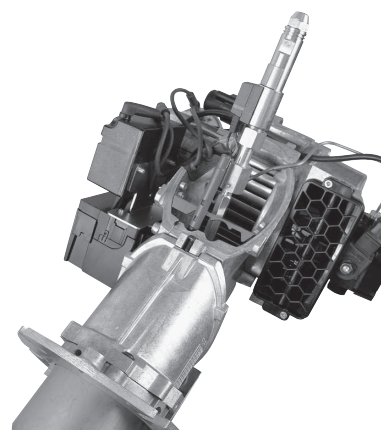
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 1 may be used.
3. Carry out a visual inspection of the combustion assembly and check the various parts for defects.
4. Undo and remove the brake plate and the electrode package from the oil pipe. Clean the brake plate as necessary.
5. Screw off the nozzle.
6. Install the nozzle. The nozzle may not be cleaned; it must be replaced with a new nozzle if the existing one is considered defective.
7. Check the ignition electrodes. Replace as necessary (refer to Technical data for electrode settings).
8. Install the brake plate and electrode package. Check that the distance between the nozzle and brake plate is correct (refer to Technical data).
9. Undo the screw that the fan housing is suspended from. Reassemble the front piece and the fan housing and fasten them together.
10. Connect the Eurostecker and switch on the power at the main switch.
11. Start the burner and check the combustion.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

### 5.1.3 Preheater replacement

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 1 may be used.
3. Remove the brake plate and electrode package.
4. Disconnect the preheater cable from the preheater.
5. Screw off the nozzle.
6. Undo the nut that connects the oil pipe to the preheater.
7. Install the new preheater. Check the condition of the O-ring; replace as necessary.
8. Connect the preheater cable.
9. Install the nozzle.
10. Install the brake plate and electrode package. Check that the distance between the nozzle and brake plate is correct (refer to Technical data).
11. Re-assemble the burner.
12. Connect the Eurostecker and switch on the power at the main switch.
13. Start the burner and check the combustion.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

## 5.1.4 Replacing the oil pump

1. Break the main current and disconnect the Euro plug from the burner.
2. Disconnect the electrical plug from the oil valve (1).
3. Detach the oil hoses from the pump.
4. Detach the solenoid valve housing from the valve (2). Remove the entire solenoid valve housing.
5. Disconnect the oil connection pipes from the solenoid valve (3).
6. Loosen the screws (4) and pull out the oil pump and solenoid valve as one assembly.
7. Turn the valve forward and detach it from the pump.
8. Reassemble in reverse order.

**!** Do not forget thread sealer between the pump and the elbow. (t.ex Loctite 5188, 5400)

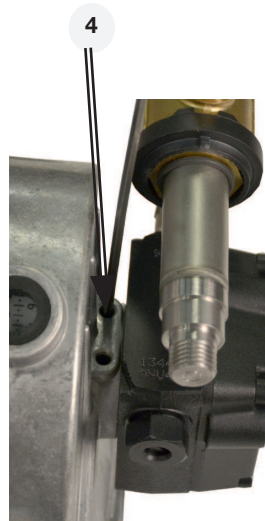
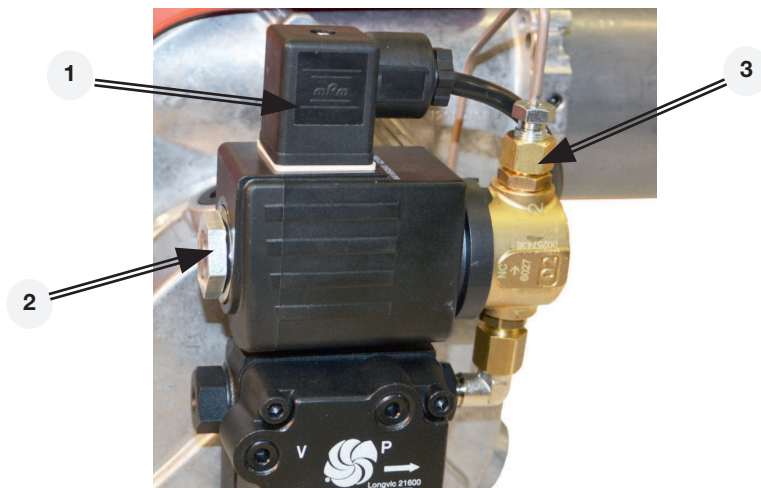
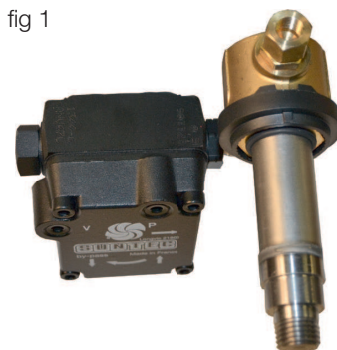


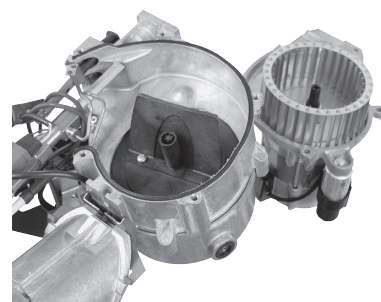
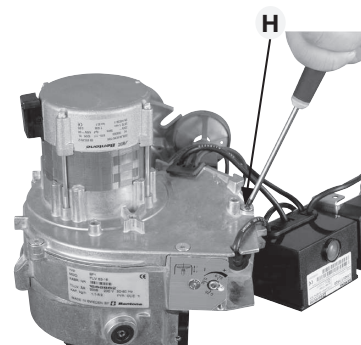
fig 1



**!** When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

### 5.1.5 Fan motor replacement

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 2 may be used.
3. Remove the electrical connection from the motor.
4. Remove the electrical box retaining screw.
5. Remove the cable conduit entry to the ignition electrodes and the preheater (where fitted) and remove the photocell cable from the motor flange.
6. Undo the screws (H) to the motor flange, 5 pcs.
7. Lift away the motor.
8. Remove the drive coupling end from the motor shaft, loosen and remove the fan wheel.
9. Install the fan wheel on the new motor, tighten the locking screw. The fan wheel must be installed in the bottom position toward the motor shaft. Install the drive coupling end.
10. Align and fit the motor flange to the fan housing. Pay attention to the drive coupling so that it does not fall out, and also that it aligns correctly in the drive coupling end of the motor and pump.
11. Bolt the motor flange and fan housing together. Tighten the screws diagonally, and do not tighten hard one at a time. This is in order to ensure the fan housing and the motor flange assume the correct relative positions.
12. Place the cable conduit entry and the photocell cable in position.
13. Screw the electrical console in place.
14. Connect the motor wiring.
15. Join together the fan housing and the burner front piece.
16. Connect the Eurostecker and switch on the power at the main switch.
17. Start the burner and check the combustion.

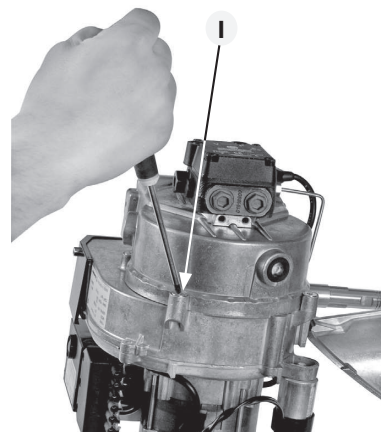


When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.



### 5.1.6 Air intake and intake cone service

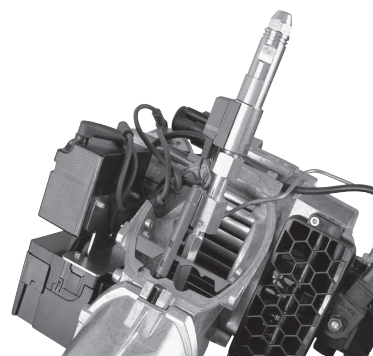
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 3 may be used.
3. Remove the solenoid cable from the pump.
4. Remove the connecting pipe from the pump.
5. Undo the air intake retaining screws (I).
6. Remove the air intake.
7. Undo the inlet cone retaining screw; make note of the inlet cone position.
8. Remove the inlet cone from the fan housing.
9. Check the function and visual condition of the various air regulator components. Clean and replace components as necessary.
10. Re-assemble the burner. Be especially careful when installing the inlet cone; install it in the same position it had at removal.
11. Fit the O-ring in the groove between the fan housing and inlet cone. Ensure that it is properly located in the groove and is not damaged when the air intake is fitted.
12. Connect the Eurostecker and switch on the power at the main switch.
13. Start the burner and check the combustion.



### 5.1.7 Fan wheel checks

#### 5.1.7.1 Inspection

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 1 may be used.
3. Perform a visual inspection of the fan wheel. Spin the fan wheel with your finger, or carefully using a tool.
4. If the fan wheel is not very dirty, clean it carefully where possible.
5. If thorough cleaning is required, refer to point 5.1.7.2 or alternatively 5.1.7.3.
6. If cleaning is not necessary, re-assemble the burner.
7. Connect the Eurostecker and switch on the power at the main switch.
8. Start the burner and check the combustion.

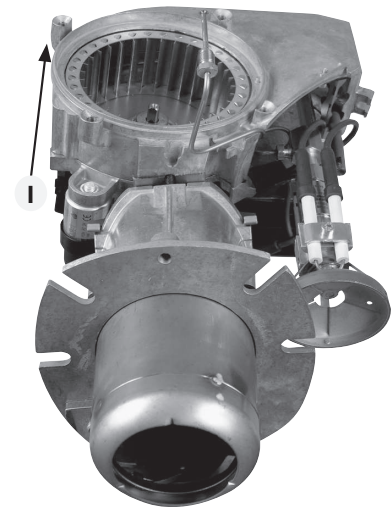


When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.



### 5.1.7.2 Cleaning, alternative 1

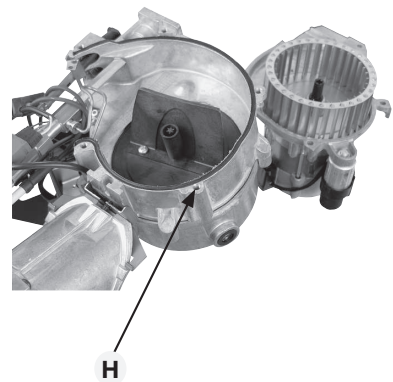
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 3 may be used.
3. Remove the solenoid cable from the pump.
4. Remove the connector pipe from the pump.
5. Undo the air intake retaining screws (I).
6. Remove the air intake.
7. Undo the inlet cone retaining screw; make note of the inlet cone position.
8. Remove the inlet cone from the fan housing.
9. Clean the fan wheel. Undo and if necessary remove the fan wheel for more thorough cleaning of the fan and fan housing.
10. Install the fan wheel; tighten the retaining screw. The fan wheel must be installed in the bottom position toward the motor shaft. Install the drive coupling end.
11. Re-assemble the burner. Pay attention to the drive coupling so that it does not fall out, and also that it aligns correctly in the drive coupling end of the motor and pump.
12. Fit the inlet cone in the same position as before disassembly
13. Fit the O-ring in the groove between the fan housing and inlet cone. Ensure that it is properly located in the groove and is not damaged when the air intake is fitted.
14. Connect the Eurostecker and switch on the power at the main switch.
15. Start the burner and check the combustion.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

### 5.1.7.3 Cleaning, alternative 2

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 2 may be used.
3. Remove the electrical connection from the motor.
4. Remove the electrical box retaining screw.
5. Remove the cable conduit entry to the ignition electrodes and the preheater (where fitted) and remove the photocell cable from the motor flange.
6. Undo the motor flange retaining screws (H), 5 pcs.
7. Lift away the motor.
8. Clean the fan wheel and the fan housing. For more thorough cleaning remove the drive coupling from the motor shaft and loosen and remove the fan wheel.
9. Install the fan wheel on the motor and tighten the locking screw. The fan wheel must be installed in the bottom position toward the motor shaft. Install the drive coupling end.
10. Align and fit the motor flange to the fan housing. Pay attention to the drive coupling so that it does not fall out, and also that it aligns correctly in the drive coupling end of the motor and pump.
11. Screw the motor flange and the fan housing together. Tighten the screws diagonally, and do not tighten hard one at a time. This is in order to ensure the fan housing and the motor flange assume the correct relative positions.
12. Place the cable conduit entry and the photocell cable in position.
13. Screw the electrical box in place.
14. Connect the motor wiring.
15. Join together the fan housing and the burner front piece.
16. Connect the Eurostecker and switch on the power at the main switch.
17. Start the burner and check the combustion.



### 5.1.8 Electrical module

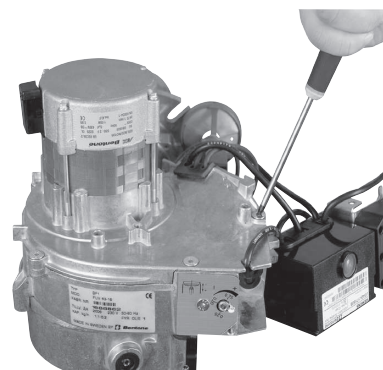
Check that the electrical console retaining screw is tight so that good contact to earth is established between the console and the burner body. Only use electrical components recommended by Enertech.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

### 5.1.8.1 Replacement of complete electrical package

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 2 may be used.
3. Remove the electrical connection from the motor.
4. Remove the electrical box retaining screw.
5. Remove the cable conduit entry to the ignition electrodes and the preheater (where fitted) and remove the photocell cable from the motor flange.
6. Install the new electrical package.
7. Place the cable conduit entry and the photocell cable in position.
8. Screw the electrical box in place.
9. Connect the motor wiring.
10. Assemble the fan housing and burner front piece.
11. Connect the Eurostecker and switch on the power at the main switch.
12. Start the burner and check the combustion.



### 5.1.8.2 Replacement of individual electrical components

1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 2 may be used.
3. Remove the oil burner control.
4. Disconnect the wires to the components that are to be replaced.
5. Insert the new wires.
6. Install the oil burner control.
7. Assemble the fan housing and burner front piece.
8. Connect the Eurostecker and switch on the power at the main switch.
9. Start the burner and check the combustion.

When replacing the electrical components transformer and control box included in the electrical package, the junction box lid need not be removed.



When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.

## 6. PUMP INSTRUCTIONS

### 6.1 Suntec ANV47C

#### 6.1.1 Technical data

Viscosity range:	2,0–75,0 mm <sup>2</sup> /s (cSt)
Pressure range:	7–14 bar
Oil temperature:	max. 60°C

#### 6.1.2 Components

1. Nozzle connection G 1/8"
2. Vacuum manometer connection G 1/8"
3. Manometer connection G 1/8"
4. Filter
5. Suction line G 1/4"
6. Metal plug G 1/4"
7. Return plug
8. Return line G 1/4"
9. Pressure regulation

### 6.1.3 Filter replacement

Cut off the power and shut off the oil.

Remove the pump cover with the aid of a 4 mm Allen key. If necessary a screwdriver may be used between the cover and the housing to carefully pry the cover loose. Replace the old filter by a new one. Replace the cover, tighten lightly.

Do not forget to replace the gasket.

Open the oil supply and switch on the power.

### 6.1.4 One-pipe system

Conversion to one-pipe system

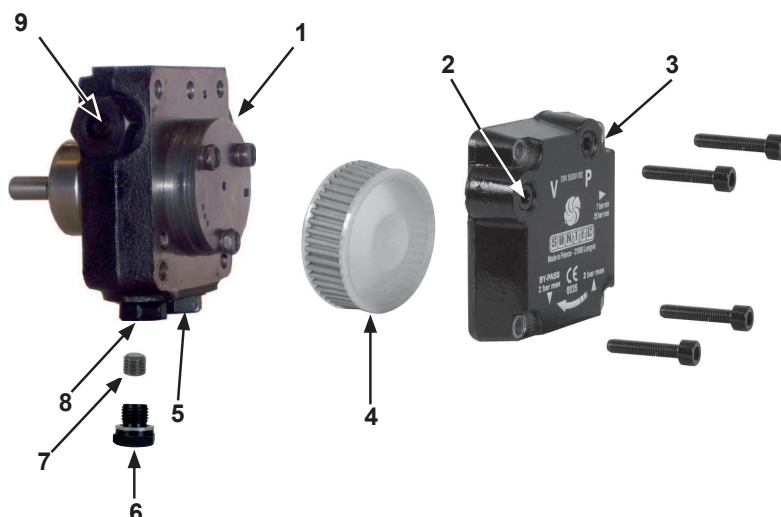
Remove the return plug (8), plug the return line (9) with the metal plug (7) G 1/4".

### 6.1.5 Two-pipe system

Conversion to two-pipe system

Remove the metal plug (7) G 1/4", fit the return plug (8) in the return line (9).

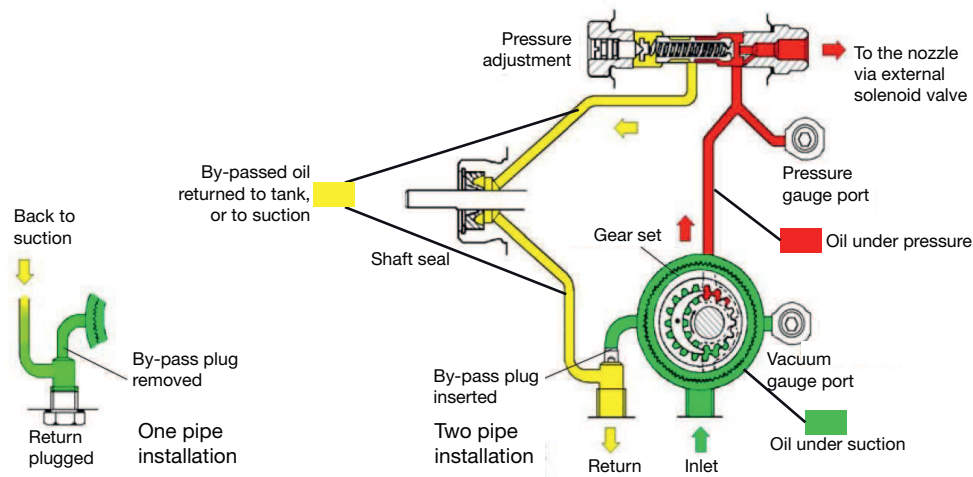
Return plug are not included in products with one-pipe system, separately sold.



### 6.1.6 Solenoid valve



### 6.1.7 Function ANV47C



#### Pump working method

The oil pump is combined with an external solenoid valve that regulates oil flow and providing a precise pressure within a large speed range.

The pump's gear wheels draw oil from the tank through the integral filter and conveys the oil to the regulator valve which pressurizes the nozzle connection.

The quantity of oil that does not go to the nozzle connection is led through the valve back to the return line, or in the case of a one-pipe installation, back to the suction connection in the gear wheel pump.

#### - Two-pipe system

When the solenoid valve is not activated, the return plug channel between the pressure side and the return side of the pressure valve is open. No pressure will be built up to open the pressure valve, regardless of gear wheel pump rpm. When the solenoid valve is activated, the return plug channel is shut. The gear wheel pump's rotation at full rpm quickly builds up the pressure necessary for opening the valve and provides a sharp opening action.

#### - One-pipe system

Purging of the oil line system is not automatic in the one-pipe system; open the manometer connection for purging.

#### Shut-down

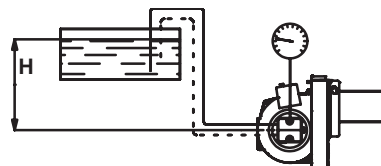
When the burner stops, the solenoid valve opens the return plug channel and drains oil to the return line. At that same moment the nozzle line is closed. This provides a sharp cut-off. The on and off functions can be controlled independent of motor rpm, and react very quickly. When the solenoid valve is not activated torque is low up to full motor rpm.

## 6.1.8 Suction pipe tables ANV47C

### 6.1.8.1 Overhead Tank

#### One-pipe system

Height m	4,0	3,0	2,0	1,0	0,5	0,0
Line diameters						
ø 4 mm	100	100	100	91	82	74



The table applies to Fuel oil 1

Height m	4,0	3,0	2,0	1,0	0,5	0,0
Line diameters						
ø 6 mm	29	25	22	18	16	14

The table applies to Fuel oil 1

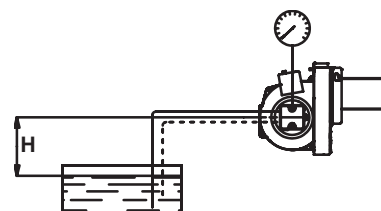
### 6.1.8.2 Underlying Tank

#### One-pipe system

For reliable operations, use of a Tigerloop is recommended in underlying tanks.

#### Two-pipe system

Height m	0,0	-0,5	-1,0	-2,0	-3,0	-4,0
Line diameters						
ø 6 mm	14	12	10	7	3	0



The table applies to Fuel oil 1

The suction line tables comprise theoretically calculated values where pipe dimensions and oil flow are adapted to prevent turbulent flows from occurring.

Turbulent flows can result in pressure losses and noise in the pipework. A typical pipe system usually comprises pipe runs with 4 bends, a non return valve, a shut-off valve and a pre-filter.

The total resistance of these items is such that it can be disregarded. In the tables no run longer than 100 m is listed, as experience shows this not to be required.

The tables apply to standard heating oil of normal grade merchantable according to existing norms. When starting operations with an empty pipe system, the pump should not be run without oil for more than 5 min.

The tables give the total suction line length in meters with a nozzle capacity of 2.1 kg/h. Max. permissible pressure on the suction and return lines is 2.0 bar. For a two-pipe system the  $Q_{max}$  46 l/h pump capacity at 0 bar applies.



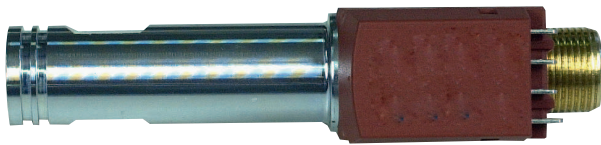
## 7. PREHEATER

### 7.1.1 Function FPHE 5

When the boiler thermostat connects, the PTC element is energized and oil begins to preheat. When the oil has reached the correct temperature, the preheater thermostat closes and the burner receives the start signal.

During operations the PTC element compensates its output so that the temperature does not become too high.

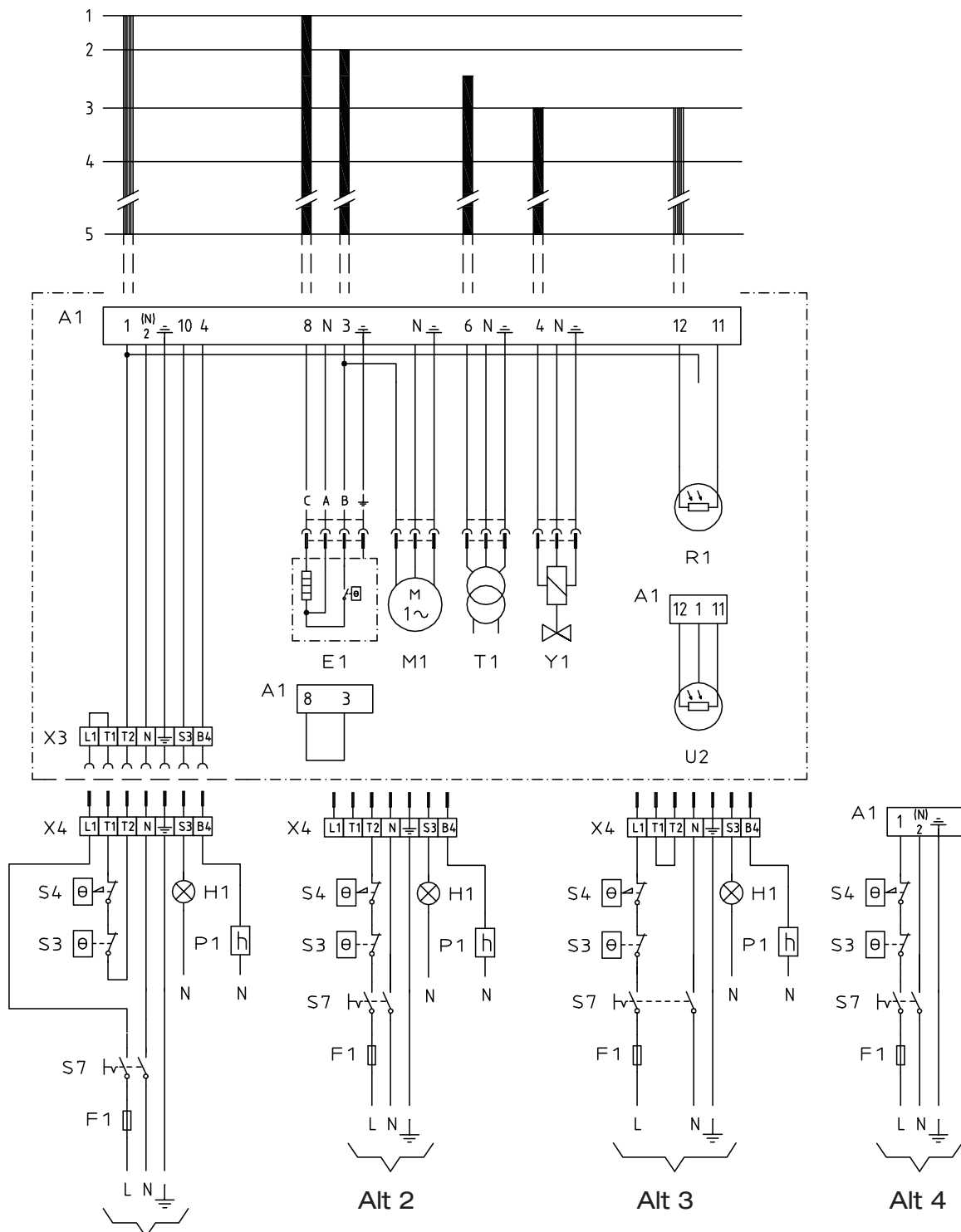
If the oil temperature is low and the oil flow high, the preheater thermostat may open owing to the PTC element's inability to maintain oil temperature. In this case it is important to use oil burner controls with a preheater holding circuit.



## 8. ELECTRICAL EQUIPMENT

### LMO1..2..4..

#### 8.1 Wiring diagram



## 8.1.1 Component list

A1	Oil burner control	S3	Operations thermostat
E1	Preheater	S4	Temperature limiter
F1	Fuse, max 10 A	S7	Main switch
H1	Alarm lamp	T1	Ignition transformer
M1	Burner motor	Y1	Solenoid valve
P1	Timer (Accessory)	X3	Plug-in contact, burner
R1	Photocell QRB	X4	Plug-in contact, boiler
U2	UV-cell QRC		

Preheater wiring colours:    A   Blue    B   Brown    C   Black

The installation must be connected to the mains and fused according to local regulations.

## 8.1.2 Function LMO1..2..4..

### 1a. **Operations switch ON, thermostat ON**

The burner motor starts, ignition sparks initiated and pre-ventilation continues until the set pre-ventilation period is over and the solenoid valve (2) opens..

### 1b. **Operations switch ON, thermostat ON**

The preheater is energized and the pre-heating period begins. This continues until the operating temperature is reached and the preheater thermostat closes. The burner motor starts, ignition sparks initiated and pre-ventilation continues until the set pre-ventilation period is over and the solenoid valve (2) opens.

### 2. **Solenoid valve opens**

The oil mist is formed and ignited. The photocell indicates flame. The ignition spark ceases 15 sec. after flame indication.

### 3. **Safety period runs out**

- a    If the flame is not present before the end of this period, the oil burner control blocks further operation.
- b    If the flame for any reason disappears after this time period, the burner will make a new start attempt.

### 4-5 **During operation**

If burner operations are interrupted via the main switch or thermostat, a new start will be initiated when conditions according to point 1 are fulfilled.

### **Oil burner control blocks**

Red light on the oil burner control illuminates. The burner is re-started by pressing the reset button.

### 8.1.3 Technical data

	LMO14	LMO24
Pre-ignition period:	15 s	25 s
Pre-ventilation period:	16 s	26 s
Post-ignition period:	10 s	5 s
Safety period:	< 10 s	< 5 s
Re-connection after release:	< 1 s	< 1 s
Reaction time flame extinction:	< 1 s	< 1 s
Ambient temperature:	-5 - +60°C	-5 - +60°C
Min. current with flame:	45 µA	45 µA
Max current when dark, start:	5,5 µA	5,5 µ A
Ingress Protection:	IP 40	IP 40

**LOA not to be used within EU**

#### Photocell current checks

Photocell current is measured with a direct current ammeter (multimeter µA) connected in series with the photocell.

### 8.1.4 Colour codes LMO14/24

When the burner starts, three signal lights in the reset switch indicate the normal sequence, as well as provide indication if something abnormal is happening in accordance with the following table:

Preheater in operation	Solid yellow
Ignition switched on	Flashing yellow
Normal operation	Solid green
Operation, poor flame signal	Flashing green
Undervoltage	Flashing yellow-red
Fault, alarm	Solid red
False light	Flashing red-green
Communication mode	Fluttering red

### 8.1.5 Fault codes LMO14/24

When the red light for a blocked relay box comes on, you can get information about what has caused the problem by pressing and holding the reset button for 3 seconds.

The number of flashes below is repeated with a pause in between.

2 flashes	No flame signal when safety time expires
4 flashes	False light during start
7 flashes	3 x Losses of flame during operation
8 flashes	Time-out for preheater *
10 flashes	Incorrect wiring, internal fault or simultaneous occurrence of two faults

\* In order for this fault code to occur, the preheater shall not reach its cut-off temperature within 10 mins. from switch on.

To return to normal operation: Press the reset button for 1 second.

If the reset button is instead kept pressed a second time for at least 3 seconds, you can, via an interface, obtain the corresponding information on a computer or flue gas analyser.

To return to normal operation: Press the reset button for 1 second

## 9. FAULT LOCATION

### 9.1 Burner will not start

Symptom	Causes	Remedies
Motor starts	Unstable flame	Adjust the damper
Burner pre-ventilates	Excess air	Check the oil pressure
	Low oil pressure	Check the nozzle in relation to the combustion apparatus dimensions and the ignition electrode position
Flame formed		Check the flame monitor is clean and can register light
Burner trips	Incorrect combustion apparatus settings	Check with using new photocell
	Flame monitor does not register light	Check using new oil burner control (Note: replacement of photocell recommended if oil burner control replaced)
Motor starts	Defective flame monitor	Check the oil supply to the burner and that there are no air bubbles in the pump
Burner pre-ventilates	Defective oil burner control	Check function of solenoid
No flame formed		Check flame monitor does not register ambient light
Burner trips	No oil	Check high voltage wiring and ignition electrodes
	False light	
	No spark	

### 9.2 Burner will not start after normal use

Burner does not start	Fuse blown	Check and replace fuse as necessary. Investigate cause of fault
	Boiler thermostat has not reset	Adjust thermostat
Burner pre-ventilates	Overheating protection has deployed	Reset the overheating protection. Investigate the cause of its deploying. Remedy fault
	Defective preheater	Check by replacing with new
	Defective oil burner control or flame monitor	Check that tank, oil lines, solenoid valves, pump and nozzle are in good condition
	No oil supply	Adjust the burner
Burner stops	Too great a pressure drop at brake plate	Correct the boiler draught
	Too strong draught prevents flame forming	Check the ignition transformer. Check the ignition electrode settings and ceramics
	No spark	

### 9.3 Delayed ignition, burner starts; pulsation

Burner pulsates at start with hot flue gases	Too strong a draught	Correct the boiler draught
	Too great a pressure drop at brake plate	Adjust the burner
	Nozzle partially blocked	Replace nozzle
Burner pulsates at start	Oil pressure too low	Check and adjust
	Flue blocked or damaged	Check and correct
	Fan wheel slipping on shaft	Check and tighten
	Pump coupling loose or worn	Replace
	Preheater clogged	Check ignition electrode adjustment (refer to technical data)
	Delayed ignition	Check ignition electrodes not damaged
	Too strong a draught	Check high voltage wiring
	Too great a pressure drop at brake plate	Check position of nozzle assembly adjustment
		Correct the boiler draught
		Adjust the burner

# EU Declaration of conformity



## Bentone Oilburners

Type

BF 1	ST 133	B 10	B 55
ST 97	ST 146	B 30	B 65
ST 108	B 1	B 40	B 70
ST 120	B 2	B 45	B 80

This declaration of conformity is issued under the sole responsibility of the manufacturer. The object of the declaration described above is in conformity with:

**Machinery Directive 2006/42/EC**

**EMC 2014/30/EU**

**Restriction of the use of certain hazardous substances (RoHS) Directive 2011/65/EU**

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

EN 267:2009+A 1 :2011 (excluded Annex J/K) Automatic forced draught burners for liquid fuels

Additional information can be downloaded at:

[www.bentone.com](http://www.bentone.com)

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# 11. OIL BURNERS MAINTENANCE INSTRUCTIONS

## General information

Keep the boiler room clean. Ensure that the boiler room has permanent fresh air intake. Switch off before dismantling the oil burner.

At hinged mounting, make sure that an automatic safety switch is fitted, so that the burner cannot start when the swing door is open.

Don't use the oil fired boiler to burn paper or rubbish, unless the boiler is especially fitted with a hinged door to make this possible.

Don't fill tank while burner is working.

## Starting precautions

Make sure that the oil tank is not empty

Make sure that the valves on oil and water supply pipes are open.

Make sure that the boiler flue damper is open.

Make sure that the boiler thermostat is set at the correct temperature.

Switch on the current. Most relay systems have a delayed action so that the burner will not start for perhaps 20 seconds.

With heavy oil the delay will be longer as the burner will not start until the oil in the preheater reaches the required temperature.

## If the burner will not start

Press the reset button on the relay. Check that the thermostats are correctly adjusted.

Don't forget the room thermostat, check that any fuses are intact and main switch is on.

## If the burner starts but does not ignite

Make an attempt to start the burner.

Never make close repeated start attempts.

Don't restart the burner until the boiler is free from oil gases.

If the burner still does not ignite send for the service engineer.

## When switching off during summer

Always use the main switch to cut out the burner even when adjusting the burner or cutting off the heating for a short time. For longer periods of shut down, close all valves and the oil supply stop-cock.

Clean the filter and nozzle by washing in petrol or paraffin.

Make sure the filter medium is not damaged or defective.

Protect electrical gear from damp.

## Warning

Never stand too near or put your face to the inspection or fire door, when the burner is about to start.

Never use a naked flame to ignite oil if the electrical ignition fails.

Always wait for about 10 minutes for the unburnt gases to disperse before restarting the oil burner if it has failed to ignite previously.

## Installed by:

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Tel: .....





