

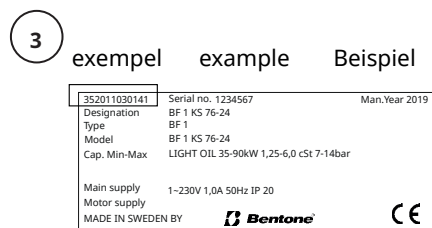
Providing sustainable energy solutions worldwide

Installation- and maintenance instruction

## **BF 1 FUV FAME/RME**

LMO14.113C2E

ANV47C



#### -sv

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# 1. General Information

The burner may only be used for its intended purpose in accordance with the product's technical data.

We reserve the right to make design changes and cannot be held liable for any misprints or typographical errors.

Modifying the design or using accessories or components that have not been approved by Enertech in writing is strictly prohibited.

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site.
- must be read prior to installation.
- is intended for use by authorised personnel.

## 1.1 Delivery inspection

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

## 1.2 Safety

### - before installation:

- Installation and work on the burner and associated system components may only be carried out by persons who have undergone relevant training.
- The product is packaged to prevent damage from occurring when handled – 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.



### - installation:

- The burner must be installed in accordance with local regulations for fire safety, electrical safety, and fuel distribution.
- The premises must comply with local regulations pertaining to use of the burner, and must have adequate air supply.
- The installation site must be free of chemicals.
- Fire extinguisher with Class BE recommended.
- Make sure when installing the burner that there is enough space to service the burner.
- The electrical installation must be professionally carried out in accordance with current mains electricity regulations and in a professional manner.
- Make sure that the burner is suitable for the application (see Technical Data).
- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces that affect components.



- Care must be taken by the installer to ensure that no electrical cables or fuel lines are pinched or otherwise damaged during installation or service.
- Flame tubes, fan wheels and air dampers, for example, may contain sharp edges.

**- before first start:**

- The burner must not be put into operation without proper safety and protection devices.
- Permitted ambient temperature during operation -10 to +60 °C. Max. 80% relative humidity, no condensation.
- The surface temperature of the burner's components may exceed 60 °C.
- Handle with caution – the burner has moving parts, and there is risk of crushing injuries.
- Seal inspections must be performed during installation and servicing to prevent leakage.
- 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.
- 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!



**- Operation:**

- Carry out all stipulated settings, service and inspection work within the set time.
- If the oil burner control has a solid red light, contact your installer.

### 1.3 General requirements FAME/RME

- The fuel must meet the requirements of standard EN 14214 for FAME.
- The fuel must be stored and used according to the manufacturer's instructions. It should typically be used within 6 months of manufacture. Fuel that is allowed to age loses its oxidation stability and produces aggressive constituents. These may cause oxidation damage to components in the oil system. The fuel should be stored in a cool and dark area.
- The RME tank must be made of metal or dark coloured plastics approved for the fuel.
- Burners fuelled by FAME (RME) are – and must be – equipped with parts designed for this fuel. This applies to oil-related parts such as the pump, solenoid valve, oil filter and hoses.
- Oil hoses must be of high-quality fluoride rubber or PTFE intended for FAME/RME, and the hoses must be fitted with fire-retardant sleeves in order to satisfy requirements according to EN-ISO 6806.
- The installation should be performed as a single-pipe system. Copper should be avoided the fuel system since the fuel and copper have an oxidising effect on each other.
- Annual cleaning and checking for the presence of water in the tank should be done to avoid corrosion and microorganisms.

## 2. Technical data

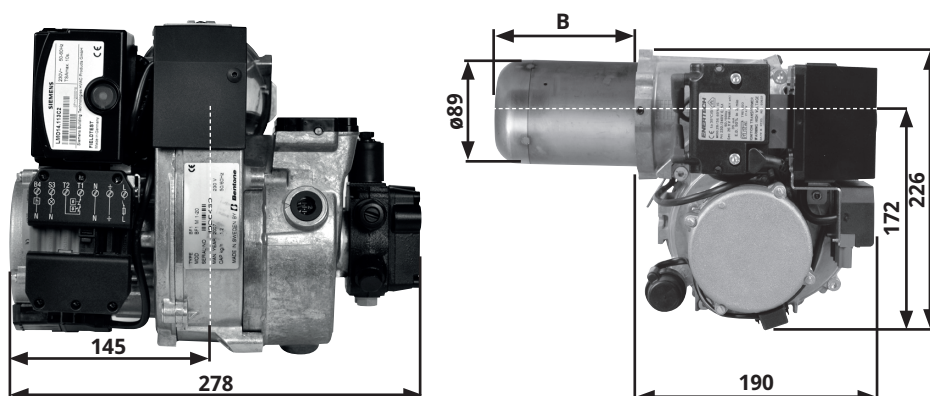
### The burner is intended for:

- Operation in installations according to EN 303 and EN 267.  
When operating with a hot air boiler, the LMO24.255 or LMO44.255 control unit must be used.

### Fuels:

- FAME/RME according to EN 14214.
- HVO/XTL according to EN 15940.
- Fuel oil according to DIN 51603-1.
- Fuel oil A Bio 10 according to DIN 51603-6.

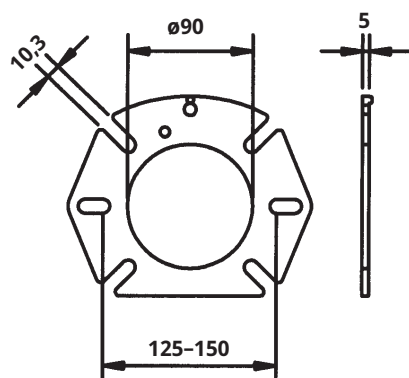
### 2.1 Dimensions BF 1 FUV



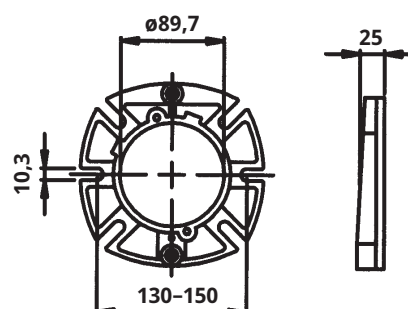
| Length of<br>flame tube | Protrusion from flange,<br>measurement B |          |
|-------------------------|--|----------|
|                         | Flange 1                                 | Flange 2 |
| 102                     | 85                                       | 69       |
| 132                     | 115                                      | 99       |

#### 2.1.1 Dimensions, flanges

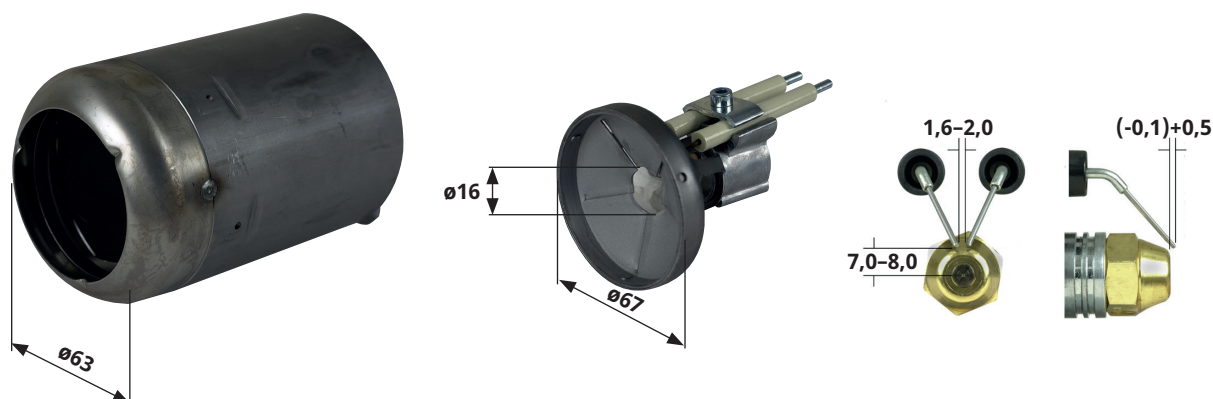
Flange 1



Flange 2



## 2.2 Model BF 1 FUV 63-16



## 2.3 Technical specification

| BF 1                                     |                                   |
|--|-----------------------------------|
| Main supply <sup>1)</sup>                | 230V, 1~, 1.1/1.7A, 50/60Hz, IP20 |
| Max fuse rating                          | 8A                                |
| EI <sub>min</sub> preheater included     | 0.91A, 198W                       |
| EI <sub>max</sub> preheater included     | 1.04A, 226W                       |
| P <sub>SB</sub>                          | 0                                 |
| NO <sub>x</sub> -class                   | 4                                 |
| NO <sub>x</sub> (GCV) preheater included | 101mg/kWh                         |
| Noise level                              | 75dBA                             |

<sup>1)</sup> Max operating current, see data plate.

Measurements according to EN 15036-1:2006

Alt.1 The noise level of the burner can be reduced by equipping the burner with silencer. Installation must be done so it does not prevent air supply to the burner.

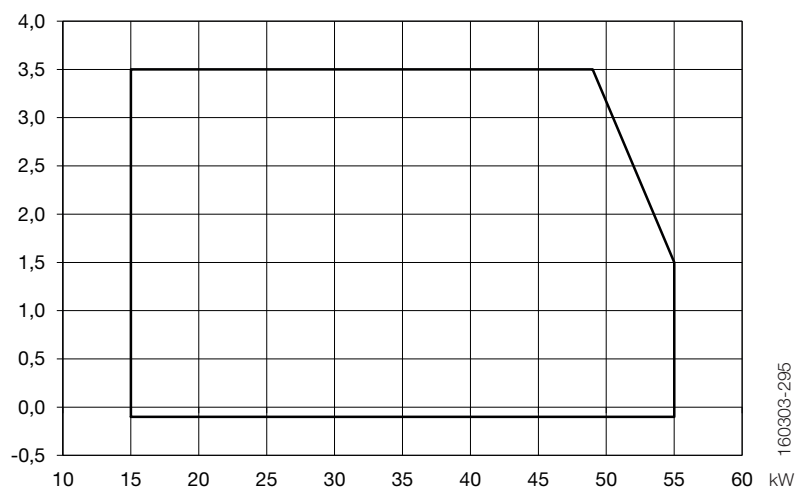
Alt.2 The burner's noise level can be reduced by connecting the burner's air intake to the air duct that opens into an appropriate location. Installation must be done so it does not prevent air supply to the burner.

## 2.4 Working area

1.3-4.6 kg/h

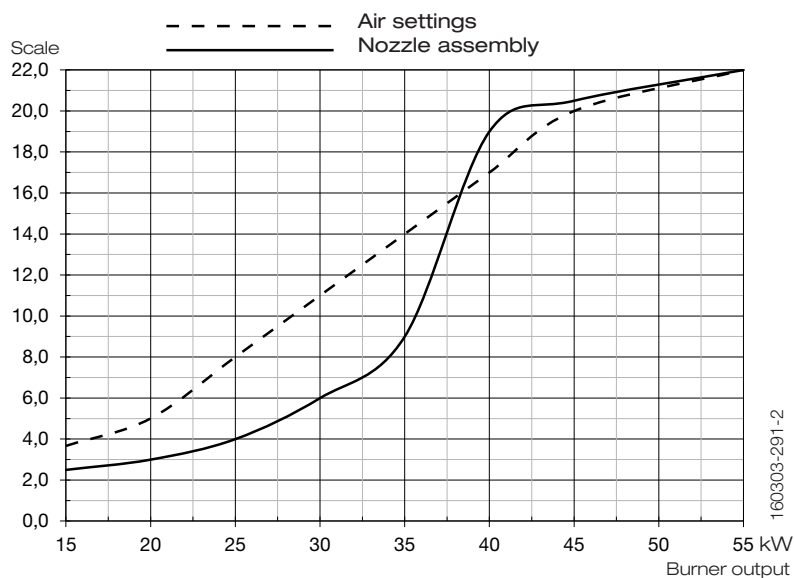
15-55 kW

mbar



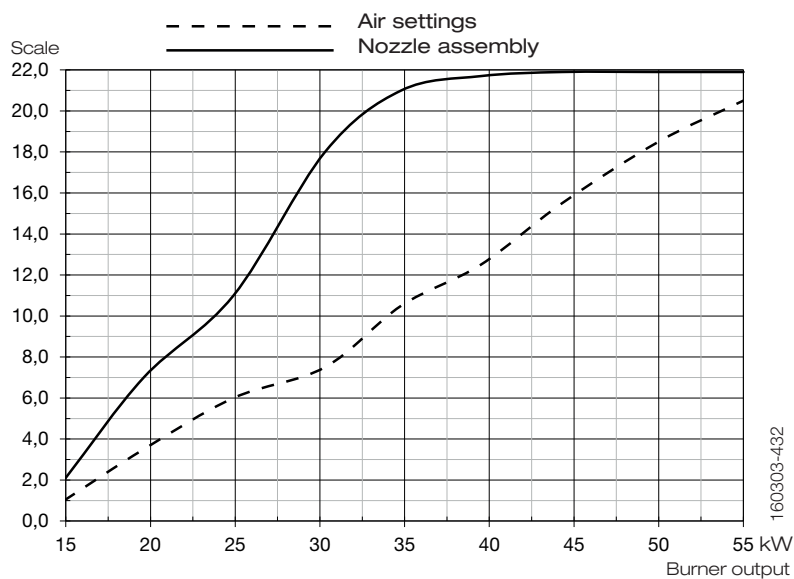
**!** Do not exceed the working area.

## 2.5 Basic settings - Fuel oil



**!** Scale value applies to 0 mbar furnace pressure.

## 2.6 Basic settings - HVO/XTL



**!** Scale value applies to 0 mbar furnace pressure.

### Flame signal

When operating at high power or low air excess and HVO/XTL is used as fuel, the flame signal may deteriorate (blue flame), the signal lamp in the reset button flashes green.

By lowering the air velocity or changing the flame detector to QRC1 A1, the flame signal can be improved.



## 2.7 Nozzle and pump pressure

Due to different furnace geometries and capacities, it is not possible to recommend a nozzle model.

|               |  |
|---------------|--|
| Nozzle        | 60° Solid/Hollow cone<br>80° Solid/Hollow cone           |
| Pump pressure | 10 bar (8–14 bar) Fuel oil<br>10 bar (7–12 bar) Kerosene |

### Nozzle table

| 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 |

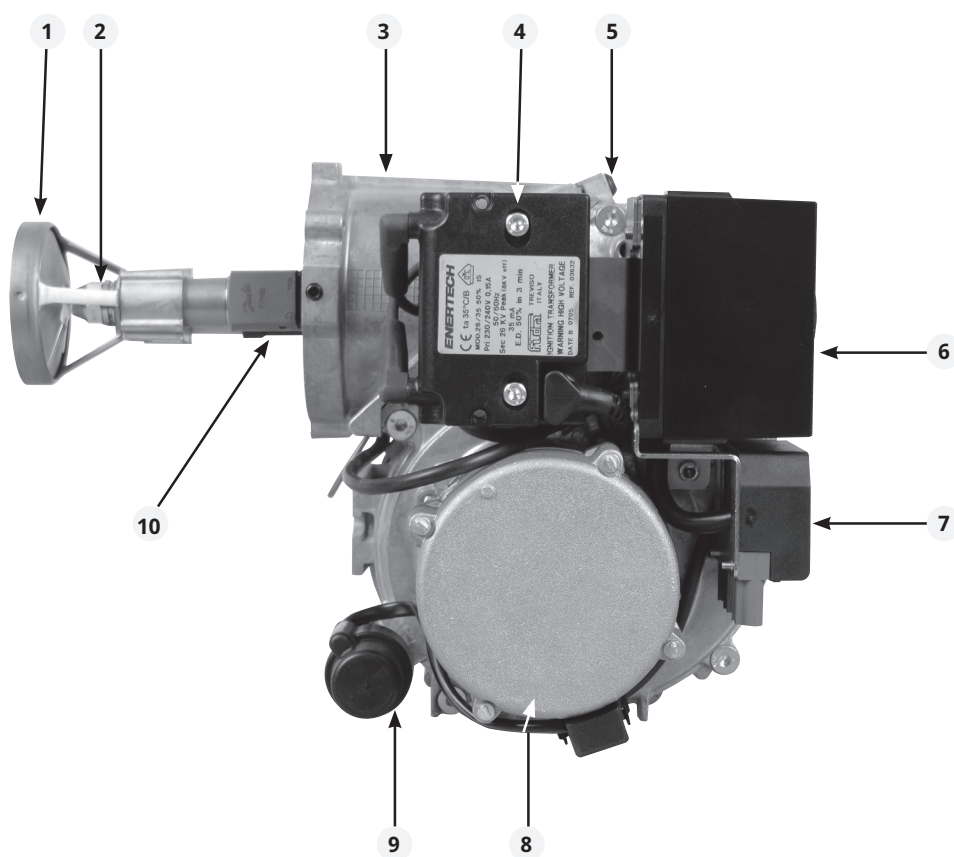
The table applies to oils with a viscosity of 4.4 mm<sup>2</sup>/s (cSt) at a density of 830 kg/m<sup>3</sup>.

### Burner with preheater

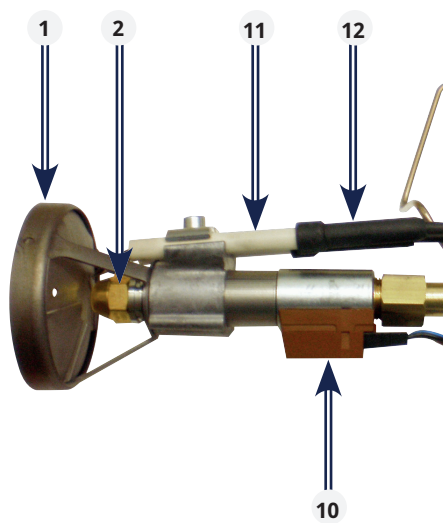
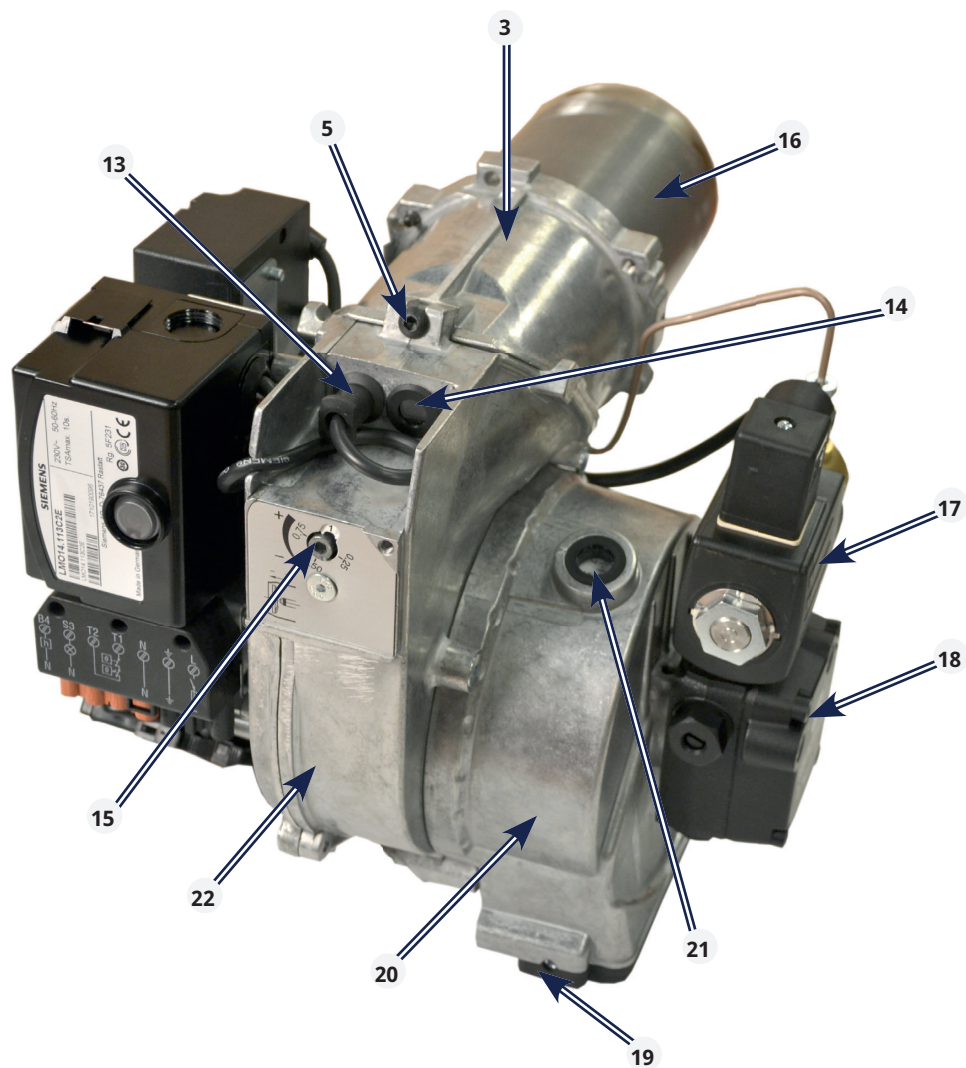
Allow for a reduction in oil quantity of 5–20% with preheating owing to:

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

## 2.8 Components



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

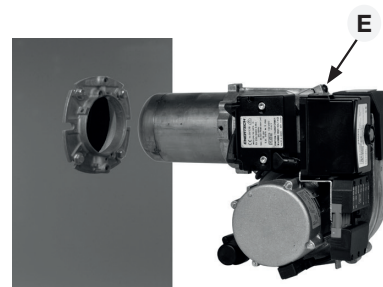
## 3.7 Burner installation

### 3.7.1 Hole pattern

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

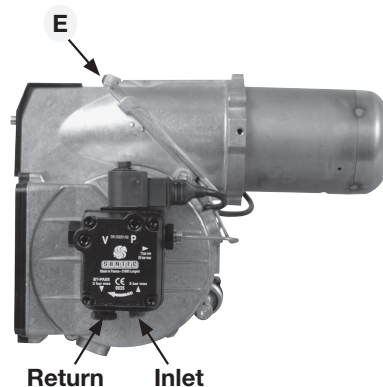
### 3.7.2 Burner installation

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

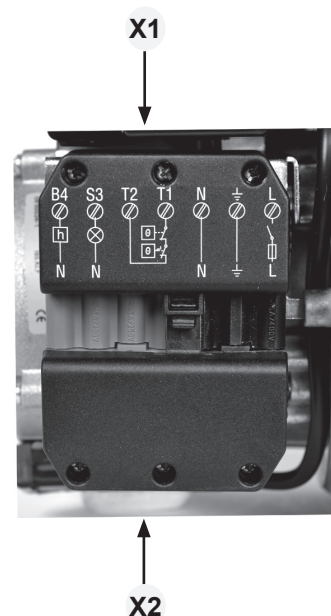
1. Check the oil pipe dimensions. (Refer to Pump Instructions.)
2. The oil filter should be installed in the oil supply line. If an air separator is fitted, the oil filter should be installed before the air filter to increase the life span of the filter.
3. For one-pipe systems the return plug must be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

### 4.1 Example of basic setting

#### BF 1 FU 63-16

|                          |                                    |
|--------------------------|------------------------------------|
| Burner output:           | 33 kW                              |
| Estimated nozzle output: | $33 / 11.86^* = 2.78 \text{ kg/h}$ |

(\* Calorific value Fuel oil = 11.86 kWh/kg)

This provides the following nozzle according to the nozzle table, (see Technical data).

|                |          |
|----------------|----------|
| Nozzle:        | 0.75 Gph |
| Pump pressure: | 10.0 bar |

Setting values for 33 kW according to basic setting diagram, (see Technical data).

|                 |   |      |
|-----------------|---|------|
| Air setting:    | = | 13.0 |
| Insert setting: | = | 7.0  |

#### BF 1 FUV 63-16

|  |                                    |
|--|------------------------------------|
| Burner output:                               | 33 kW                              |
| Output increase, for burners with preheater: | $33 \times 1.06 = 35 \text{ kW}$   |
| Estimated nozzle output:                     | $35 / 11.86^* = 2.95 \text{ kg/h}$ |

(\* Calorific value Fuel oil = 11.86 kWh/kg)

This provides the following nozzle according to the nozzle table, (see Technical data).

|                |          |
|----------------|----------|
| Nozzle:        | 0.75 Gph |
| Pump pressure: | 11.0 bar |

Setting values for 33 kW according to basic setting diagram, (see Technical data).

|                 |   |      |
|-----------------|---|------|
| Air setting:    | = | 13.0 |
| Insert setting: | = | 7.0  |

## 4.2 Nozzle assembly adjustment

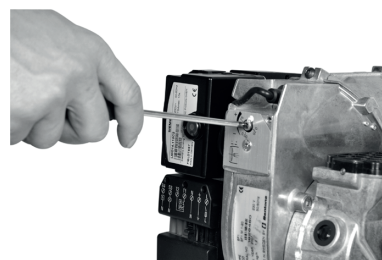
The burner is fitted with a regulator which changes the brake plate position in the flame tube. This is used to set the correct pressure drop across the combustion assembly and thereby achieve good combustion without pulsation.

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

### Brake plate setting

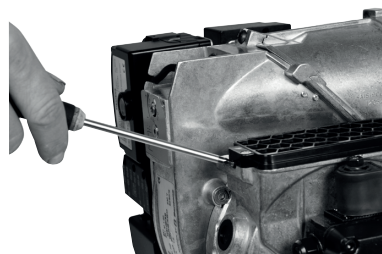
- Less diffusion: turn screw to left.
- More diffusion: turn to right.

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



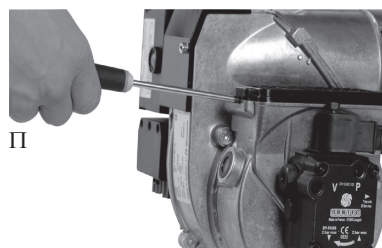
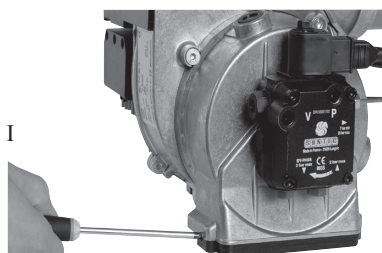
## 4.3 Air intake adjustment

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 flame tube position.



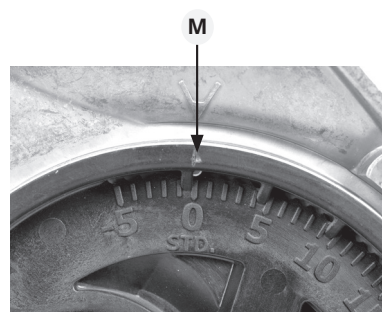
## 4.4 Method of adjusting air quantity

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.



## 4.5 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.)

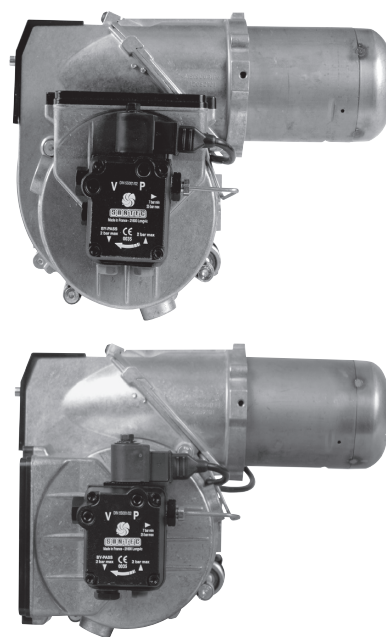


## 4.6 Air intake rotation

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.

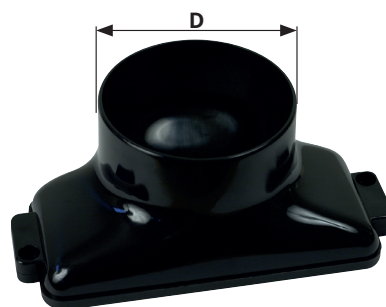
To rotate the air intake, undo the three screws that fasten the air intake and the two screws which retain the pump. Then rotate the air intake to the desired position and tighten the screws. The position of the air intake affects the airflow through the burner somewhat.

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



## 4.7 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



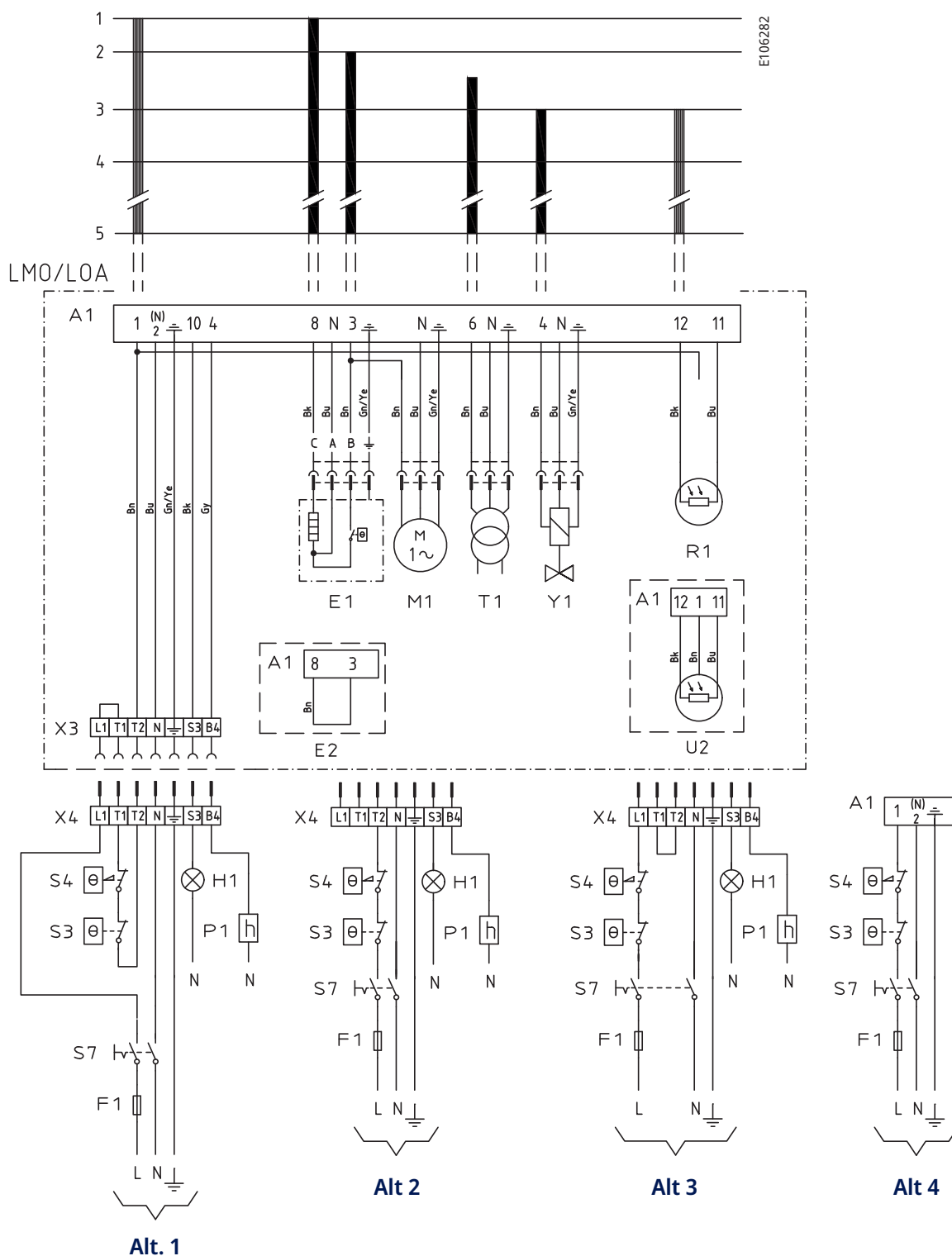
## 5. Electric equipment

### 5.1 Safety system

The safety system (safety switch for hatches, doors, water level, pressure, temperature and other safety devices) must be installed in the safety circuit in accordance with current regulations for the system.

The cables of the safety system must be separated so that the outgoing signal is not placed in the same cable as the incoming signal.

## 5.2 Wiring diagram



Enl DIN 4791

|       |               |
|-------|---------------|
| Bn    | Brown         |
| Bu    | Blue          |
| Gn/Ye | Ground/Yellow |
| Bk    | Black         |
| Gy    | Grey          |



## 5.2.1 List of components

|    |                                    |    |                         |
|----|------------------------------------|----|-------------------------|
| A1 | Oil burner control                 | U2 | UV-cell QRC             |
| E1 | Preheater                          | S3 | Control thermostat      |
| E2 | Burner without preheater           | S4 | Temperature limiter     |
| F1 | Fuse max. 10 A                     | S7 | Main switch             |
| H1 | Lamp, low capacity                 | T1 | Ignition transformer    |
| M1 | Burner motor                       | Y1 | Solenoid valve          |
| P1 | Time meter, low capacity (optinal) | X3 | Plug-in contact, burner |
| R1 | Flame detector QRB                 | X4 | Plug-in contact, boiler |

## 5.3 Function LMO14/24

### 1 Switch on operating switch and twin thermostat

A spark is formed. The air damper motor opens the damper to low load position. The burner motor starts, the prepurge goes on till the prepurge period expires and the solenoid valve 1 opens (2).

### 2. Solenoid valve 1 opens

Oil mist is formed and ignited. The photocell indicates a flame. The ignition spark goes out after flame indication (See Technical data oil burner control).

### 3. The safety time expires

**a** If no flame is established before this time limit the control cuts out.

**b** If for some reasons the flame disappears after this time limit, the burner will make an attempt to re-start.

### 4 High/Low thermostat ON

The burner is in operating position and can now change between full load and low load.

### 4-5 Operating position

If the burner operation is interrupted by means of the main switch or the thermostat, a new start takes place when the conditions in accordance with point 1 are fulfilled.

### The oil burner control cuts out

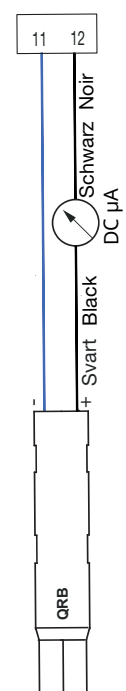
A red lamp in the control is lit. Press the reset button and the burner re-starts.

**!** Mains connection and fuse in accordance with local regulations.

## 5.3.1 Technical data

|  | LMO14.113... | LMO24.255... |
|--|--------------|--------------|
| Preignition time                           | 15 s         | 25 s         |
| Prepurge time                              | 16 s         | 26 s         |
| Postignition time                          | 3 s          | 5 s          |
| Safety lockout time                        | < 10 s       | < 5 s        |
| Reset time after lockout                   | < 1 s        | < 1 s        |
| Reaction time on flame failure             | < 1 s        | < 1 s        |
| Ambient temperature                        | -5 - +60°C   | -20 - +60°C  |
| Min detector current required (with flame) | 45 µA dc     | 45 µA dc     |
| Max perm. detector current (without flame) | 5.5 µA dc    | 5.5 µA dc    |

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## 5.4 Colour codes LMO14/24

When the burner starts, the light in the reset switch indicates the normal sequence, and also indicates whether something abnormal is happening as per 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      |

## 5.5 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.

## 6. Pump Suntec ANV47C

### 6.1 Technical data

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

### 6.2 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

## 6.3 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.

## 6.4 One-pipe system

Conversion to one-pipe system

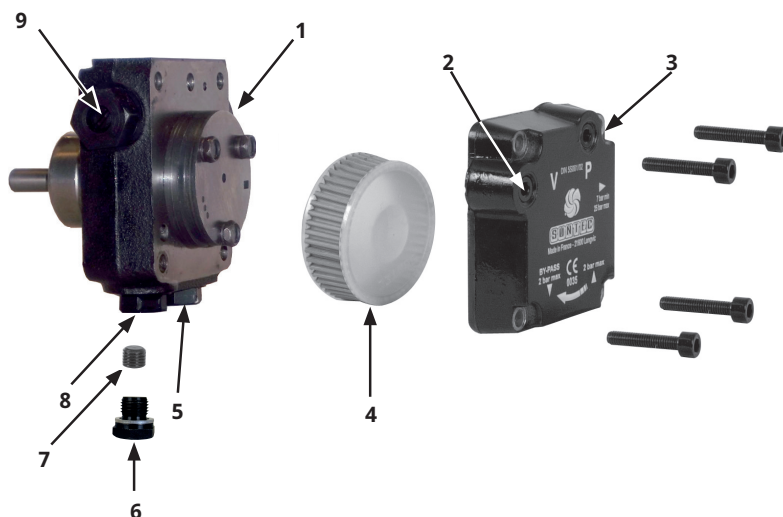
Remove the return plug (8), plug the return line (9) with the metal plug (7) G 1/4".

## 6.5 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).

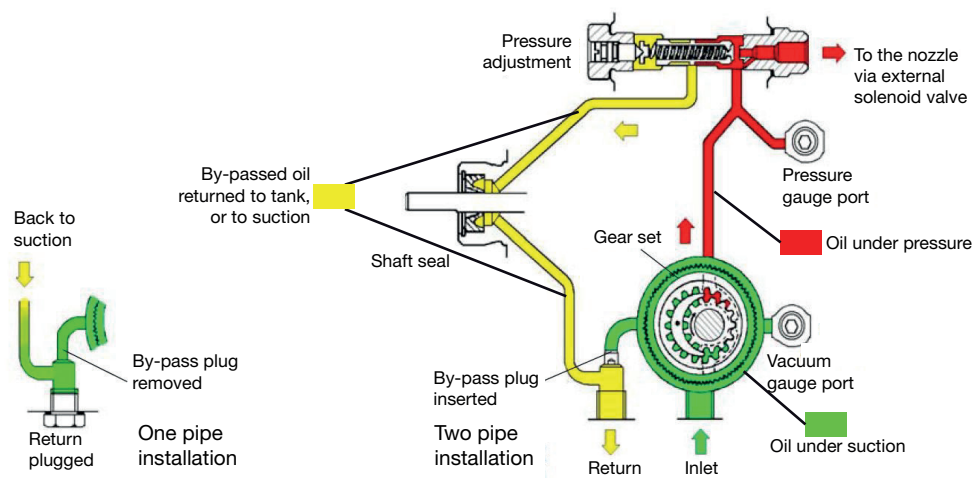
Return plug are not included in products with one-pipe system, separately sold.



## 6.6 Solenoid valve



## 6.7 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.

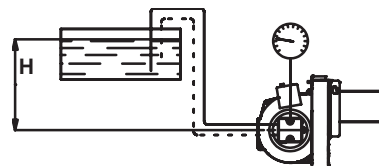


## 6.8 Suction pipe tables ANV47C

### 6.8.1 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

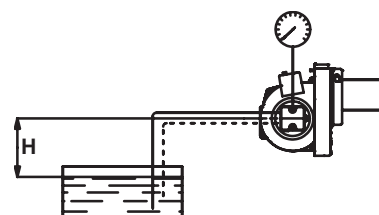
### 6.8.2 Underlying Tank

#### 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.

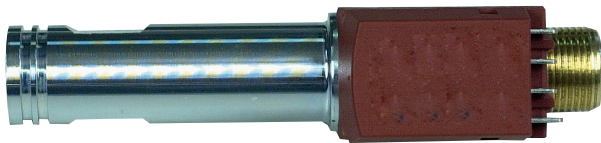
The tables apply to standard heating oil of normal grade merchantable according to existing norms. When starting operations with an empty pipe system, the pump should not be run without oil for more than 5 min.

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

### Function FPHB 5

When the boiler thermostat closes it supplies power to the preheater PTC element in order to preheat the oil. When the oil reaches the right temperature the preheater thermostat closes, sending the start signal to the burner. During operation the output of the PTC element is adjusted automatically so that the temperature does not rise too high. If the oil temperature is low and the oil flow is high, the preheater thermostat may cut out. Because of this it is important that the burner control system has a circuit that maintains preheat.



## 8. Service

Service and maintenance work may only be performed by qualified personnel. Perform operational check of all safety systems and components at each service. Only Enertech original parts should be used when replacing components.



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



### 8.1 Burner Service Schedule, Oil

Servicing must be carried out twice a year or after 3,000 hours of operation.

|             |  |   |
|-------------|--|---|
| Burner      | Twice a year   | 3,000 h   |
| Filter      | Twice yearly replacement                               | 3,000 h replacement                               |
| Oil hose    | Once yearly replacement                                |   |
| Nozzle      | Twice yearly replacement                               | 3,000 h replacement                               |
| Electrodes  | Replace/Clean twice a year                             | Replace/Clean 3,000 h                             |
| Brake disc  | Replace/Clean twice a year                             | Replace/Clean 3,000 h                             |
| Motor       | Twice a year   | 3,000 h   |
| Drive shaft | Check/replace in the event of damage                   | Check/replace in the event of damage              |
| Fan wheel   | Twice a year<br>Replace if need for cleaning/imbalance | 3,000 h<br>Replace if need for cleaning/imbalance |
| Tank        | Check for water once a year<br>Clean tank once a year  |   |
| Oil filter  | Twice a year   | 3,000 h replacement                               |
| Oil valve   | Leakage check twice a year                             | Replace if leaky                                  |

### 8.2 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  |
| Ignition system with flame guard | 10 years                               | 250,000 cycles  |
| UV flame sensor                  | 10,000 h                               | N/A   |
| Damper motor                     |  | 500,000 cycles  |
| Contactors                       | 10 years                               | 500,000 cycles  |



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

## 8.3 Service positions

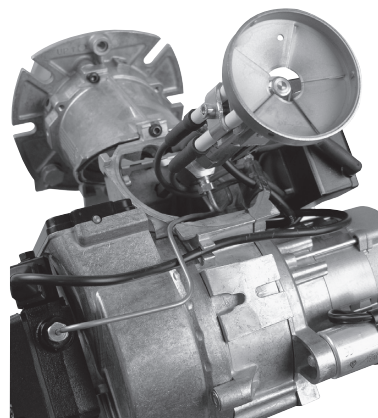


Before obtaining access to terminals, all supply circuits must be disconnected.



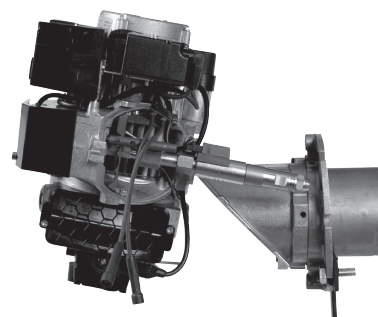
### 8.3.1 Service position 1

1. Disconnect the main power and shut off the fuel supply.
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.



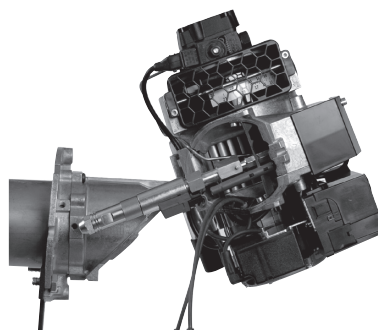
### 8.3.2 Service position 2

1. Disconnect the main power and shut off the fuel supply.
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.



### 8.3.3 Service position 3

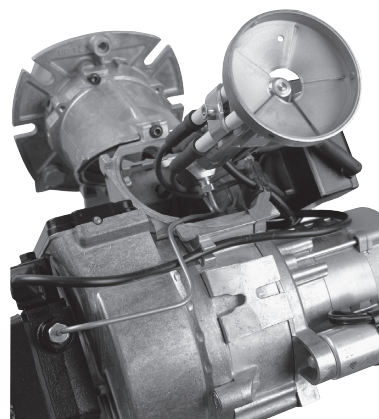
1. Disconnect the main power and shut off the fuel supply.
2. Undo the screw which fastens the burner front piece to the fan housing, but only so much as to allow the fan housing to be removed from the burner front piece.
3. Remove the fan housing from the burner front piece and pull it backwards until 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.



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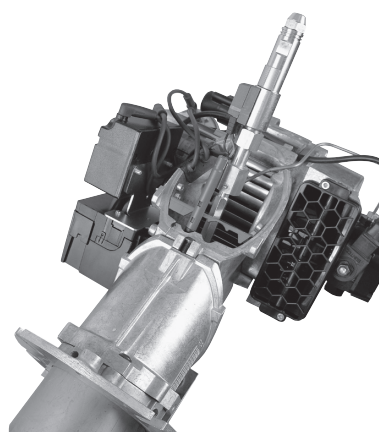
## 8.5 Combustion assembly service

1. Disconnect the main power and shut off the fuel supply.
2. Service position 1 can 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. Switch on the main power and open the fuel supply.
11. Start burner and check/adjust combustion.



## 8.4 Preheater replacement

1. Disconnect the main power and shut off the fuel supply.
2. Service position 1 can 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. Switch on the main power and open the fuel supply.
13. Start burner and check/adjust combustion.

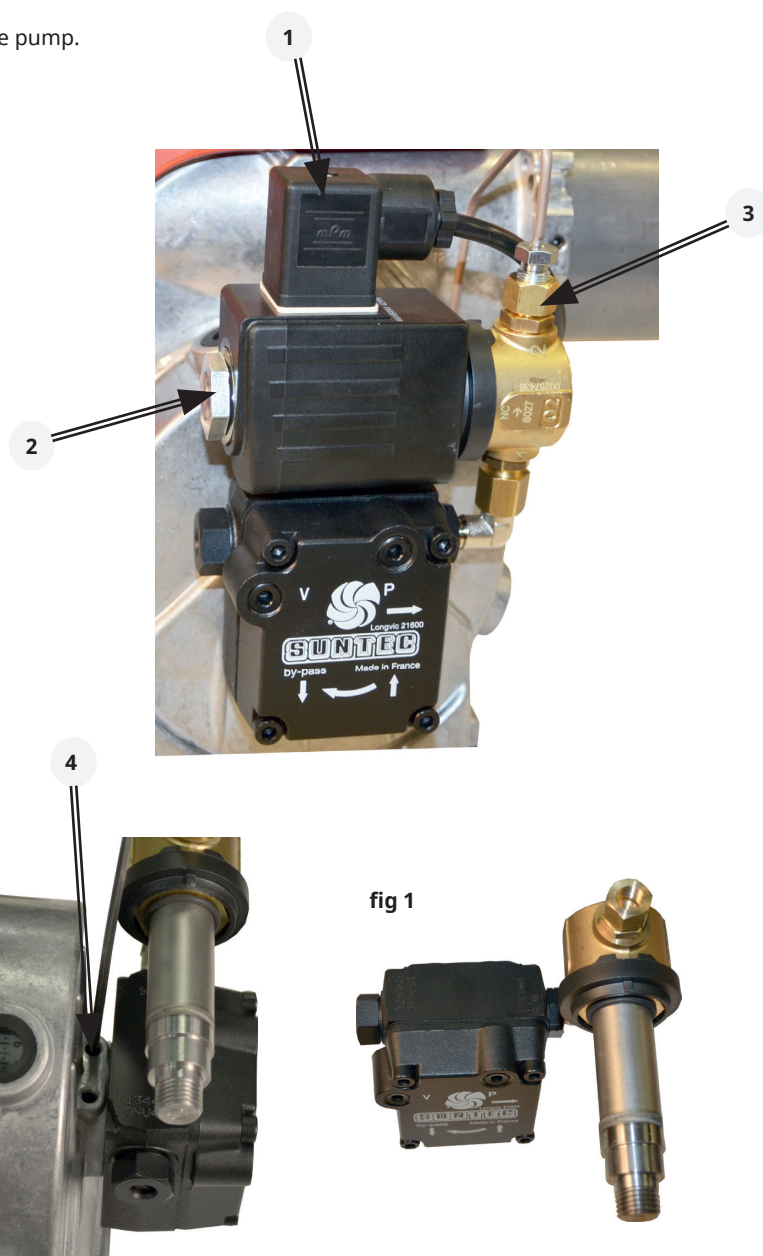


When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

## 8.6 Replacing the oil pump

1. Disconnect the main power and shut off the fuel supply.
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.

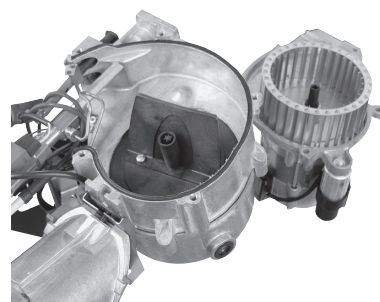
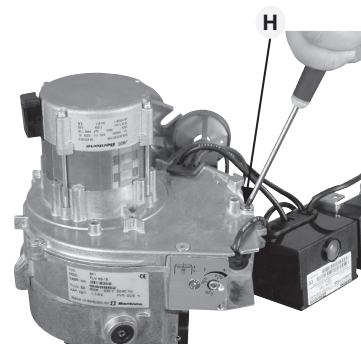
**!** Do not forget thread sealer between the pump and the elbow.  
(t.ex Loctite 5188, 5400)



**!** When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

## 8.7 Fan motor replacement

1. Disconnect the main power and shut off the fuel supply.
2. Service position 2 can 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. Switch on the main power and open the fuel supply.
17. Start burner and check/adjust combustion.

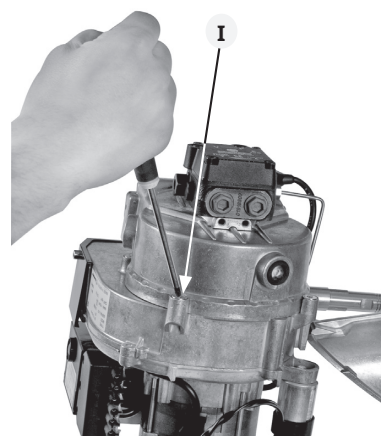


When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.



## 8.8 Air intake and intake cone service

1. Disconnect the main power and shut off the fuel supply.
2. Service position 3 can 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. Switch on the main power and open the fuel supply.
13. Start burner and check/adjust combustion.



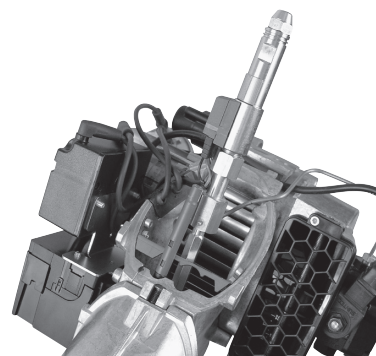
When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.



## 8.9 Fan wheel checks

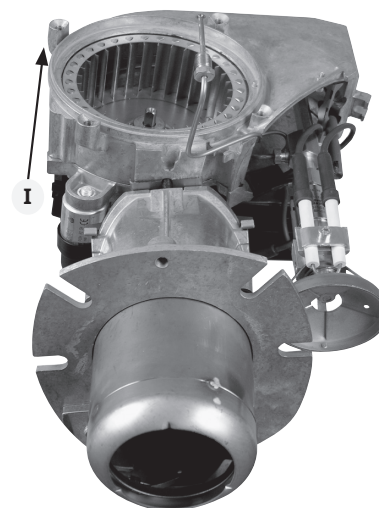
### 8.9.1 Inspection

1. Disconnect the main power and shut off the fuel supply.
2. Service position 1 can 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 considered necessary, see "Cleaning alternative 1 or 2".
6. If cleaning is not necessary, re-assemble the burner.
7. Switch on the main power and open the fuel supply.
8. Start burner and check/adjust combustion.



### 8.9.2 Cleaning, alternative 1

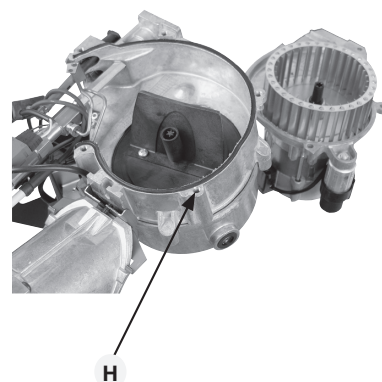
1. Disconnect the main power and shut off the fuel supply.
2. Service position 3 can be used.
3. Remove the solenoid cable from the pump.
4. Remove the connector pipe from the pump.
5. Undo the air intake retaining screws (I).
6. Remove the air intake.
7. Undo the inlet cone retaining screw; make note 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. Switch on the main power and open the fuel supply.
15. Start burner and check/adjust combustion.



When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

### 8.9.3 Cleaning, alternative 2

1. Disconnect the main power and shut off the fuel supply.
2. Service position 2 can 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. Switch on the main power and open the fuel supply.
17. Start burner and check/adjust combustion.



When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

## 9. Fault Location

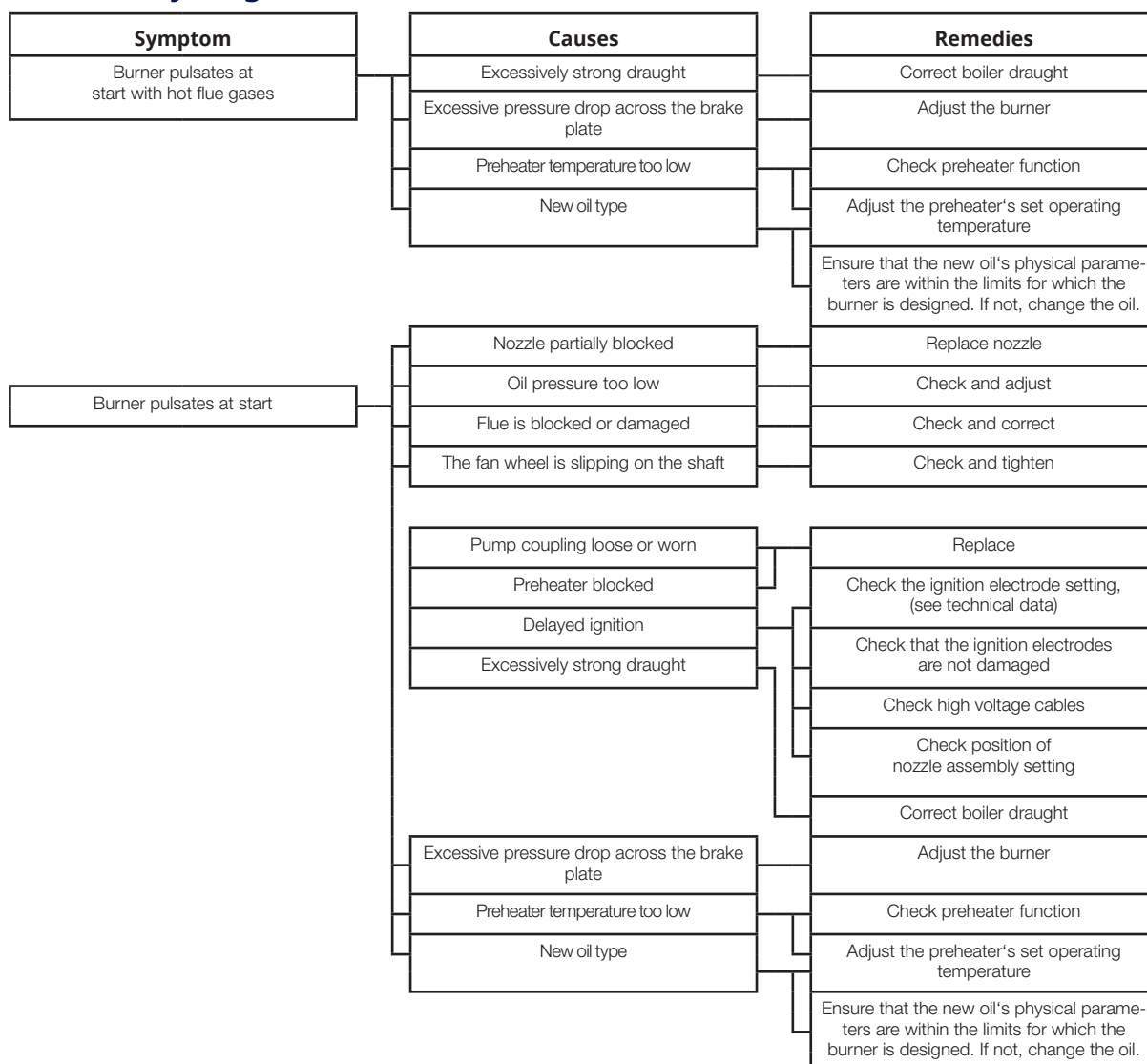
### 9.1 Burner will not start

| 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          | 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       | No oil                                    | Check flame monitor does not register ambient light  |
| Burner trips          | False light                               | Check high voltage wiring and ignition electrodes  |
|                       | No spark                                  | Check preheater function   |
| Motor does not start  | Preheater does not get up to temperature. |  |

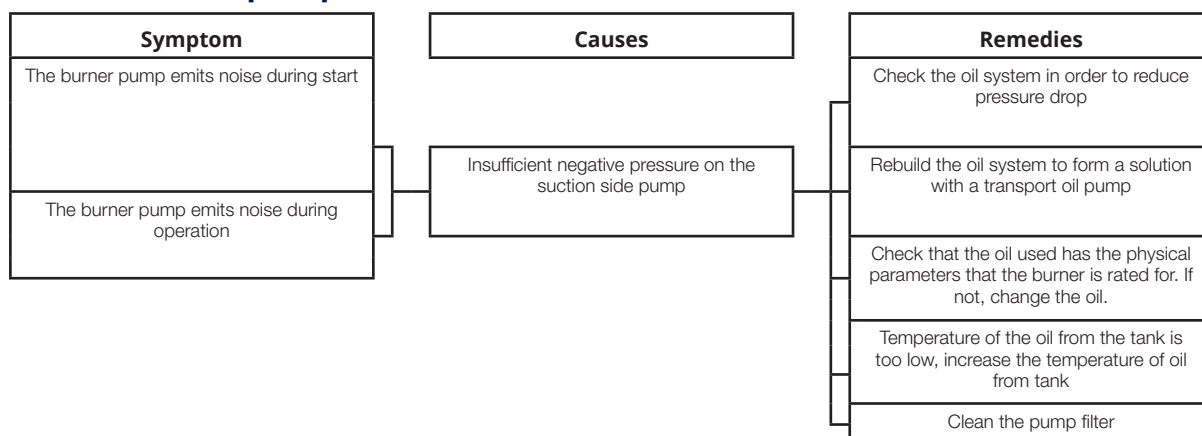
### 9.2 Burner will not start after normal use

| 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 |   |
| Burner stops          | No oil supply                                 | Check that tank, oil lines, solenoid valves, pump and nozzle are in good condition                        |
|                       | Too great a pressure drop at brake plate      | Adjust the burner   |
|                       | Too strong draught prevents flame forming     | Correct the boiler draught  |
|                       | No spark                                      | Check the ignition transformer. Check the ignition electrode settings and ceramics                        |
|                       | 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. |

## 9.3 Delayed ignition



## 9.4 Noise in pump



## 9.5 Pump pressure

| Symptom                                   | 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   |

## 10. Log of flue gas analysis

|              |         |          |
|--------------|---------|----------|
| Owner        | Adresss | Tel. no: |
|              |         |          |
| Installation |         | Tel. no: |

Boiler

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

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<br>bar |        |        |        |
| Nozzle               |        |        |        |

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



## EU Declaration of conformity

### Bentone Oil Burners

Type:

|        |        |      |      |
|--------|--------|------|------|
| BF 1   | ST 133 | B 40 | B 65 |
| ST 108 | ST 146 | B 45 | B 70 |
| ST 120 | B 30   | B 55 | 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
- The 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 267:2020** Excluding the requirements of Annex J/K.  
Automatic forced draught burners for liquid fuels.

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

Manufacturer: Enertech AB  
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Sweden

Notified Body: TUV SÜD Product Service GmbH  
Ridlerstraße 65  
D-80339 München, Germany  
Notified Body Number: 0123

Ljungby, 2022-10-10

Joachim Hultqvist  
Technical Manager  
Enertech AB

Ola Karlsson  
Quality Manager  
Enertech AB

## UK Declaration of conformity

## Bentone Oil Burners

Type:

|        |        |      |      |
|--------|--------|------|------|
| BF 1   | ST 133 | B 40 | B 65 |
| ST 108 | ST 146 | B 45 | B 70 |
| ST 120 | B 30   | B 55 | 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:

- Supply of Machinery (Safety) Regulations 2008
- Electromagnetic Compatibility Regulations 2016
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

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

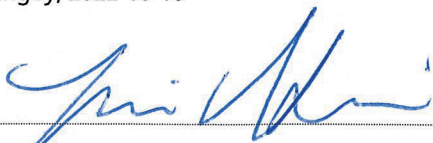
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Additional information can be downloaded at: [www.bentone.com](http://www.bentone.com)

Manufacturer: Enertech AB  
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Approved Body: TUV SÜD BABT Unlimited  
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Approved Body Number: 0168

Ljungby, 2022-10-10



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