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Installation- and maintenance instruction  
**BF1**

Original translation of Installation- and maintenance instruction

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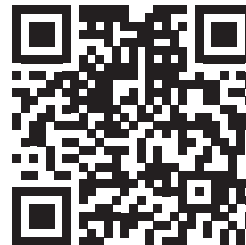
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sur votre plaque signalétique (consultez l'illustration)  
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exempel example Beispiel

352011030141	Serial no. 1234567	Man.Year 2019
Designation	BF 1 KS 76-24	
Type	BF 1	
Model	BF 1 KS 76-24	
Cap. Min-Max	LIGHT OIL 35-90kW 1,25-6,0 cSt 7-14bar	
Main supply	1-230V 1,0A 50Hz IP 20	
Motor supply		
MADE IN SWEDEN BY		



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# 1. General Information

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site
- is intended for use by authorised personnel
- must be read prior to installation
- must be observed by all who work with the burner and associated system components
- work with the burner may only be carried out by certified installers/ personnel
- Enertech AB is not liable for any typographical errors and reserves the right to make design changes without prior notice.
- The burner may only be used for its intended purpose in accordance with the product's technical data.
- The burner may only be installed and operated by authorised personnel.
- The product is packaged to prevent damage from occurring during handling. Handle the product with care. Lifting equipment must be used to lift larger packages.
- The products must be transported/stored on a level surface in a dry environment, max. 80% relative humidity, no condensation. Temperature -20 to +60 °C.
- Check that the burner is compatible with the boiler's output range.
- The label information on the rating plate refers to the burner's minimum and maximum power.
- The power data on the type sign refers to the burner's min. and max. power.
- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces which can affect the components.
- The burner must be installed so that it complies with local regulations for fire safety, electrical safety, and fuel distribution.
- Make sure when installing the equipment that there is enough space to service the burner.
- Permitted ambient temperature during operation -0 to +60 °C. Max 80% relative humidity, no condensation.
- The installer must ensure that the room has adequate air supply.
- The room must comply with local regulations pertaining to its intended use.
- The installation site must be free of chemicals.



- Burner pipes, fan wheels and air dampers may contain sharp edges.
- The surface temperature of the burner's components can exceed 60 °C.
- Caution: The burner has moving parts, and there is risk of crushing injuries.
- The electrical installation must be professionally carried out in accordance with applicable high voltage regulations, as per Enertech's recommendations.
- Before servicing, shut off the fuel supply and turn off the power to the burner.
- Leak checks must be performed during installation and servicing to prevent fuel leakage.
- Care should be taken by the installer to ensure that no electrical cables or fuel lines are crushed or otherwise damaged during installation or servicing.
- If the boiler is equipped with an access hatch, this must be equipped with a hatch opening switch connected to the burner's safety system.
- When in operation, the burner's noise level can exceed 85 dBA. Use hearing protection.
- The burner must not be put into operation without proper safety and protection devices.
- A Class BE fire extinguisher is recommended.
- It is forbidden to alter the design or use accessories which have not been approved by Enertech in writing.
- Prior to operation, the following points must be checked:
  - fitting and installation work has been completed and approved
  - electrical installation has been correctly performed
  - flue gas ducts and combustion air ducts are not blocked
  - all actuators and control and safety devices are in working order and correctly set
- After commissioning, if a steady red light on the burner control is displayed, contact your installation technician.

## Burner servicing schedule

Servicing must be carried out once a year or after 3000 hours of operation

Burner	1 year	3000 hrs
Filter	1 year	3000 h Change
Oilhose	1 year control/change	
Nozzle	1 year change	3000h Change
Electrods	1 Year Change /cleaning	3000h Change /cleaning
Brake plate	1 Year Change /cleaning	3000h Change /cleaning
Motor	1 year	3000 hrs
Cuppling chaft	1 year control/change	3000h control/change
Fan wheel	"1 Year Change when dirty / unbalance"	"3000h Change when dirty / unbalance"

## Component replacement intervals

Components	Service life – Recommended replacement	Service life – Recommended replacement Operating cycles
Control system	10 years	250,000 cycles
Pressure switch	10 years	250,000 cycles
Flame guard	10 years	250,000 cycles
UV flame sensor	10000 hrs	N/A
Damper motor		500 000 cycles
Contaktor	10 years	500,000 cycles



The burner and its components must be recycled according to applicable regulations.

## Delivery check

- Make sure everything is delivered and the goods have not been damaged during transit.
- If something is wrong with a delivery, report it to the supplier.
- Transport damage must be reported to the shipping company.

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

## 2. Technical data

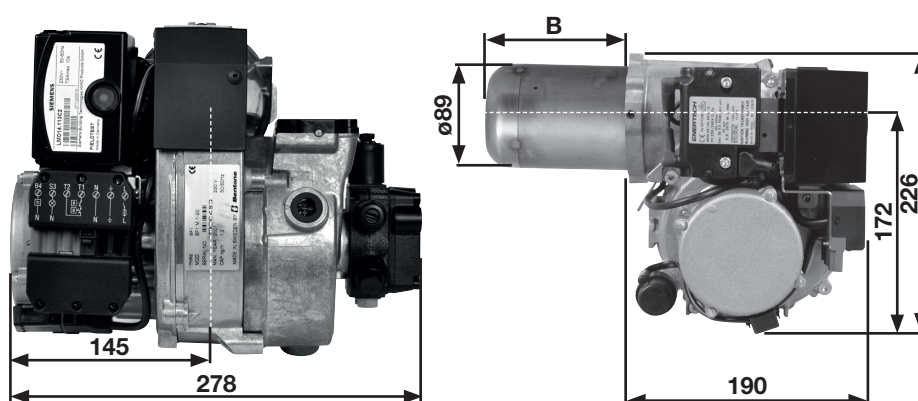
The burner is intended for:

- Light oil, B10 heating oil/biofuel blend (as defined in DIN V51603-6)

and is used for:

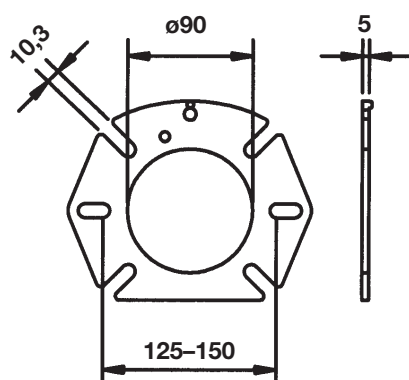
- Water heating generators
- Hot air generators (these require LMO 24 255 C2E)

### 1.1 Dimensions BF1

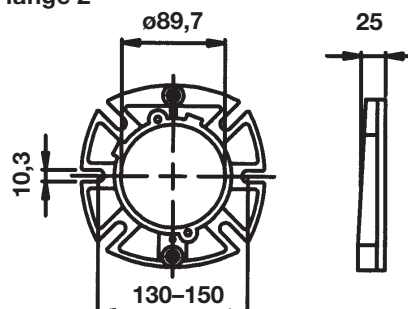


#### 2.1.1 Dimensions, flanges

Flange 1



Flange 2

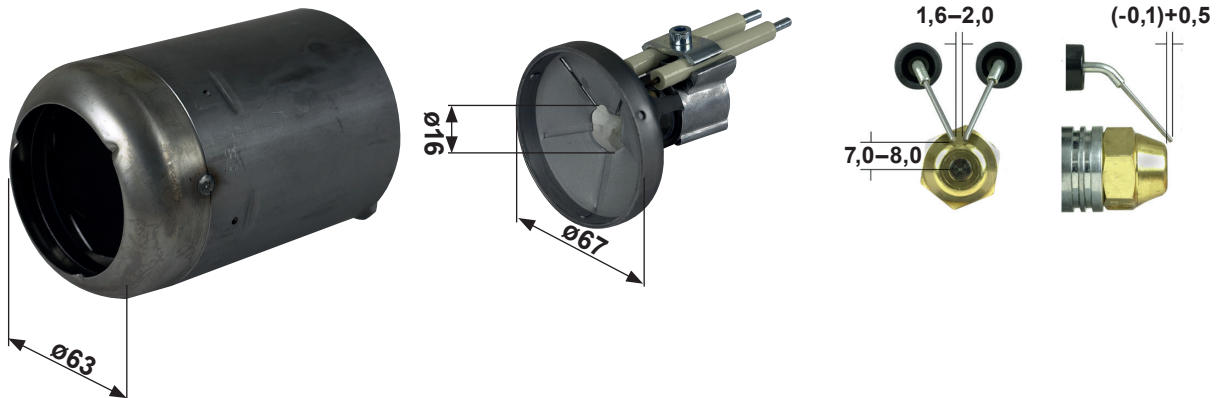


#### 2.1.2 Electric Specification

Burner correspond to IP 20

Type	Motor	Complete burner	Sound
<b>BF1</b>	110W 0,9A 230V 50/60Hz 4μF	230V 1,74A 50Hz	70dBA ± 0,5 dBA
Max operating current, see data plate			

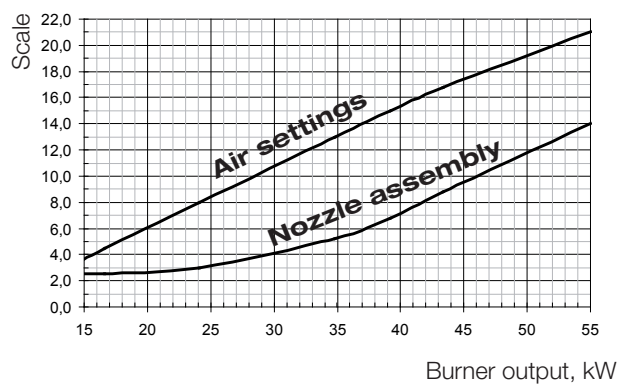
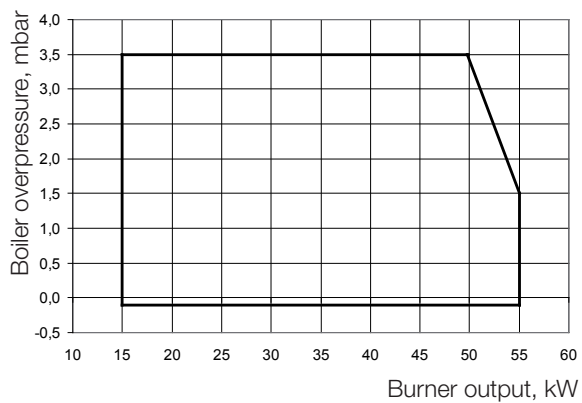
## 2.1 Model BF1 FU/FUV 63-16



Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
102	85	69
132	115	99

### 2.1.1 Burner output/ Basic settings

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



Scale value applies to 0 mbar furnace pressure.

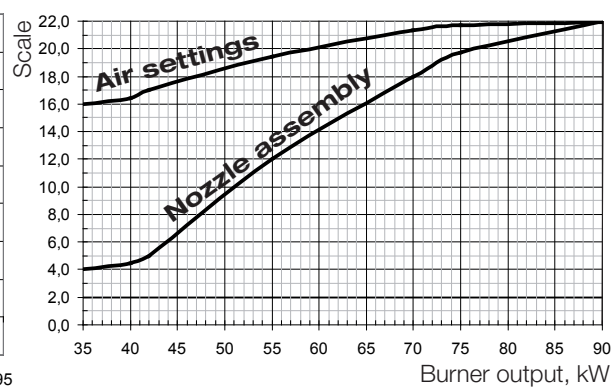
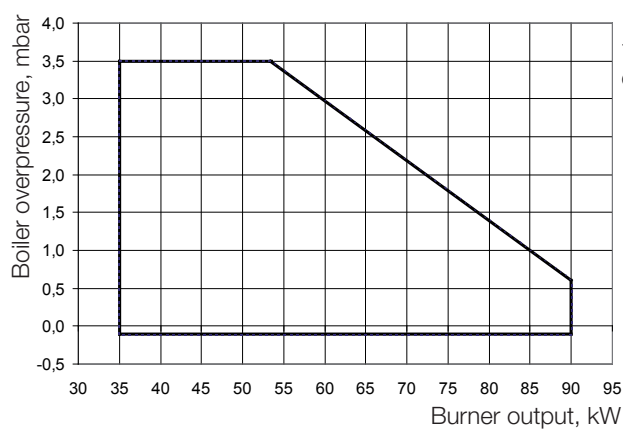
## 2.2 Model BF1 KS/KSV 76-24



Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
147	130	114
224	207	191

### 2.2.1 Burner output/ Basic settings

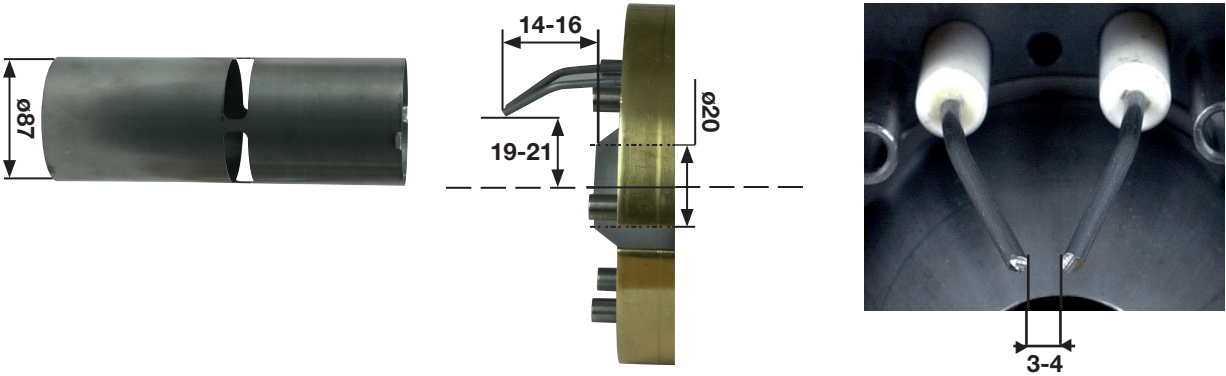
3,0 - 7,6 kg/h  
35 - 90 kW



Scale value applies to 0 mbar furnace pressure.



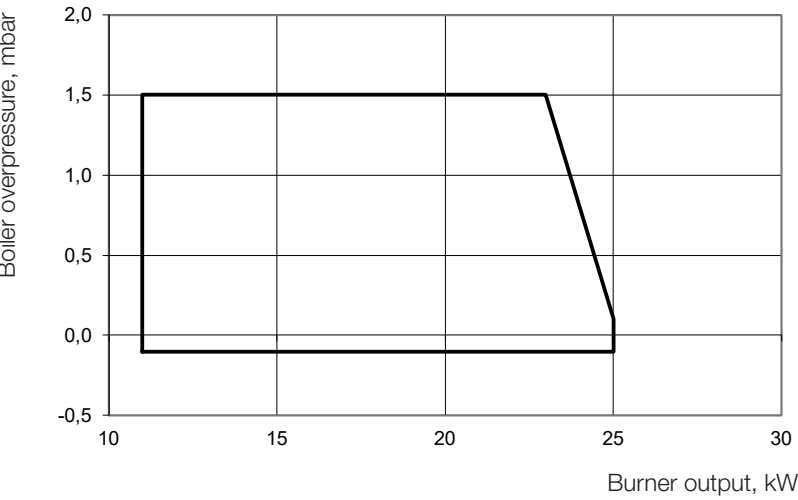
2.3 Model BF1 M1V 87-20



Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
247	230	214

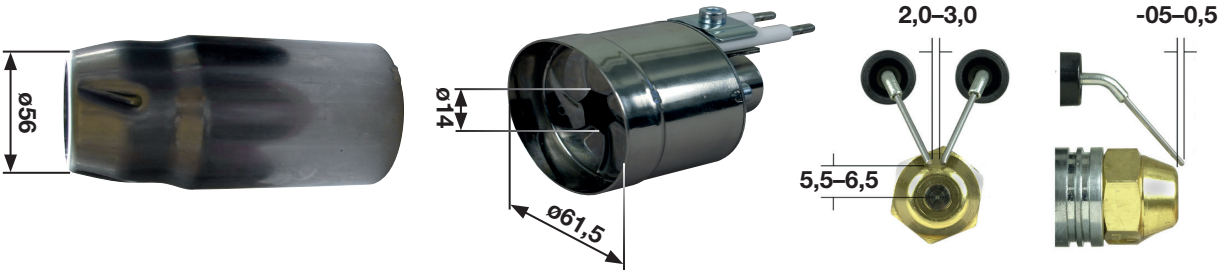
2.3.1 Burner output

0,9 - 2,2 kg/h  
 11 - 25 kW



Scale value applies to 0 mbar furnace pressure.

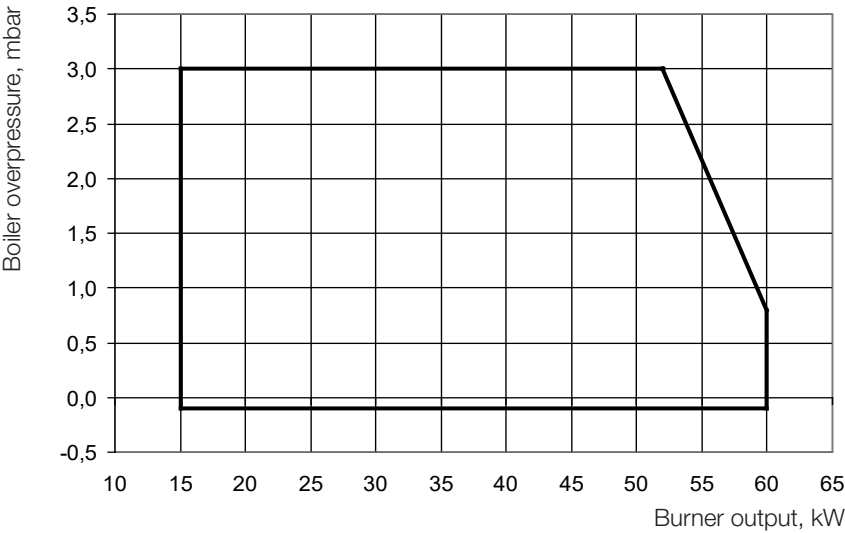
2.4 Model BF1 N1V 56-14/BF1 N1 56-14



Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
131	114	98

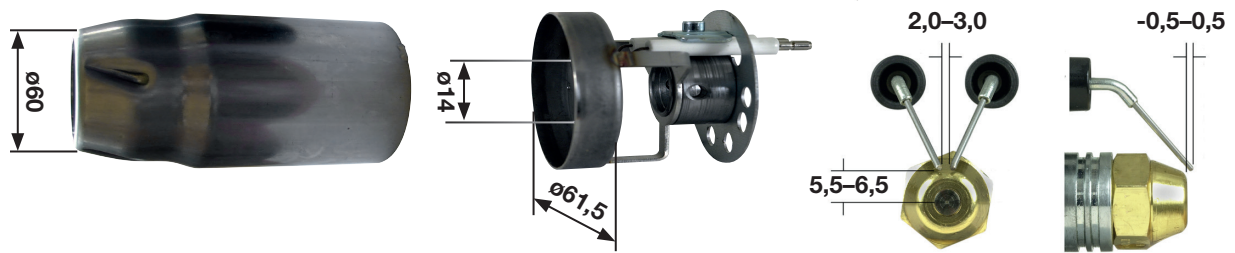
2.4.1 Burner output

1,3 - 5,1 kg/h  
15 - 60 kW



Scale value applies to 0 mbar furnace pressure.

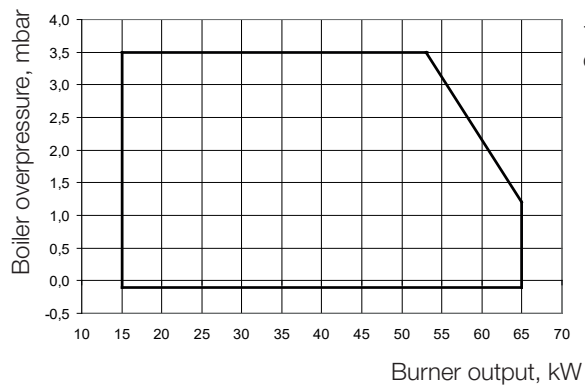
## 2.5 Modell BF1 NU1V 60-14



Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
131	114	98
181	164	148

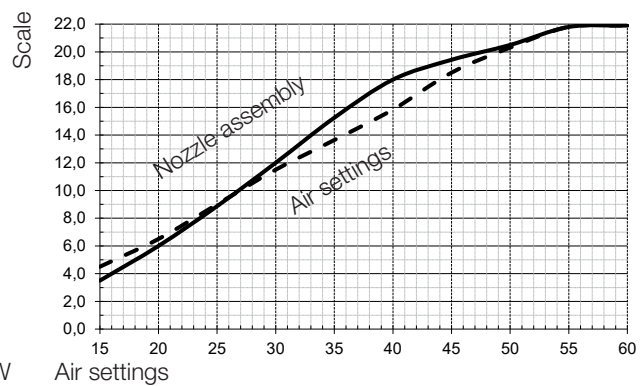
### 2.5.1 Burner output

1,3 - 5,5 kg/h  
15 - 65 kW



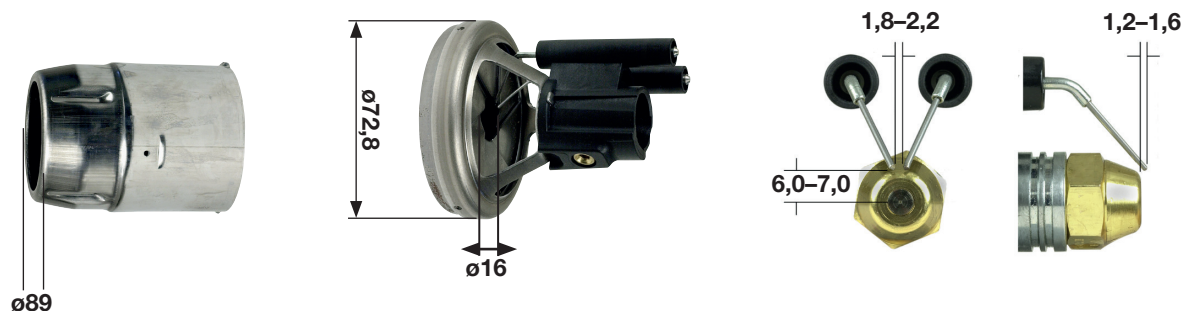
### 2.5.2 Basic settings

Nozzle assembly ———  
Air settings - - - - -



Scale value applies to 0 mbar furnace pressure.

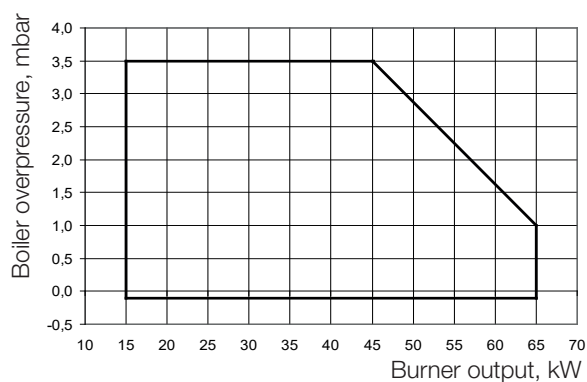
## 2.6 Modell BF1 R 69-16/BF1 RV 69-16



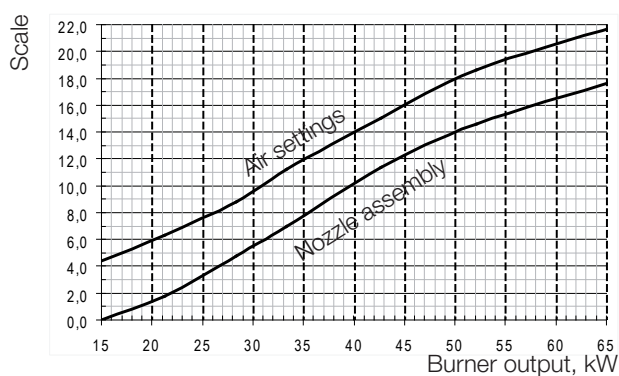
Length of blast tube	Protrusion from flange, measurement B	
	Flange	
	1	2
131	114	98

### 2.6.1 Burner output

1,3 - 5,5 kg/h  
15 - 65 kW



### 2.6.2 Basic settings



Scale value applies to 0 mbar furnace pressure.

## 2.7 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
	10 bar (7–12 bar) Kerosene

## 2.8 Nozzle table, 7-15 bar

Pump pressure, bar

Gph	7		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	kg/h	kW
0,35	1,13	13	1,21	14	1,28	15	1,35	16	1,42	17	1,48	17	1,54	18	1,60	19	1,65	19
0,40	1,22	14	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	1,56	18	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	1,98	23	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	2,23	26	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	2,46	29	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	2,77	32	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	3,11	37	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	3,55	42	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	3,72	44	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	3,94	47	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	4,33	51	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	4,89	58	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	5,09	60	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	5,48	65	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	6,21	74	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	6,99	83	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>.

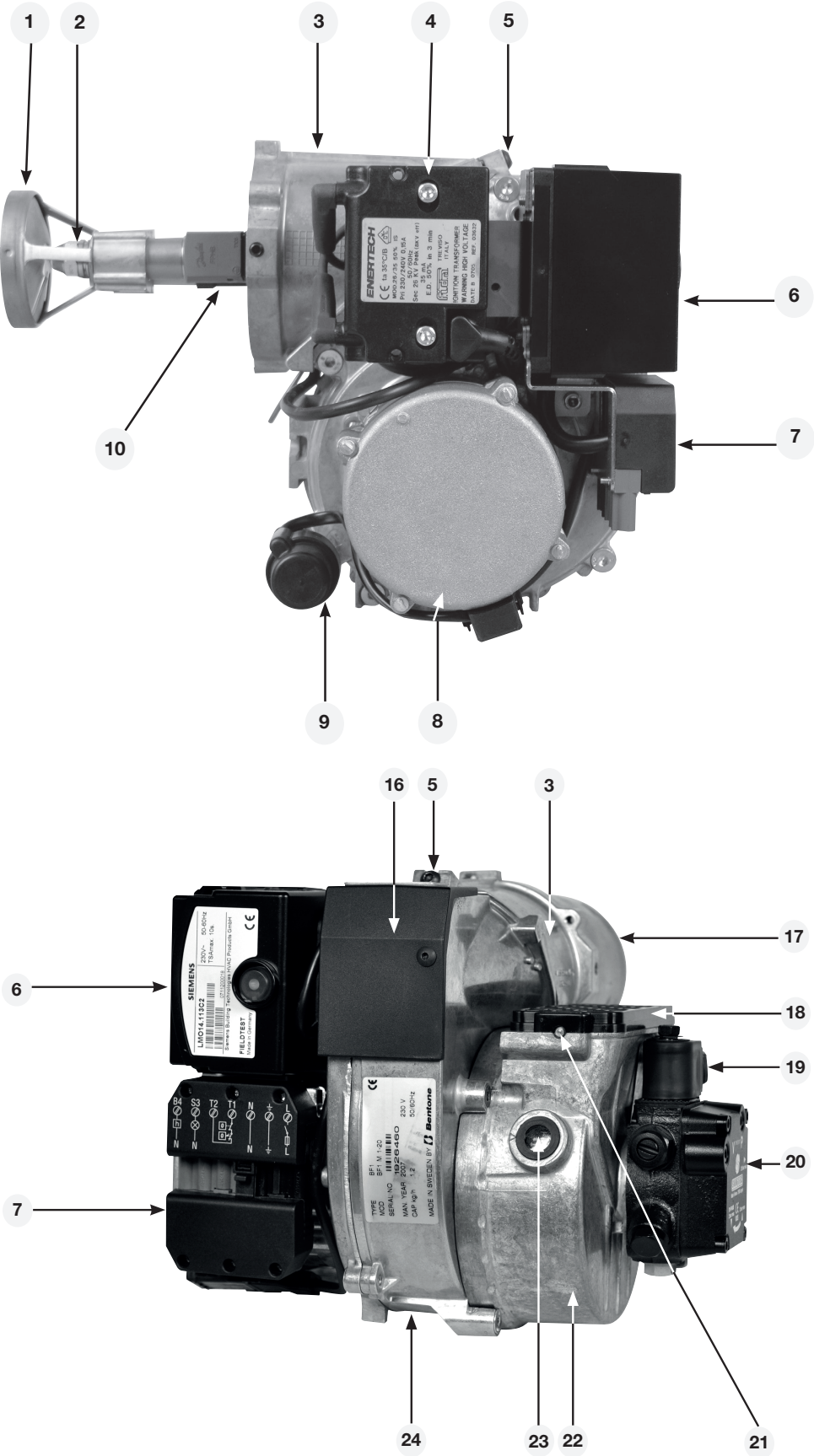
### 2.8.1 Burner with preheater

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).

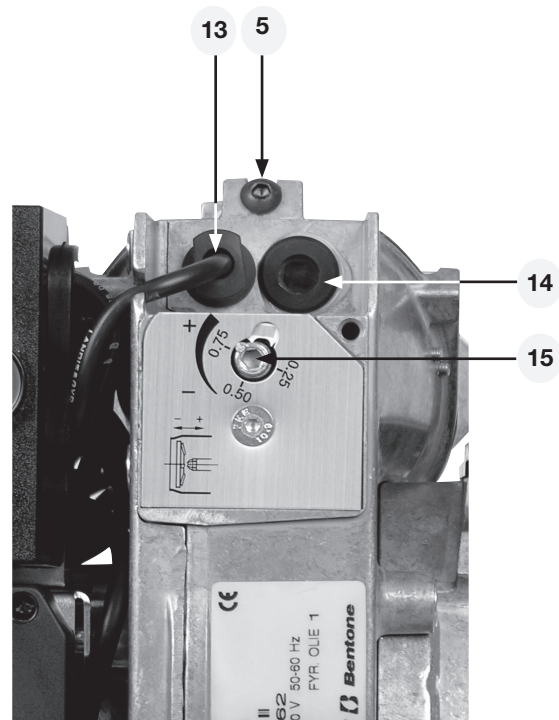
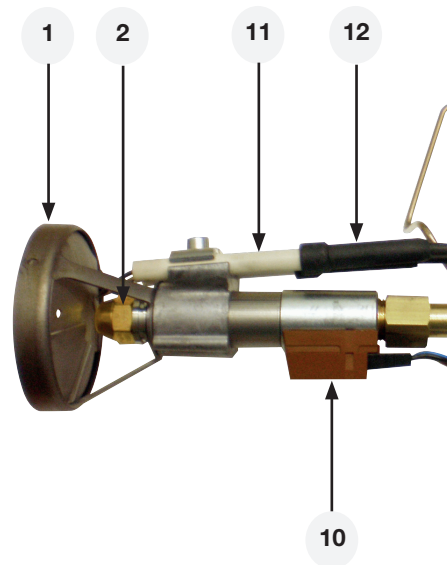


2.9 Description



## 2.9.1 Components

1. Brake plate
2. Nozzle
3. Fan housing, front
4. Ignition transformer
5. Separating screw
6. Oil burner control
7. Electrical contact X1 (refer to wiring diagram)
8. Motor
9. Capacitor
10. Preheater, where fitted
11. Ignition electrode
12. Ignition cable
13. Photoresistor
14. Inspection glass
15. Nozzle assembly adjustment
16. Cover plate
17. Blast tube
18. Grid
19. Solenoid valve
20. Oil pump
21. Air regulator
22. Air intake
23. Air flow indicator
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.

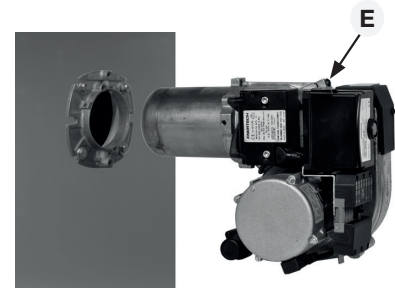
## 3.7 Burner installation

### 3.7.1 Hole pattern

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

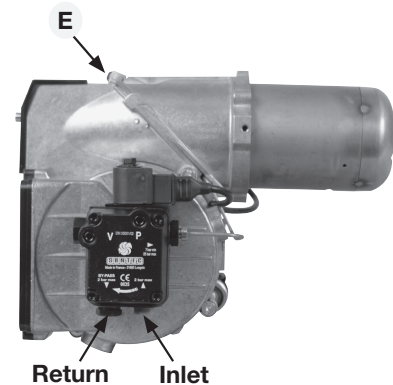
### 3.7.2 Burner installation

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

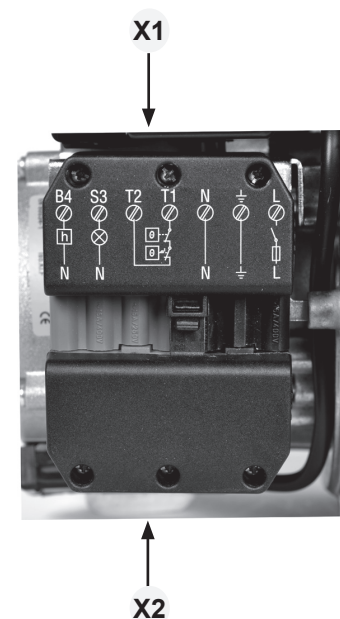
1. Check the oil pipe dimensions. (Refer to Pump Instructions.)
2. The oil filter should be installed in the oil supply line. If an air separator is fitted, the oil filter should be installed before the air filter to increase the life span of the filter.
3. For one-pipe systems the return plug must be 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, X2 in accordance with the wiring diagram.

1. Disconnect the power at the main switch.
2. Wire the Eurostecker X2 as in alt. 1–3 (refer to Electrical equipment).
3. Connect the Eurostecker X2 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

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 FU 63-16/FUV 63-16

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

Because of preheater, output is adjusted upward for choice of nozzle according to table.

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
* Calorific 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 FU 63-16).

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



### 4.1.3 Nozzle assembly adjustment

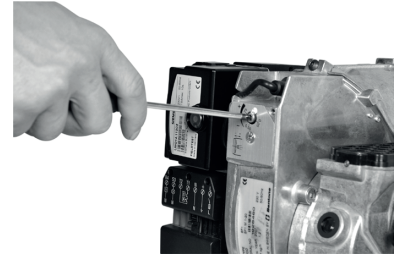
The burner is fitted with a regulator which changes the brake plate position in the blast tube. This is used to set the correct pressure drop across the combustion assembly and thereby achieve good combustion without pulsation.

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

#### Brake plate setting

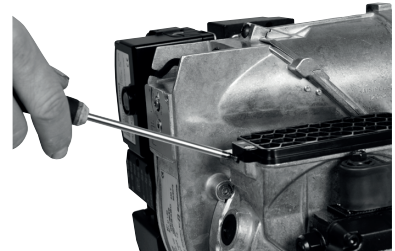
- Less diffusion: turn screw to left.
- More diffusion: turn to right.

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



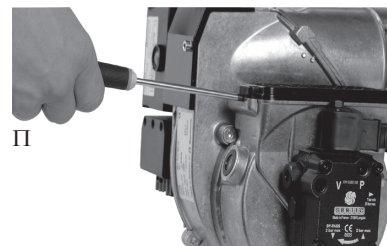
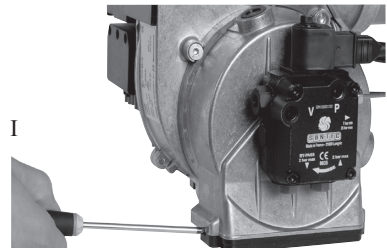
### 4.1.4 Air intake adjustment

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.



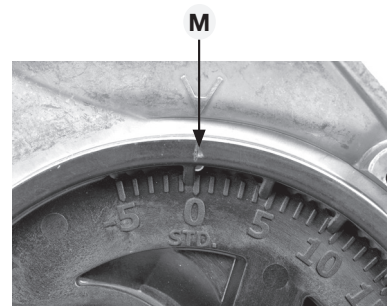
### 4.1.5 Method of adjusting air quantity

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.)

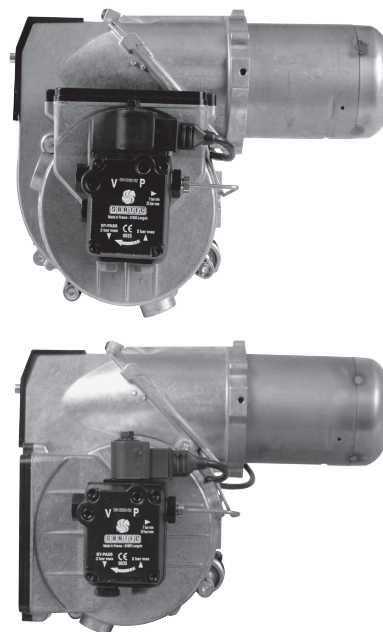


### 4.1.7 Air intake rotation

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 left.

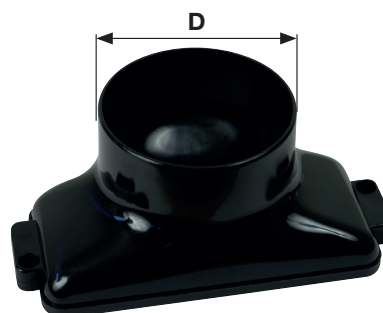
To rotate the air intake, undo the three screws that fasten the air intake and the two screws which retain the pump. Then rotate the air intake to the desired position and tighten the screws. The position of the air intake affects the airflow through the burner somewhat.

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.

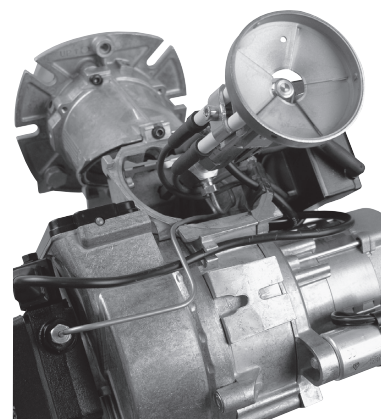
Exercise caution as parts which are exposed when the burner is taken apart can be hotter than 60°C. The installation engineer must be especially careful to ensure that no electrical wiring or oil lines are pinched or damaged during installation or service.



#### 5.1.1 Service position

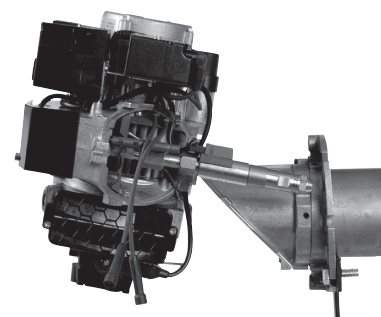
##### 5.1.1.1 Service position 1

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 to the left. If necessary, tighten the screw somewhat to ensure that the burner is suspended safely. Något för att få brännaren att hänga säkrare.



##### 5.1.1.2 Service position 2

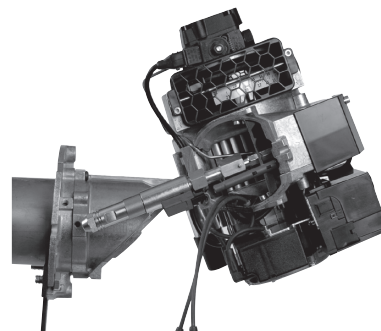
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. Undo the screw which fastens the burner front piece to the fan housing, but only so much as to allow the fan housing to be removed from the burner front piece.
3. Remove the fan housing from the burner front 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 to the left.



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

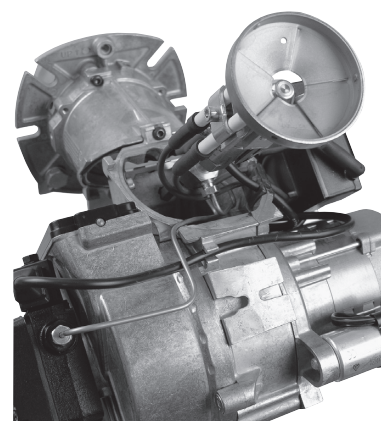
### 5.1.1.3 Service position 3

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 to the left.



### 5.1.2 Combustion assembly service

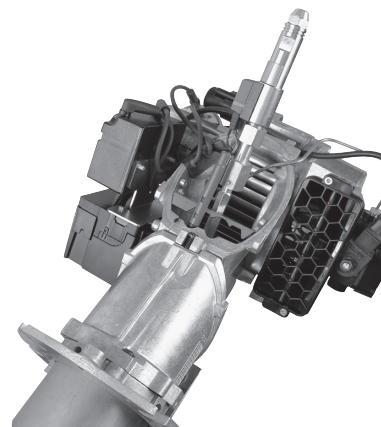
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 1 may be used.
3. Carry out a visual inspection of the combustion assembly and check the various parts for defects.
4. Undo and remove the brake plate and the electrode package 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.

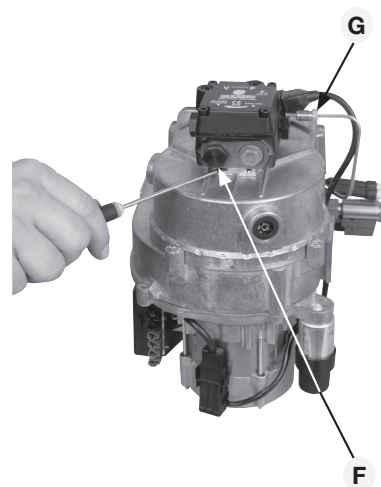
### 5.1.3 Preheater replacement

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.



### 5.1.4 Oil pump replacement

1. Switch off the power at the main switch and disconnect the Eurostecker.
2. Disconnect the oil hoses from the oil pump.
3. If so desired, service position 3 may be used.
4. Remove the solenoid cable from the pump.
5. Remove the connecting pipe (G) from the pump.
6. Undo the screws (F) and pull out the oil pump.
7. Install the oil pump in the burner. Tighten the screws and attach the connecting pipe (G). (It is important that the splines engage the pump coupling correctly.)
8. Connect the oil hoses. (For conversions from one- and two-pipe systems refer to the Pump instructions.)
9. Connect the Eurostecker and switch on the power at the main switch.
10. Start the burner, purge the pump, adjust to correct pressure and check combustion.

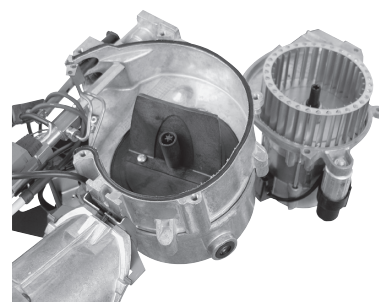
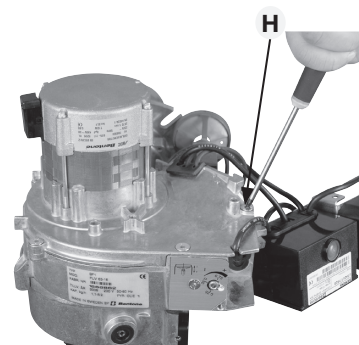


When servicing or replacing components that affect combustion, analyses and soot tests must be carried out on the installation.



### 5.1.5 Fan motor replacement

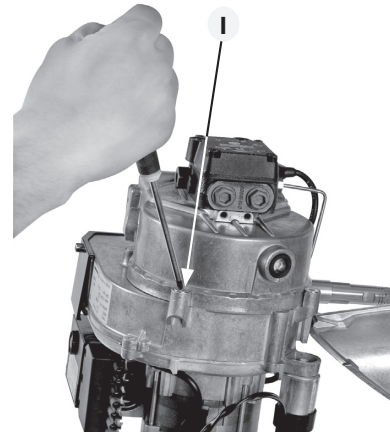
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 2 may be used.
3. Remove the electrical connection from the motor.
4. Remove the electrical box retaining screw.
5. Remove the cable conduit entry to the ignition electrodes and 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

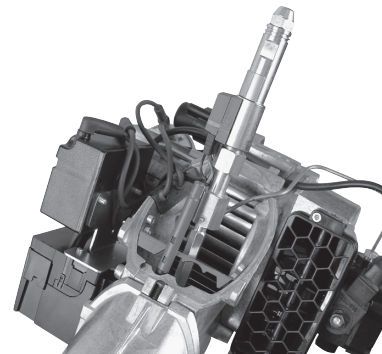
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 3 may be used.
3. Remove the solenoid cable from the pump.
4. Remove the connecting pipe from the pump.
5. Undo the air intake retaining screws (I).
6. Remove the air intake.
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

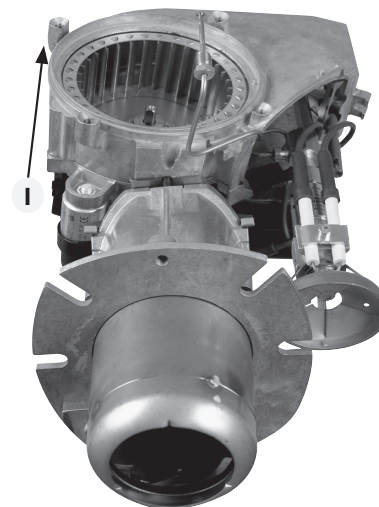
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 1 may be used.
3. Perform a visual inspection of the fan wheel. Spin the fan wheel with your finger, or carefully using a tool.
4. If the fan wheel is not very dirty, clean it 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

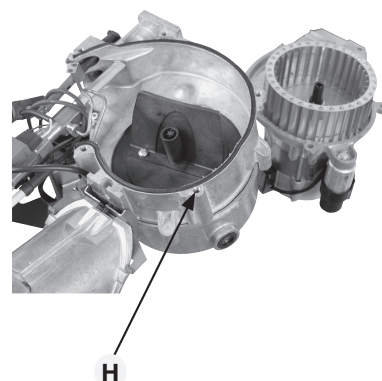
1. Switch off the power at the main switch and disconnect the Eurostecker from the burner.
2. If so desired, service position 3 may be used.
3. Remove the solenoid cable from the pump.
4. Remove the connector pipe from the pump.
5. Undo the air intake retaining screws (I).
6. Remove the air intake.
7. 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

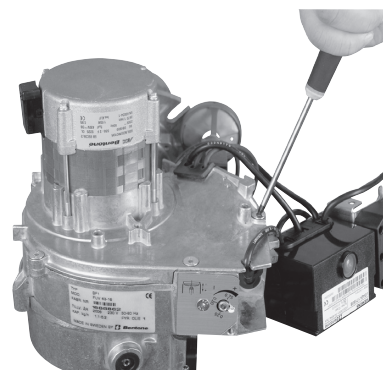
Check that the electrical console retaining screw is tight so that good contact to earth is established between the console and the burner body. Only use electrical components recommended by Enertech.



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. Instructions Pump

### 6.1 SUNTEC AS

#### Technical data AS47CK

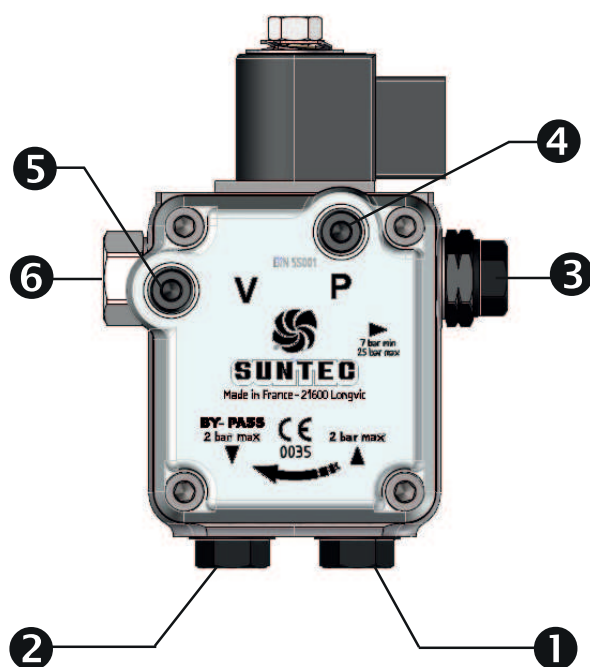
##### One or two-pipe system.

Viscosity range: 1-12 mm<sup>2</sup>/s

Pressure range: 7-14 bar

Rated voltage of coil: 220/240V 50/60 Hz

Oil temperature: max 60°C



#### Components

1. Suction line G 1/4"
2. Return line G 1/4" and internal by-pass plug
3. Nozzle outlet G 1/8"
4. Pressure gauge port G 1/8"
5. Vacuum gauge port G 1/8"
6. Pressure adjustment

## Applications for SUNTEC AS47C

The SUNTEC AS oil pump has a built in solenoid valve which controls the regulator cut-off valve giving fast cut-off and cut-on function independent of the rotational speed.

## Applications

Light oil, B10 heating oil/biofuel blend (as defined in DIN V51603-6) and kerosene.

- One or two-pipe system.

## Pump operating principle

The gear set draws oil from the tank through the built-in filter and transfers it to the valve that regulates the oil pressure to the nozzle line. All oil that does not go through the nozzle line will be dumped through the valve back to the return line in two pipe installation or, if it is a one-pipe installation, back to suction port in the gear set.

In that case, the by-pass plug must be removed from the return port, and the return port sealed by steel plug and washer.

The solenoid valve of the AS pump is of the "normally opened" type.

When the solenoid valve is non-activated, the by-pass channel between the

pressure and return sides of the valve is open. No pressure will then be built up to open the valve; it does not matter which speed the gear set has.

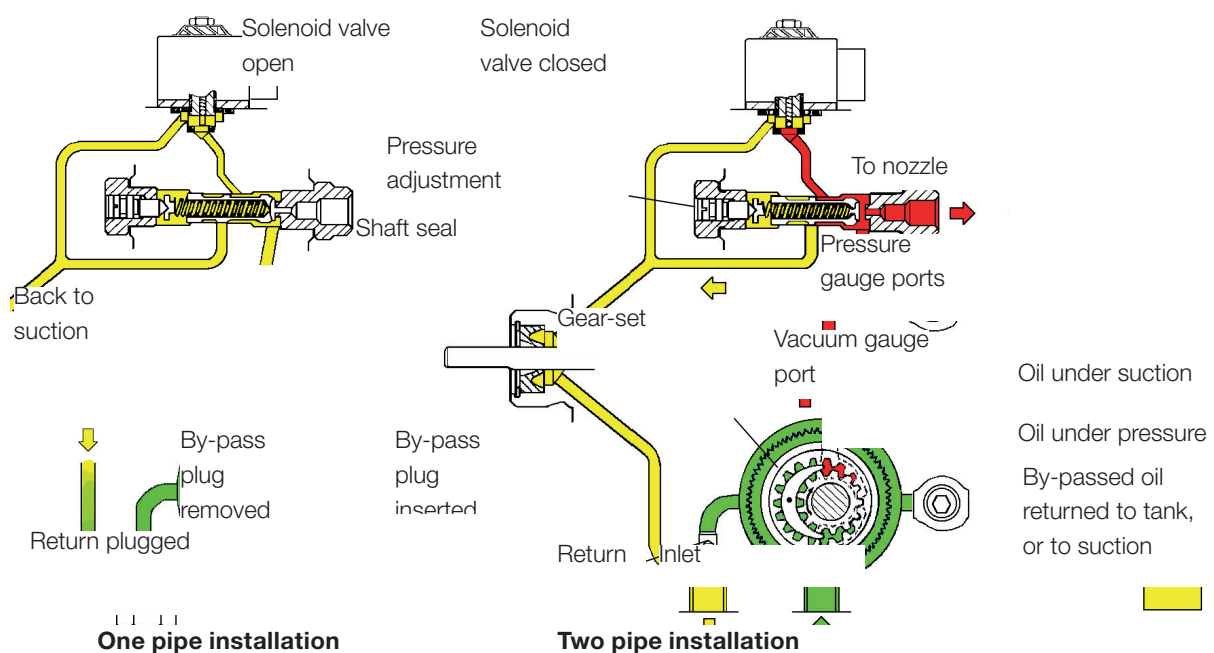
When the solenoid is activated, this by-pass channel is closed and because of the full speed of the gear set, the pressure necessary to open the valve will be built up very rapidly, which gives a very sharp cut-on function.

## Cut-off

When the burner stops, the solenoid opens the by-pass at the same moment, which drains all the oil down to the return, and the nozzle valve closes immediately.

This gives a very sharp cut-off function. The cut-on and cut-off can be actuated regardless of motor speed and have an extremely fast response.

When the solenoid is not activated, the torque requirement is low up to full motor speed.



## 6.1.1 Suction line tables

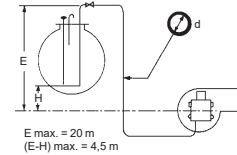
### 6.1.1.1 Overlying tank

#### 1-pipe system

Nozzle*/Düse* Gicleur*/Ugello* (US GPH)	0,50		0,60		0,80		1,00		1,50		2,00		4,00		6,00		9,50	
d (mm)	4		4		4		4		4		4		4		4		4	
H (m)	4		4		4		4		4		4		4		4		4	
0	90	75	56	45	30	150	22	113	11	56	150	7	37	119	4	23	74	150
0,5	100	83	63	50	33	150	25	126	12	63	150	8	41	133	4	26	83	150
1	110	92	69	55	37	150	27	139	13	69	150	8	46	146	5	28	92	150
2	131	109	82	65	44	150	33	166	16	82	150	10	55	150	6	34	109	150
3	152	126	95	76	50	150	38	192	18	96	150	12	63	150	7	39	127	150
4	172	144	108	86	57	150	43	218	21	109	150	14	72	150	8	45	144	150

\*A2L pumps : sum up the 2 nozzles / A2L-Pumpen : Summe der zwei Düsen  
pompe A2L : somme des 2 gicleurs / Perle pompe A2L agglungere n.2 ugelli

One pipe siphon feed system  
Einstranginstallation - Tank höher als Pumpe  
Installation monotubo en charge  
Impianti monotubo a sifone

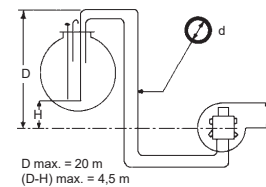


#### Two-pipe system

Pump/Pumpe Pompe/Pompa Q** (l/h)		35/45				55				65				75				95			
		60				77				102				130				150			
H (m)	d (mm)	4	6	8	10	6	8	10	12	6	8	10	12	8	10	12	14	8	10	12	14
0	2	15	50	124	11	38	96	150	7	27	71	150	20	54	116	150	16	46	100	150	
0,5	2	16	56	138	12	42	107	150	8	31	79	150	23	61	130	150	19	52	112	150	
1	2	18	61	150	13	47	118	150	9	34	88	150	26	68	144	150	21	57	124	150	
2	3	22	73	150	16	56	141	150	11	41	105	150	31	81	150	150	26	69	148	150	
3	4	26	85	150	19	66	150	150	13	48	122	150	36	94	150	150	31	81	150	150	
4	4	30	97	150	22	75	150	150	16	55	139	150	42	108	150	150	35	92	150	150	

\*\*Q = pump capacity @ 0 bar / Pumpenleistung bei 0 bar  
capacité de l'engrenage à 0 bar / portata della pompa a 0 bar.

Two pipe siphon feed system  
Zweistranginstallation - Tank höher als Pumpe  
Installation bitubo en charge  
Impianti bitubo a sifone





### 6.1.1.2 Underlying tank

#### 1-pipe system

With an underlying tank a 1-pipe-system is not recommended

#### Two-pipe system

Pump/Pumpe Pompe/Pompa Q** (l/h)	35/45 60				55 77				65 102				75 130				95 150			
H (m) \ d (mm)	6	8	10	12	6	8	10	12	6	8	10	12	8	10	12	14	8	10	12	14
0	15	50	124	150	11	38	96	150	7	27	71	150	20	54	116	150	16	46	100	150
0,5	13	44	109	150	9	33	84	150	6	24	62	132	17	48	103	150	14	40	88	150
1	11	38	95	150	8	29	73	150	4	20	54	115	15	41	89	150	12	34	76	144
2	7	26	66	138	5	19	51	107	2	13	37	80	9	28	61	116	7	23	52	100
3	3	14	37	79		10	28	60		6	20	44	4	14	33	65		11	28	56
4			8	19			5	14				9			6	14			4	11

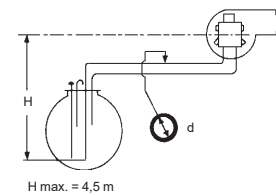
The suction line tables consist of theoretically calculated values where the pipe dimensions and oil velocity have been matched so that tur-bulences will not occur. Such tur-bulences will result in increased pressure losses and in acoustic noise in the pipe system. In addition to drawn copper piping a pipe system usually comprises 4 elbows, a non-return valve, a cut-off valve and an external oil filter.

The sum of these individual resi-stances is so insignificant that they can be disregarded. The tables do not include any lengths exceeding 100 m as experience shows that longer lengths are not needed.

The tables apply to a standard fuel oil of normal commercial quality according to current standards. On commis- sioning with an empty tube system the oil pump should not be run without oil for more than 5 min. (a condition is that the pump is being lubricated during operation).

The tables state the total suction line length in metres at a nozzle capacity of 9,5 Gph. Max. permissible pressure at the suction and pressure side is 2,0 bar.

Two pipe lift system  
Zweistranginstallation - Tank tiefer als Pumpe  
Installation bitube en aspiration  
Impianti bitubo in aspirazione



### 6.1.3 Check oil line seals

Once the burner has been installed and commissioned, the seals of the various coupling elements should be checked (A).

When a leak is detected, it is usually sufficient to tighten the coupling element that is leaking.



Use caution when operating the burner, surfaces may be hot.

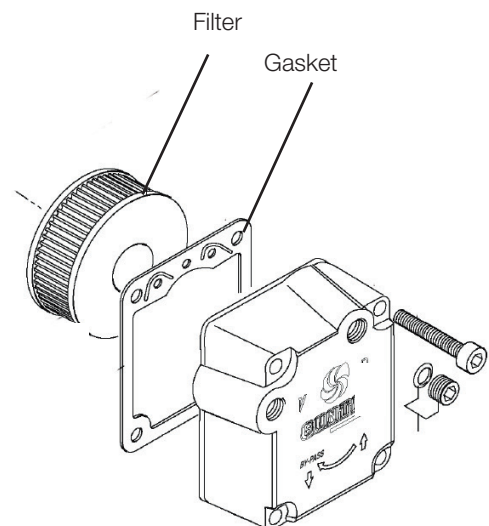


When servicing oil bearing components, check for oil leakage when the burner is commissioned after servicing.

### 6.1.2 Replacement of pump filter

#### Removal and installation

1. Close the oil supply to the burner
2. Loosen the pump cover's screws.
3. Remove the filter and gasket
4. Mount new gasket and filter
5. Refit the cover
6. Open the oil supply
7. Start the burner and check seals and combustion



### 6.1.4 Replacing the solenoid valve (pump)

#### Removal and installation



If the burner is directly connected, ensure that all components on the burner are without power.

1. Make sure the power to the burner is switched off
2. Disconnect the solenoid valves' electrical cables
3. Loosen the nut holding the magnet terminal
4. Loosen the screws securing the valve's mounting plate
5. Remove the valve
6. Check to ensure the correct valve is in place
7. Install the new valve and refit the other parts in the reverse order.
8. Check functionality

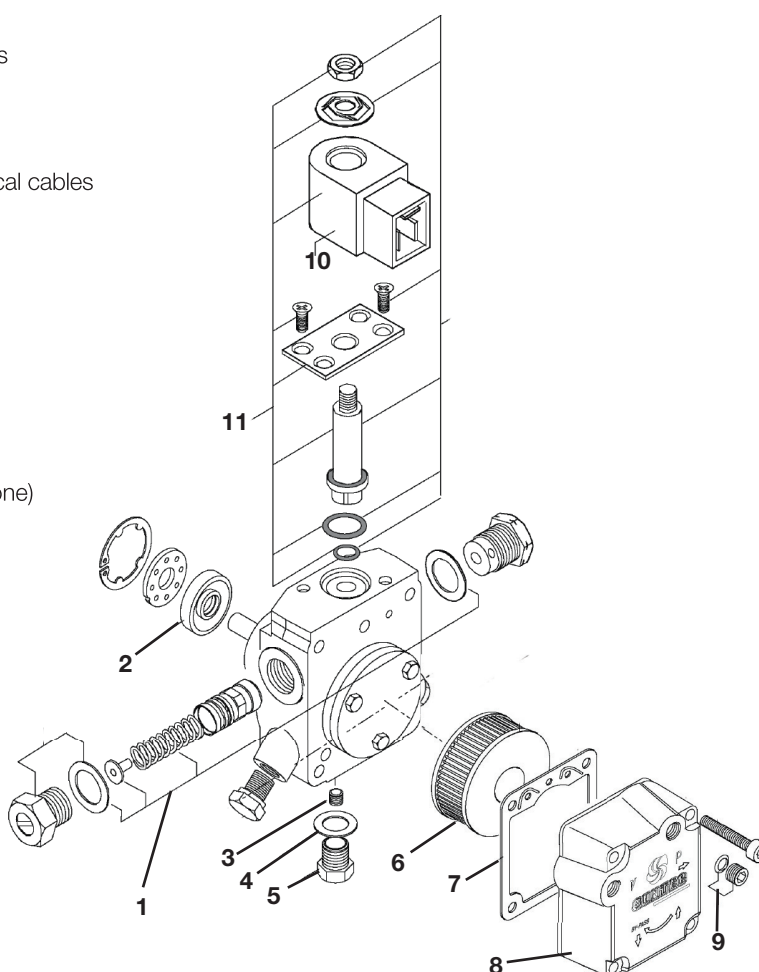
### 6.1.5 Replacing the gasket seal (pump)

#### Removal and installation

1. Disconnect hoses, oil pipes, and electrical cables
2. Loosen the pump (screw J)
3. Loosen the gasket seal's locking rings
4. Remove the old gasket seal (2)
5. Install the new gasket seal
6. Connect hoses, oil pipes, and electrical cables
7. Test run and check seals

#### Components

1. Pressure regulator
2. Shaft seal kit (lip seal + protective cone)
3. By-pass plug
4. G 1/4 gasket
5. G 1/4 steel plug (1-pipe system)
6. Filter
7. Cover gasket
8. Cover
9. Pressure gauge port or vacuum gauge port screw, O-ring
10. Coil
11. Tube assy



## 6.2 Danfoss BFP 11 and BFP 21

### 6.2.1 Technical data

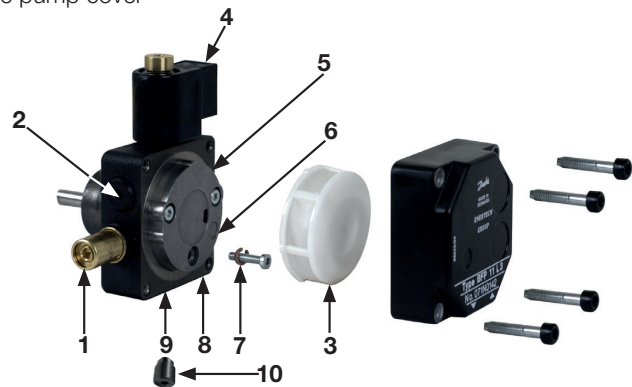
Viscosity range:	1,3–12,0 mm <sup>2</sup> /s
Pressure range:	7–15 bar
Oil temperature:	–10 to +70°C

### 6.2.2 Components

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

### 6.2.3 Filter replacement BFP 11

Cut off the power and shut off the oil supply. 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 off. Replace the old filter with a new one. Replace the cover, tighten lightly. Do not forget to replace the gasket. Open the oil supply and switch on the power.



#### 6.2.3.1 One-pipe system

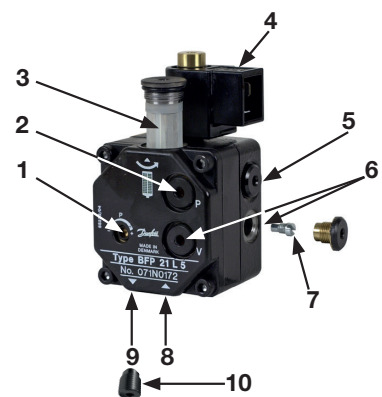
Remove the filter (refer to Filter replacement BFP 11), install the horseshoe washer (7), plug the return line (9) with the metal plug (10) G 1/4", re-install the filter.

### 6.2.4 Filter replacement BFP 21

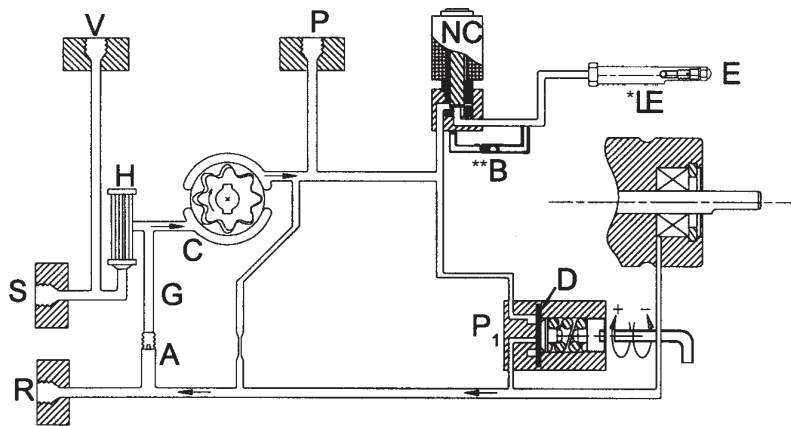
Cut off the power and shut off the oil supply. Remove the filter screw from the cover with a 4 mm Allen key and pull out the filter insert. If necessary a screwdriver may be used between the filter and the screw to carefully pry out the filter. Replace the old filter with a new one by pressing the new filter down onto the filter screw. Replace the insert, tighten lightly. Do not forget to replace the O-ring. Open the oil supply and switch on the power.

#### 6.2.4.1 One-pipe system

Remove the return plug (7), plug the return line (9) with the metal plug (10) G 1/4"



### 6.2.5 Function BFP 11 and BFP 21



When the pump is started oil is drawn from the suction connection (S) through the filter (H) to the gear wheel pump's suction side (C). From there the oil is conveyed to the pressure side of the gear wheel pump, where the oil is pressurized. The pressure is controlled and held constant at a set value by the regulator valve ( $P_1$ ) via the membrane (D). The regulator valve ( $P_1$ ) distributes the oil from the gear wheel pump (C) to the nozzle connection (E) and the pump return side (R). The amount of oil used is determined by the pressure set at the regulator valve ( $P_1$ ) and by the size of the oil nozzle in the nozzle line.

**The valve ( $P_1$ ) functions as follows:**

- When the oil has reached opening pressure the passage to the return side opens.
- The membrane and the spring keep the pressure constant at the pre-set value.
- When the pump is overloaded, i.e. if more oil is demanded from the gear wheel pump than it is able to deliver under prevailing circumstances, the oil pressure drops below the set value, whereupon the valve shuts the return side (R) to the membrane (D) and reverts to the start position

**This can be remedied by:**

- Reducing the pump pressure.
- Reducing the amount of oil delivered, i.e. replacement with a smaller nozzle.
- Replacement with a larger capacity pump.

### 6.2.6 LE-S System

#### **Note!**

The \*LE-S pump has an integrated check-valve function at the solenoid valve, allowing the oil pressure to expand backwards during standstill. The desired function of avoiding the formation of drops on the nozzle can only be achieved by using both the LE-S pump and the LE valve built into the FPHB-LE preheater.

The system is only used on the BFP pump fitted with a solenoid valve. The pumps are given a different designation, e.g. BFP 41L3 LE-S, but do not differ on the outside from the normal BFP pump.

BFP LE-S pumps cannot be converted into standard pumps, and the standard BFP pump cannot be converted to the LE-S system.

The LE valve must be fitted when using the LE-S pump. The LE valve may not be excluded unless a BFP standard pump without the LE-S function is used instead.

The check valve \*\*B allows the oil trapped between solenoid valve NC and the LE valve in the preheater to expand backwards in the system to the return port.

The cut-off valve does not cause any extra pressure drop, i.e. at a pump pressure of 10 bar the spraying pressure will also be 10 bar.

### 6.2.7 Purging

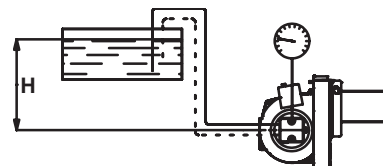
Purging air is only necessary in single-pipe systems. In two-pipe systems the pump purges air automatically through the return line.

## 6.2.8 Suction pipe tables BFP11 and BFP21

### 6.2.8.1 Overhead Tank

#### One-pipe system

Height m	4,0	3,5	3,0	2,5	2,0	1,5	1,0	0,5
Line diameters								
ø 4 mm	51	45	38	32	26	19	13	6
ø 5 mm	100	100	94	78	62	47	31	16
ø 6 mm	100	100	100	100	100	97	65	32



#### Two-pipe system

Height m	4,0	3,5	3,0	2,5	2,0	1,5	1,0	0,5
Line diameters								
ø 6 mm	33	31	29	27	25	23	21	19
ø 8 mm	100	98	91	85	79	72	66	60
ø 10 mm	100	100	100	100	100	100	100	100

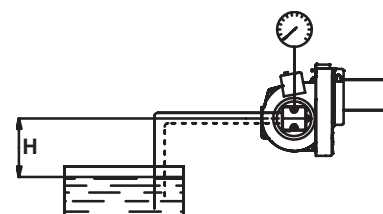
### 6.2.8.2 Underlying Tank

#### 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	-1,5	-2,0	-2,5	-3,0	-3,5	-4,0
Line diameters									
ø 6 mm	17	15	13	11	9	7	5	3	1
ø 8 mm	53	47	41	34	28	22	15	9	3
ø 10 mm	100	100	99	84	68	53	37	22	6



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. (This presupposes that the pump is lubricated with oil when running.) The tables give the total suction line length in meters with a nozzle capacity of 2.5 kg/h. Max. permissible pressure on the suction and pressure lines is 2.0 bar.

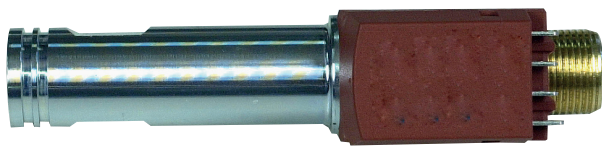
## 7. Preheater

### 7.2.1 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.



### 7.2.2 Function FPHE 5-LE

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.

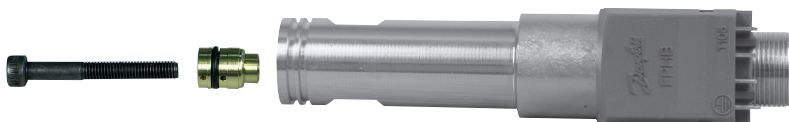
#### 7.2.2.1 LE-valve

FPHE 5-LE has an integrated shut-off valve which prevents oil drips at start and stop. When a normal preheater is used before start, the oil expands and a small quantity of oil flows out of the nozzle orifice and wets the outside of the nozzle.

Also, when the burner stops, a small quantity of oil forces its way out after the flame has gone out, especially when there are hot components which radiate heat back to the nozzle.

The cut-off valve in the FPHE 5-LE is located immediately behind the nozzle. It opens at  $\approx 6.5$  bar and closes at  $\approx 2.5$  bar.

In order to achieve the intended effect when the pressure of the trapped oil increases, it must be evacuated back to the pump. This is made possible by the pump solenoid valve's return-valve function.



The cut-off valve can be pulled out of the preheater with the aid of an M5 screw as illustrated. When the valve is re-installed, oil pressure pushes it to a position all the way forward behind the nozzle filter so that the volume in front of the valve is as small as possible.



## 8. Replacement of electrical components

1. Switch off the mains power.
2. Note the connection of the existing component.

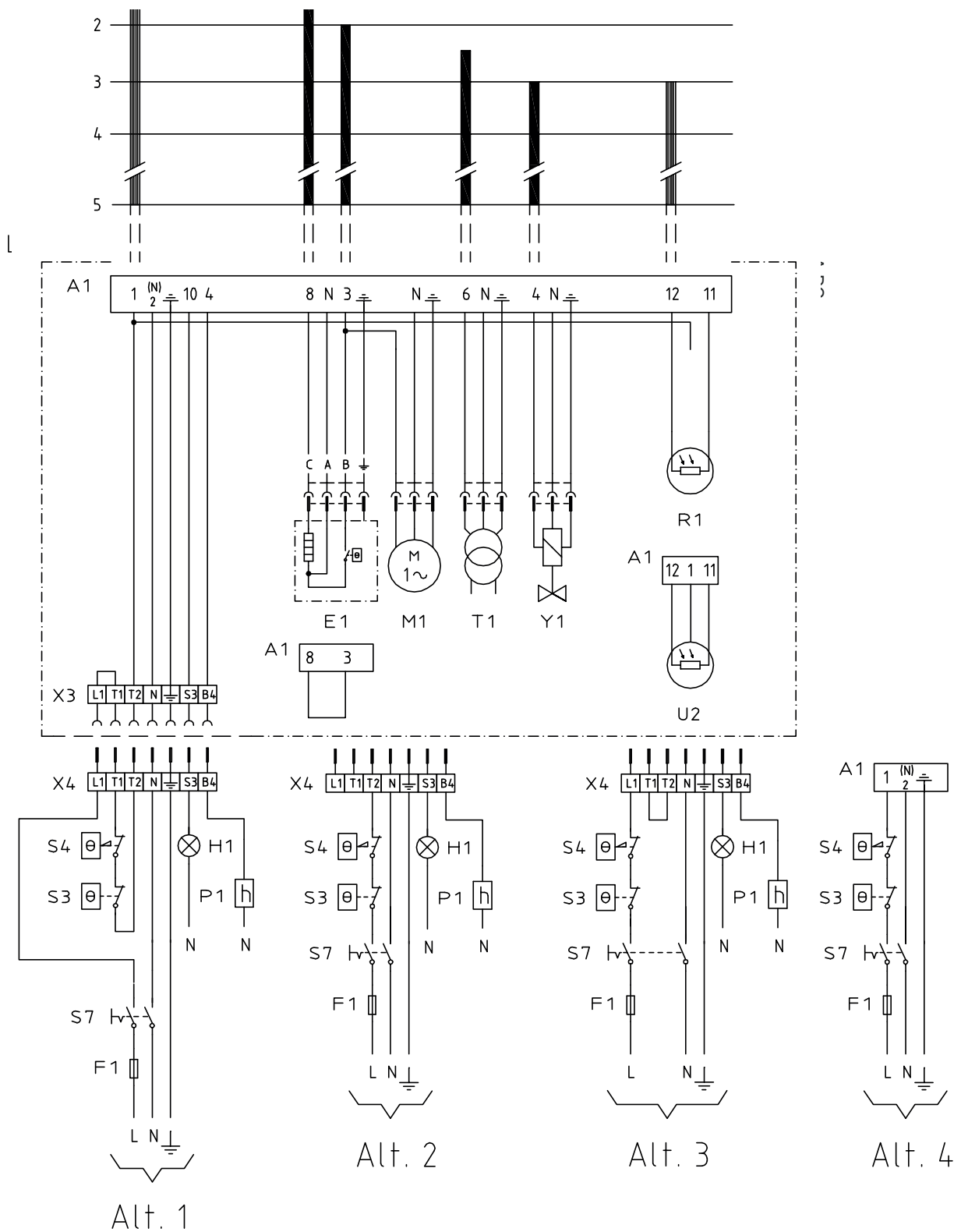


If the burner is directly connected, ensure that all components on the burner are without power.

3. Remove the existing component.
4. Install the new component using the same wiring as the existing component or the specified alternative arrangement.
5. Turn on the mains power.
6. Check the function of the new component.
7. Start the burner. Check combustion.\*

## 9. Electrical equipment LMO1..2..4..

### 9.1 Wiring diagram



### 9.1.1 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	Flame detector 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.

### 9.1.2 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.

### 9.1.3 Technical data

	LMO14	LMO24	LMO44
Pre-ignition period:	15 s	25 s	25 s
Pre-ventilation period:	16 s	26 s	26 s
Post-ignition period:	10 s	5 s	5 s
Safety period:	< 10 s	< 5 s	< 5 s
Re-connection after release:	< 1 s	< 1 s	< 1 s
Reaction time flame extinction:	< 1 s	< 1 s	< 1 s
Ambient temperature:	-5 - +60°C	-5 - +60°C	-20 - +60°C
Min. current with flame:	45 µA dc	45 µA dc	45 µA dc
Max current when dark, start:	5,5 µA dc	5,5 µA dc	5,5 µA dc

#### Photocell current checks

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

### 9.1.4 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

### 9.1.5 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

## 10. Fault Location

### 10.1 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	Incorrect combustion apparatus settings	Check the flame monitor is clean and can register light
Burner trips	Flame monitor does not register light	Check with using new photocell
	Defective flame monitor	Check using new oil burner control (Note: replacement of photocell recommended if oil burner control replaced)
Motor starts	Defective oil burner control	Check the oil supply to the burner and that there are no air bubbles in the pump
Burner pre-ventilates		Check function of solenoid
No flame formed		Check flame monitor does not register ambient light
Burner trips		Check high voltage wiring and ignition electrodes
	No oil	Check preheater function
	False light	
	No spark	
Motor does not start	Preheater does not get up to temperature.	

### 10.2 Burner will not start after normal use

Symptom	Causes	Remedies
Burner does not start	Fuse blown	Check and replace fuse as necessary. Investigate cause of fault
	Boiler thermostat has not reset	Adjust thermostat
	Preheater does not get up to temperature	Check preheater function
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
Burner stops	No oil supply	Adjust the burner
	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	
	Preheater temperature too low	Check preheater function
	New oil type	Adjust the preheater's set operating temperature
		Check that the oil used has the physical parameters that the burner is rated for. If not, change the oil.

## 10.3 Delayed ignition

Indications	Causes	Remedies
Burner pulsates at start with hot flue gases	Excessively strong draught	Correct boiler draught
	Excessive pressure drop across the brake plate	Adjust the burner
	Preheater temperature too low	Check preheater function
	New oil type	Adjust the preheater's set operating temperature
Burner pulsates at start	Nozzle partially blocked	Ensure that the new oil's physical parameters are within the limits for which the burner is designed. If not, change the oil.
		Replace nozzle
		Check and adjust
		Check and correct
	Oil pressure too low	Check and tighten
		Replace
		Check the ignition electrode setting, (see technical data)
		Check that the ignition electrodes are not damaged
	Flue is blocked or damaged	Check high voltage cables
		Check position of nozzle assembly setting
		Correct boiler draught
		Adjust the burner
	The fan wheel is slipping on the shaft	Check preheater function
		Adjust the preheater's set operating temperature
		Ensure that the new oil's physical parameters are within the limits for which the burner is designed. If not, change the oil.
	Pump coupling loose or worn	
	Preheater blocked	
	Delayed ignition	
	Excessively strong draught	
	Excessive pressure drop across the brake plate	
	Preheater temperature too low	
	New oil type	

## 10.4 Noise in pump

Indications	Causes	Remedies
The burner pump emits noise during start	Insufficient negative pressure on the suction side pump	Check the oil system in order to reduce pressure drop
The burner pump emits noise during operation		Rebuild the oil system to form a solution with a transport oil pump
		Check that the oil used has the physical parameters that the burner is rated for. If not, change the oil.
		Temperature of the oil from the tank is too low, increase the temperature of oil from tank
		Clean the pump filter

## 10.5 Pump pressure

Indications	Causes	Remedies
The burner pump can not build up pressure	No oil	Check that there is oil and that it reaches the pump
	Oil viscosity too low	Check that the oil reaching the pump has the physical parameters that the pump can handle. Change the oil or the pump's oil parameters
	Pump worn	Replace the pump
	Pump run using impure oil that has worn the pump out prematurely	Replace pump and install self-cleaning filter in the oil system
	Blocked pump filter	Check, clean pump filter



# 11. Log of flue gas analysis

Owner	Adresss	Tel. no:
Installation		Tel. no:

## Boiler

Type	Make	Power kW
------	------	----------

## Bentone Burner

Type	Model	Serial no.	Fuel
------	-------	------------	------

	Step 1	Step 2	Step 3
Draught in fireplace			
Fan Press mbar			
Filter smoke number			
CO <sub>2</sub>			
O <sub>2</sub>			
NOx			
CO			
Flue gas temp. °C			
Setting brake disc			
Setting Air damper			
Pump pressure bar			
Nozzle			

Test performed / 20	Address
Test performed by:	Postal address
Company name:	Tel. no:

## 12. 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:

.....

Tel: .....

# 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)

Enertech AB  
Box 309  
S-341 26 LJUNGBY

Ljungby September 26<sup>th</sup>, 2017

Håkan Lennartsson  
Managing Director  
Enertech AB



