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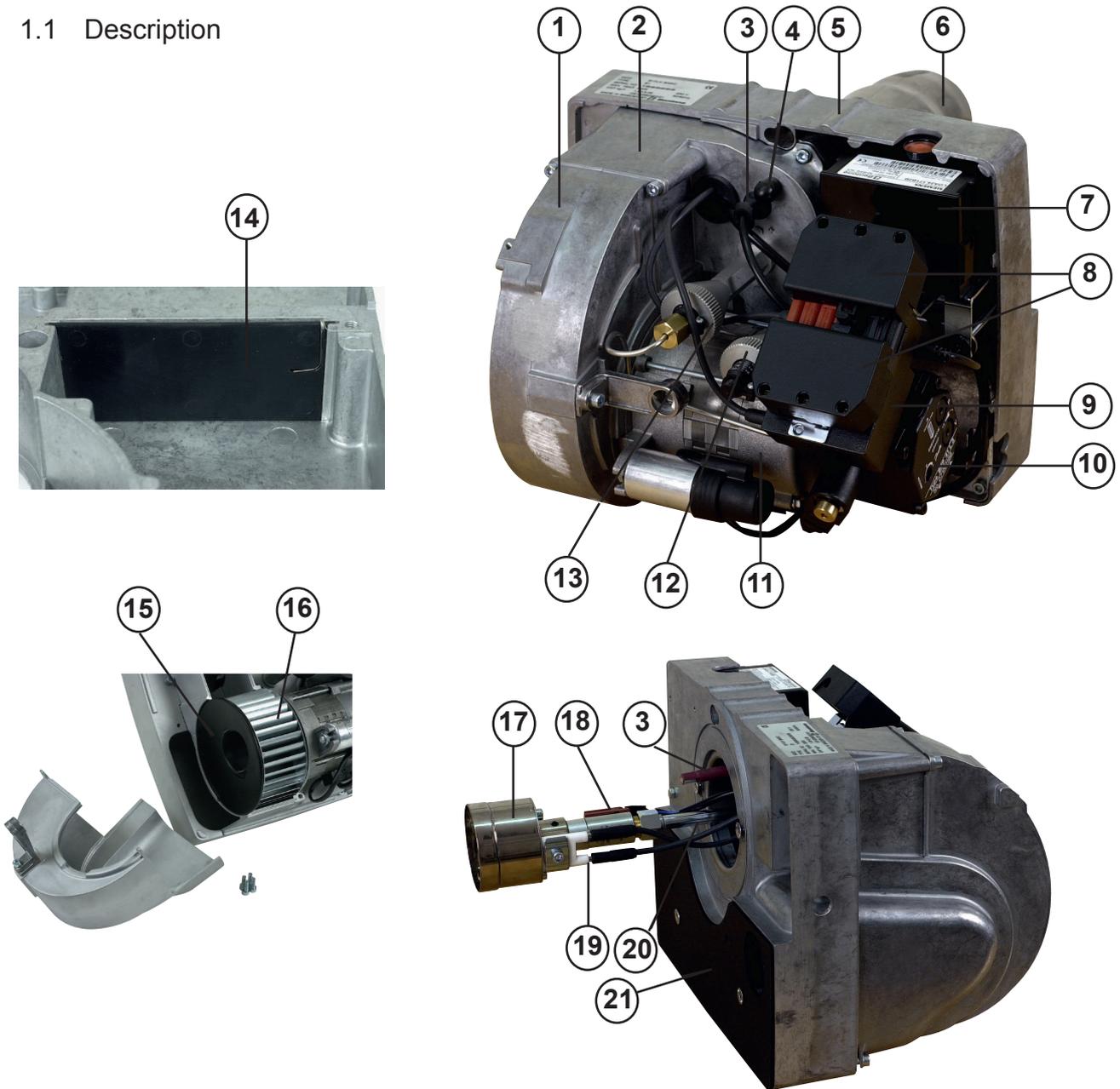
Installation- and maintenance instruction
B1FUV CLASSIC

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1. GENERAL

1.1 Description



1. Fan housing, upper part
2. Fan housing, middle part
3. Photoresistor
4. Test nipple, fan pressure
5. Frame
6. Blast tube
7. Control box
8. Electric contact X1,X2 (see wiring diagram)
9. Ignition transformer
10. Oil pump
11. Motor
12. Air adjustment
13. Adjustment of nozzle assembly
14. Automatic air damper
15. Suction plate
16. Fan wheel
17. Shrouded disc
18. Preheater
19. Electrodes
20. Oil pipe
21. Plate, silencer

01. GENERAL

- The contents of this manual are to be observed by all who work for any reason on the unit and its appertaining system parts.
- This manual is intended especially for authorised personnel.
- This manual is to be regarded as part of the burner and shall always be available near the place of installation.
- Ensure that the supply of fresh air to the place where the burner is fitted is always unobstructed.
- Bentone recommends that the burner is switched off while the cistern is being filled and for a period of six hours after filling to reduce the risk of clogging.
- Ensure that the burner is protected against direct spraying with water.
- An oil filter should be fitted.

1.2 Safety directions

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

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

1.3 Condensation in chimney

A modern burner works with less air surplus and often with a smaller nozzle than older models. This improves the efficiency but increases also the risk of condensation in the chimney. The risk is greater if the cross sectional area of the chimney flue is too big. Temperature of the flue gases should be higher than 60°C measured 0.5 m from the top of the chimney.

Measures to raise the temperature:

Insulate the chimney thermally in cold loft area.

Fit an insert tube in the chimney.

Install Dragex or equivalent (to dry and ventilate the chimney during standstill).

1.4 Setting the burner

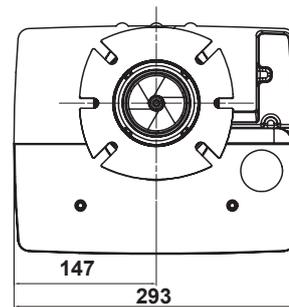
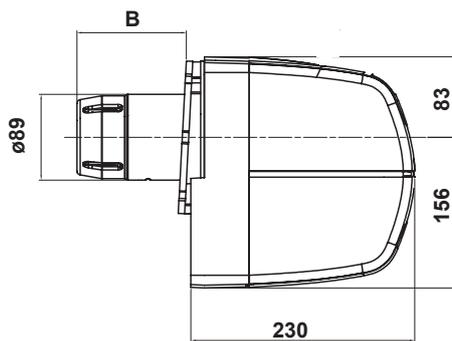
A flue-gas analysis and measuring of the temperature should be done to facilitate a correct setting. There is otherwise a risk of soot, poor efficiency or condensation in the chimney.

2. TECHNICAL DATA

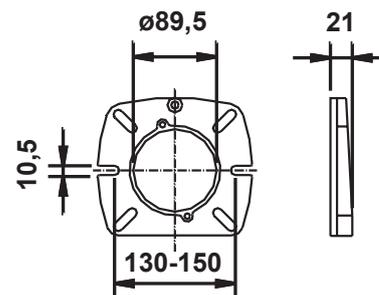
2.1 Type designation B

Model FUV

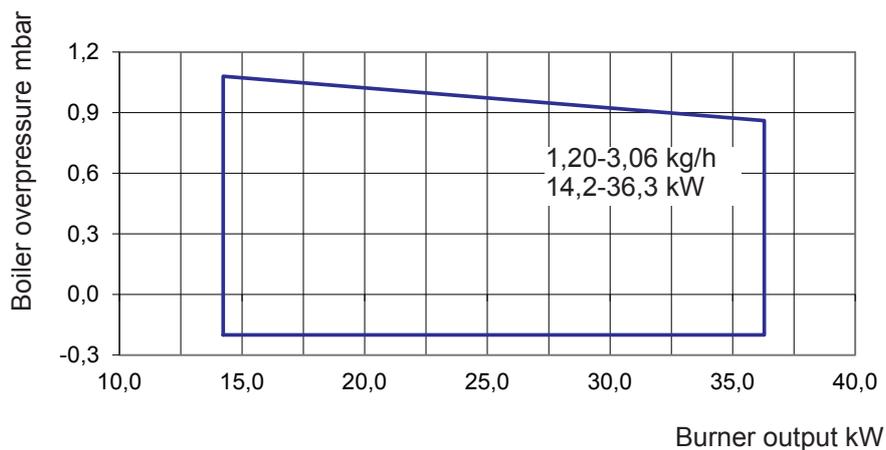
2.2 Dimensions



Length of blast tube	Projecting from flange, size B
133	108
183	158



2.3 Burner capacity



2.4 Recommended nozzle

80° H or 80° S. In certain combustion chambers and at higher power 60° S could be an option.

Table of nozzles

With preheater

	8 bar		9 bar		10 bar		11 bar		12 bar	
	Gph	kg/h	kg/h	kW	kg/h	kW	kg/h	kW	kg/h	kW
0,40	1,15	13,6	1,22	14,4	1,28	15,2	1,35	16,0	1,41	16,7
0,45	1,35	16,0	1,43	17,0	1,51	17,9	1,58	18,8	1,65	19,6
0,50	1,57	18,6	1,67	19,8	1,76	20,8	1,84	21,8	1,93	22,8
0,55	1,79	21,2	1,90	22,5	2,00	23,8	2,10	24,9	2,20	26,0
0,60	2,04	24,1	2,16	25,6	2,28	27,0	2,39	28,3	2,49	29,5
0,65	2,32	27,5	2,46	29,1	2,59	30,7	2,72	32,2	2,84	33,6
0,75	2,58	30,5	2,73	32,4	2,88	34,1	3,02	35,8	3,16	37,4
0,85	2,90	34,4	3,08	36,5	3,24	38,4	3,40	40,3	3,55	42,1
1,00	3,26	38,6	3,46	41,0	3,65	43,2	3,82	45,3	3,99	47,3

3. INSTALLATION

3.1 Acceptance inspection

Ensure that everything is delivered and that there is no transport damage. If there is anything wrong with the delivery, please report it to the supplier. Any transport damage should be reported to the forwarding company.

3.2 Preparations for installation

Ensure that the size and capacity range of the burner are suitable for the boiler. Power data on the data plate refer to the minimum and maximum power of the burner.

3.3 Distribution of oil

To ensure satisfactory operation it is essential that the oil distribution system is correct. Observe the following:

- See Pump instructions for choice of tube diameter, tube length and height difference.
- Fix the tubing with a minimum number of screw fittings.
- Fix the tubes so that the oil hoses are not subjected to tensile stress or sharp bending when swinging out the burner or removing it for service.
- Fit the oil filter so that the filter cartridge can easily be replaced, see Oil filter Bentone.

3.4 Electrical connections

The main power switch must be turned off before beginning the electrical installation. If the boiler has a 7-pole contact device type Eurostecker it will most often fit the burner direct. Otherwise use the accompanying contact device. The operating thermostat and maximum thermostat, and also any fire-door switch, can then be connected in series with the incoming phase or be connected between T1 and T2. In the first case T1 and T2 are to be strapped.



If another electrical connection is used than the one recommended by Bentone, there might be a risk of material damage or personal injury.

Choice of nozzle

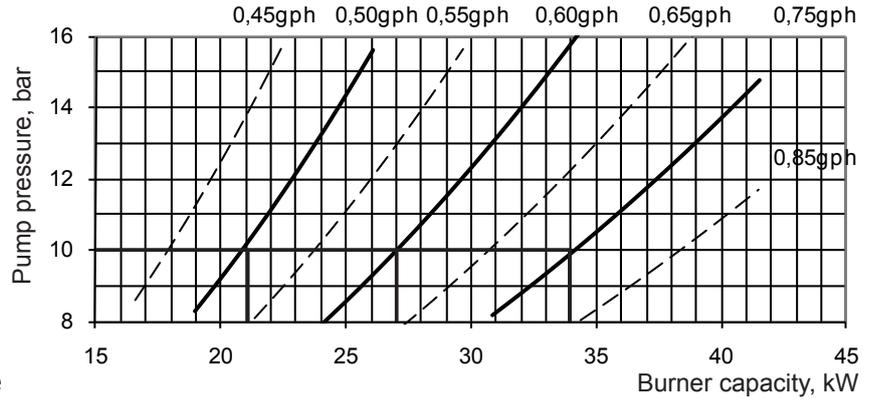
See under Technical Data: Recommended nozzle and table of nozzles.

3.5 Setting of the shrouded disc and air flow

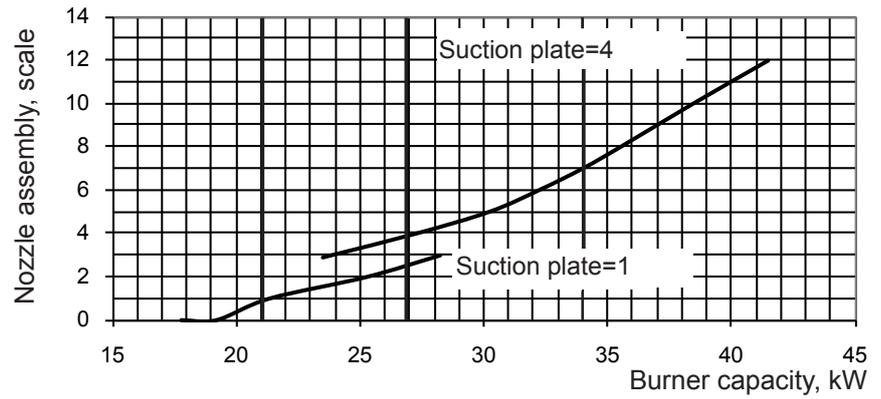
The burner is pre-set on delivery in relation to the nozzle provided. If the size of the nozzle is changed the burner can be initially set according to "Basic settings". Note that it is only a question of a basic setting that should be trimmed when the burner is started. This should include a fluegas analysis and measurement of soot.

4. BASIC SETTINGS

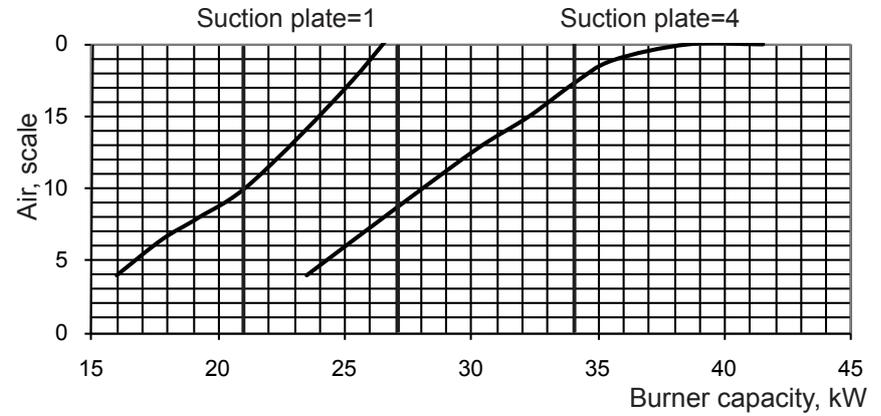
4.1 Pump pressure, bar



4.2 Adjustment of the nozzle assembly

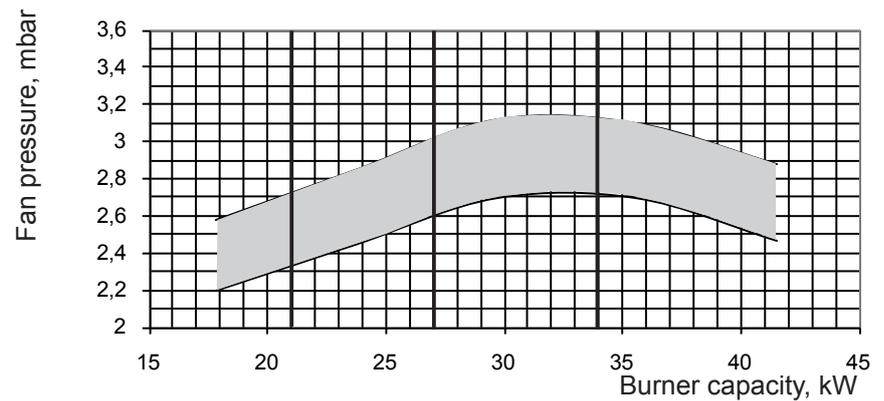
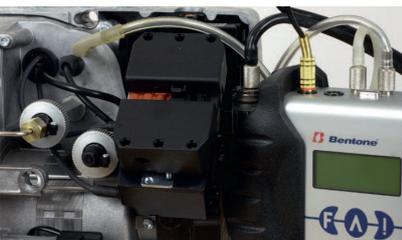


4.3 Air adjustment



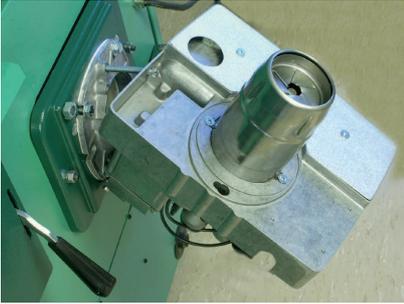
4.4 Pressure in front of the shrouded disc

Fan pressure



5. MAINTENANCE

5.1 Suspension of burner



During service the burner can be hung up on the screw in the burner flange. The blast tube, shrouded disc, nozzle, preheater and electrodes are then easily accessible.

5.2 Removing the blast tube



1. Loosen the two fastening screws one turn.
2. Turn to the right and withdraw the blast tube.

5.3 Shrouded disc



The preheater plug and the electrodes shall be placed on either side of the oil tube. The hole in the shrouded disc shall be placed upwards to increase the light towards the photoresistor.

5.4 Rubber cable



Check that the rubber cable inlet is properly fixed in order to avoid unnecessary air leakage.

05. MAINTENANCE

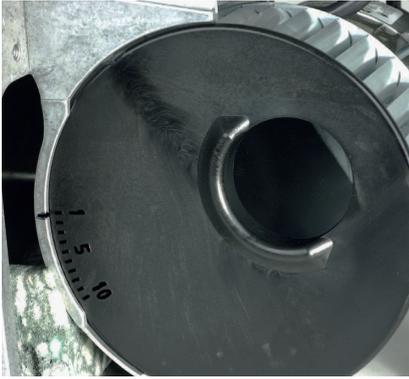
5.5 Setting the ignition electrodes

Proper setting of the electrodes is essential to ensure satisfactory operation of the burner. If the spark hits the metal the efficiency will be lower and will also cause radio disturbance. There is also a risk that carbonisation will occur. Since the electrode pack is of the factory-set twin electrode type it will be necessary to bend the wires to make any adjustment.



05. MAINTENANCE

5.6 Suction plate



In the case of higher power, as well as with boilers featuring overpressure in the combustion chamber, it is possible to achieve higher fan pressure by altering the position of the suction plate, see illustration. The plate is located beneath the outer half of the fan housing, see illustration, Cleaning the fan wheel.

Position 1 is normally used for nozzles up to 0.60 gph and position 4 for larger nozzles. Position 2 and 3 are intermediate positions. Position 5 and higher does not give more pressure and they are not used.

Check that the plate is placed in the correct position. Otherwise the air cannot be adjusted to the correct value.

5.7 Cleaning the fan wheel



Unscrew the four fastening screws. Remove the half of the fan housing. Check the position of the suction plate (position 1 up to and including 0.60 gph nozzle). Remove the suction plate. Inspect and clean the fan if necessary. Refitting the suction plate is made easier by tilting the burner forward.

5.8 Trimming



If the size of the nozzle is changed, it is suitable to first set the nozzle assembly and air according to the recommendations in section Basic settings. For the individual boiler installation, adjustments can then always be made to optimise economy, operational reliability and environmental effects.

The most important instruments for the task are one instrument for flue-gas analysis and a soot meter.

The principle of the adjustment is:

- reduce the air, either with the air regulation or the nozzle assembly, until a soot coefficient 0.5–1 is achieved.
- increase the air to give a safety margin of 0,5-1% CO₂ before soot is created. To throttle more with the shrouded disc (smaller reading on the nozzle assembly scale), gives a short, more bluish flame and often better combustion, but if one goes too far there will be starting problems. Throttling less with the shrouded disc gives a longer and more yellowish flame and can give a smoother start.

The pressure in front of the shrouded disc can be utilised as an aid in the adjustment. Recommended pressure, see under Basic settings. Remember to refit the rubber gasket on the pressure outlet after making the adjustments.

5.9 Automatic air damper



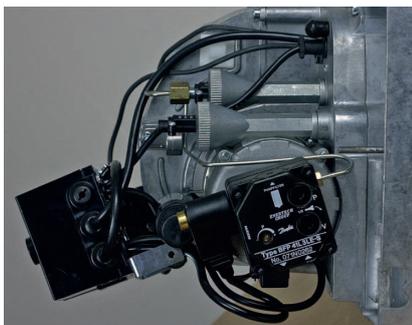
The automatic air damper is provided with a small spring at the right shaft journal. Check that the air damper moves easily.

05. MAINTENANCE

5.10 Service position electric package

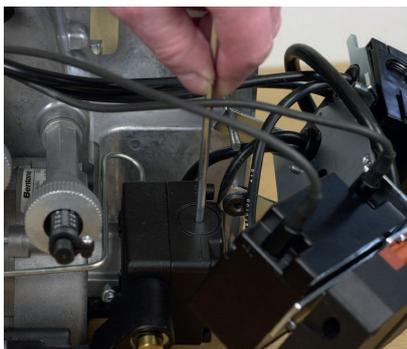


Loosen the hexagon nut from the stud bolt. Pull the electric package backwards and rotate it ca. 90° clockwise.



When required the electric package can be suspended in the cables.

5.11 Pump filter



When changing pump filter, see chapter 06.

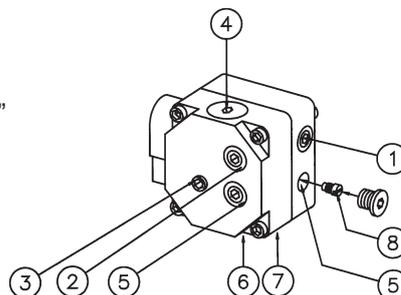
6. INSTRUCTIONS PUMP TYPE BFP 41L3

6.1 Technical data

Viscosity range: 1,3-12,0 mm²/s
Pressure range: 7-15 bar
Oil temperature: -10 to+70°C

6.2 Components

1. Nozzle connection G 1/8"
2. Pressure gauge connection G 1/8"
3. Pressure control 4 mm Allen key
4. Cartridge filter
5. Vacuum gauge connection G 1/8"
6. Return pipe G 1/4"
7. Suction pipe G 1/4"
8. Return plug



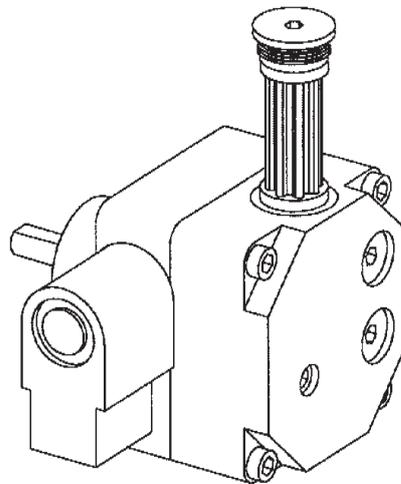
6.3 Venting

Venting is only necessary in a one-pipe system. In two-pipe systems the pump is automatically vented by the return pipe.

Changing cartridge filter

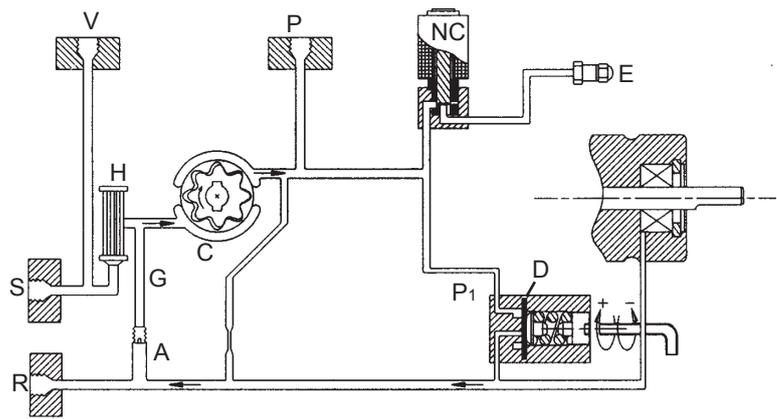
Unscrew the filter screw from the cover using a 4 mm Allen key and pull out the filter cartridge. Insert a screwdriver between the filter and screw, if necessary, to carefully ease out the filter. Replace the old filter by a new one, pushing it on the filter screw. Reassemble the cartridge and tighten lightly.

Remember to change the O-ring.



06. INSTRUCTIONS PUMP TYPE BFP 41L3

6.4 BFP 41L3 operation principle



When the pump is started, oil is drawn from the suction port (S) through the filter (H) to the suction port (C) of the gear-set.

The oil then moves to the pressure side of the gearwheel and is thus pressurised. The pressure is controlled and maintained at a constant pre-set level by diaphragm (D) of the control valve (P_1)

The control valve (P_1) distributes the oil supplied by gear-set (C) between the nozzle connection (E) and the return port of the pump (R). The amount of oil consumed is determined by the pressure set on the control valve (P_1) and by the size of the oil nozzle in the nozzle line.

The control valve (P_1) operates as follows:

- When the oil attains opening pressure, the port to the return side opens.
- The diaphragm and the spring keep a constant pump pressure at the set value.
- If the pump becomes overloaded, i.e. if an attempt is made to take out more oil than the gear-set can deliver in the prevailing circumstances, the oil pressure will fall below the set value causing the valve to close, by diaphragm (D), to the return port (R) and return to the starting position.

This can be remedied by:

- Lowering the pump pressure.
- Reducing the amount of oil delivered, i.e. changing to a smaller nozzle.
- Changing to a pump with higher capacity.

06. INSTRUCTIONS PUMP TYPE BFP 41L3

6.5 Suction line tables

One-pipe system Height Pipe diameter H $\varnothing 4$ mm $\varnothing 5$ mm $\varnothing 6$ mm m m m m				One-pipe system Height Pipe diameter H $\varnothing 4$ mm $\varnothing 5$ mm $\varnothing 6$ mm m m m m			
4,0	51	100	100	With an underlying tank a one-pipe system is not recommended			
3,5	45	100	100				
3,0	38	94	100				
2,5	32	78	100				
2,0	26	62	100				
1,5	19	47	97				
1,0	13	31	65				
0,5	6	16	32				
Two-pipe system Height Pipe diameter H $\varnothing 6$ mm $\varnothing 8$ mm $\varnothing 10$ mm m m m m				Two-pipe system Height Pipe diameter H $\varnothing 6$ mm $\varnothing 8$ mm $\varnothing 10$ mm m m m m			
4,0	33	100	100	0	17	53	100
3,5	31	98	100	-0,5	15	47	100
3,0	29	91	100	-1,0	13	41	99
2,5	27	85	100	-1,5	11	34	84
2,0	25	79	100	-2,0	9	28	68
1,5	23	72	100	-2,5	7	22	53
1,0	21	66	100	-3,0	5	15	37
0,5	19	60	100	-3,5	3	9	22
				4,0	1	3	6

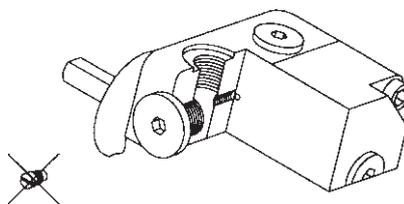
The suction line tables consist of theoretically calculated values where the pipe dimensions and oil velocity have been matched so that turbulent flow will not occur. Such turbulence would otherwise result in increased pressure losses and noise in the piping. A piping system consists normally of drawn copper pipes and four bends, a non-return valve, a shut-off valve and a pre filter.

The sum of these individual resistances is negligible. The tables do not include any lengths exceeding 100 m because experience shows that longer lengths are not needed.

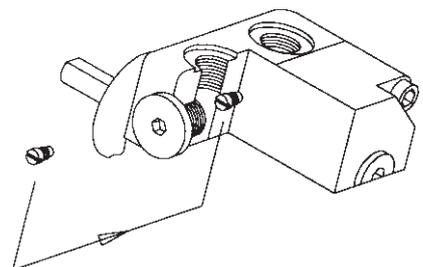
The tables apply to standard fuel oil of normal commercial quality according to current standards. On commissioning with an empty tube system the oil pump should not be run without oil for more than 5 minutes. The tables state the total length in metres of the suction line at a nozzle capacity of 2.5 kg/h. Maximum allowed pressure at the suction and return port is 2.0 bar.

Mounting/dismounting return plug

One pipe system



Two pipe system



7. ELECTRIC EQUIPMENT

7.1 Oil burner control: LMO14.113... / LMO24.255...

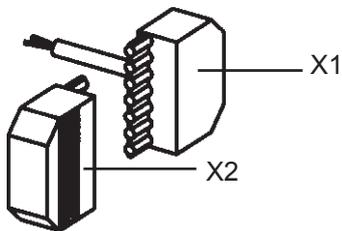
List of components

- A1 Oil burner control
- A2 Twin thermostat
- E1 Preheater
- F1 Fuse, max. 10A
- H1 Alarm lamp
- H2 Signal lamp (optional)
- M1 Burner motor
- P1 Time meter (optional)
- R1 Photoresistor
- S3 Main switch
- T1 Ignition transformer
- Y1 Solenoid valve
- X1 Plug-in contact, burner
- X2 Plug-in contact, boiler

The colours of the preheater cable:

- A Blue
- B Brown
- C Black

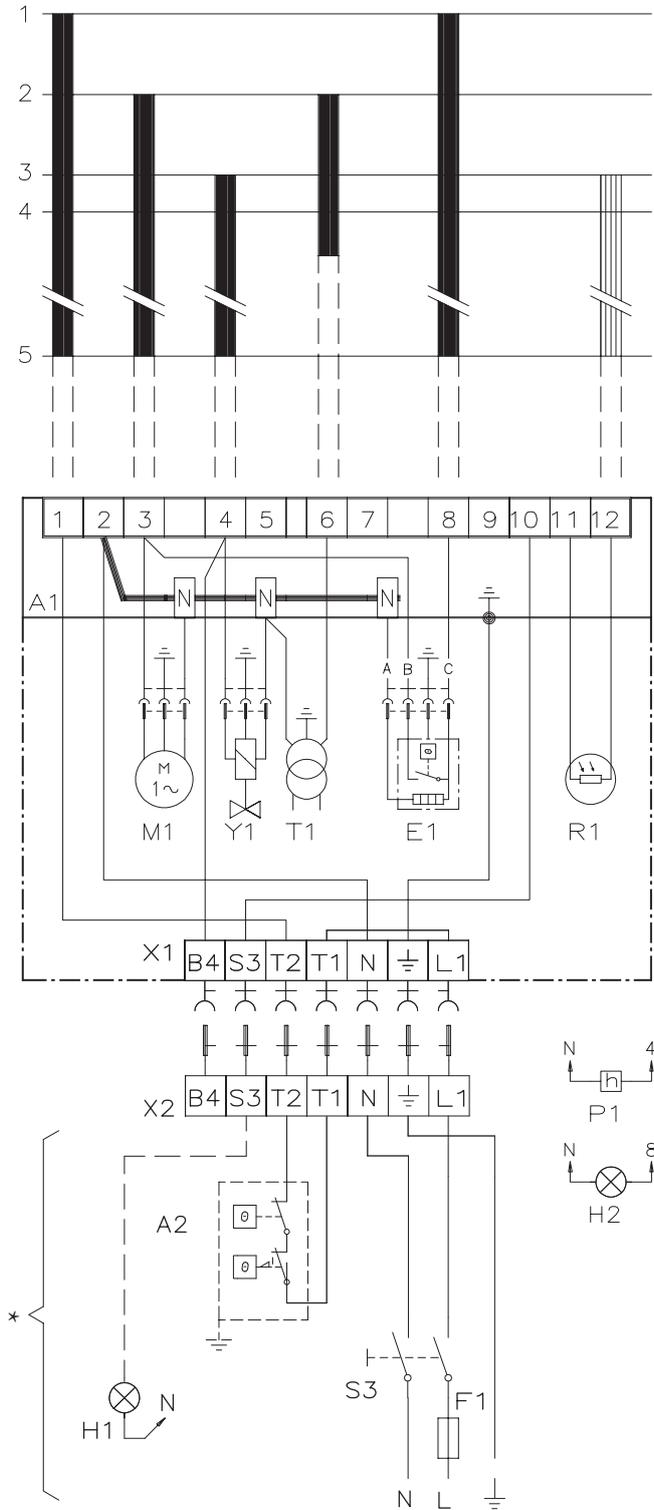
Outer electrical connection



Mains connection and fuses in accordance with local regulations.

* If there is no plug-in contact (X2) on the boiler, connect to the contact enclosed. In case the twin thermostat is in series on incoming phase L1, a loop between the terminals T1 and T2 is necessary.

Wiring diagram



ELECTRIC EQUIPMENT

Function

1. Switch on operating switch and twin thermostat

The burner motor starts, an ignition spark is formed, the prepurge goes on till the prepurge period expires and the solenoid valve opens (2).

2. Solenoid valve 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.

3-4. 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.

Technical data oil burner control

	LMO14.113...	LMO24.255...
Pre-ignition time:	15 s	25 s
Pre-purge time:	16 s	26 s
Post-ignition time:	3 s	5 s
Safety lock-out 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. current with flame established:	45 µA	45 µA
Max. photo current at start:	5,5 µA	5,5 µA

Control of photo current

Current through photo unit is measured with a d.c. ammeter (a moving coil instrument connected in series with the photo unit).

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

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

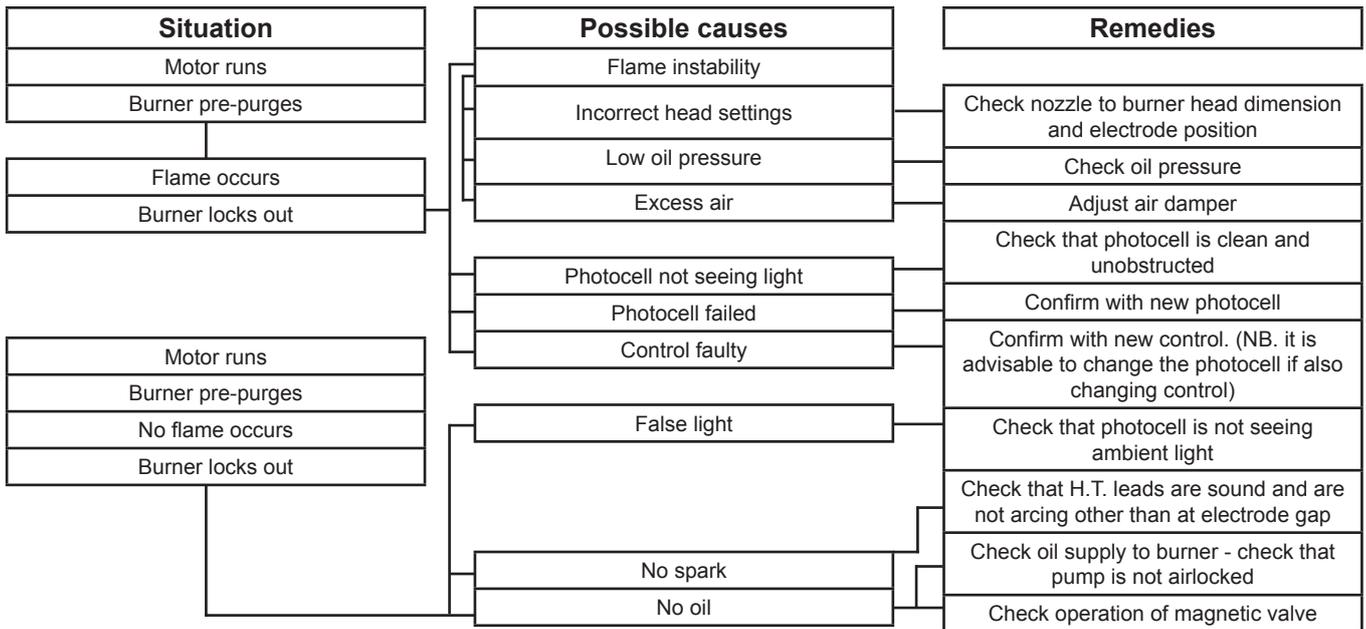
* In order for this fault code to occur, the preheater shall not reach its cut-off temperature within 10 mins. from switch on.

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.

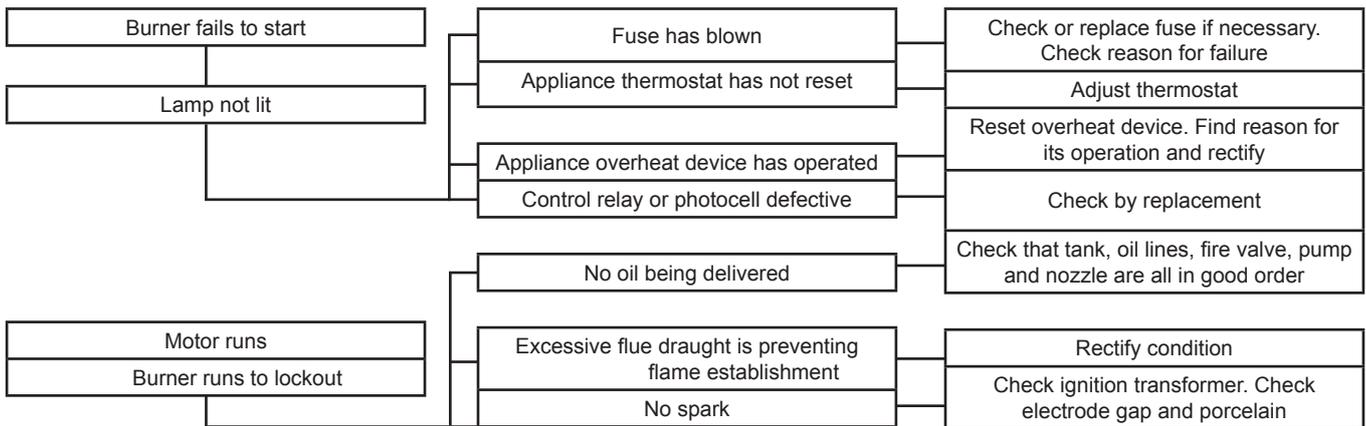
To return to normal operation: Press the reset button for 1 second

8. FAULT LOCATION

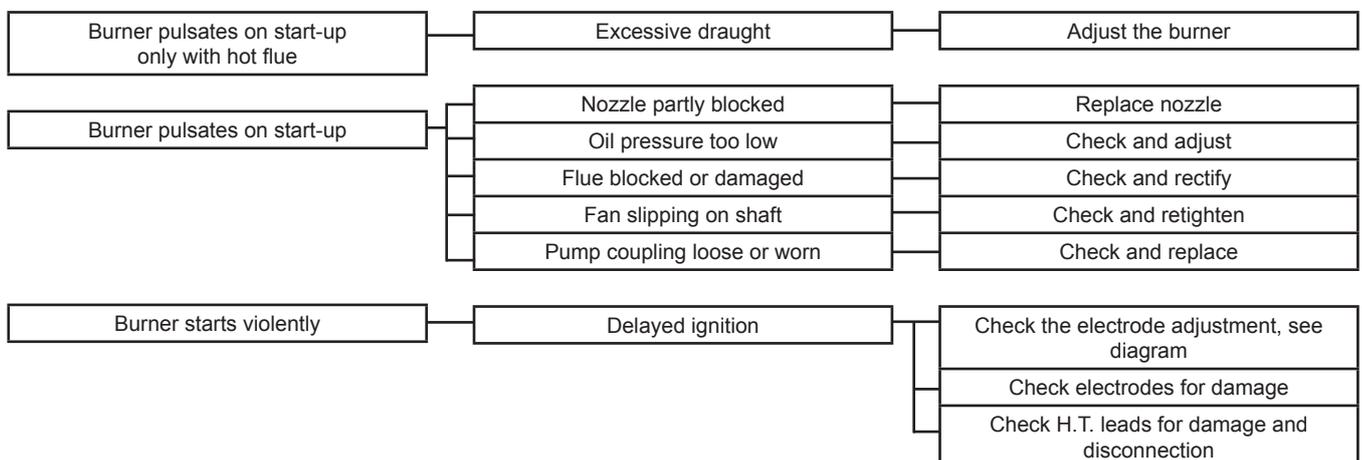
8.1 Burner fails to start



8.2 Burner fails to start after normal operation



8.3 Delayed ignition, burners starts violently



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

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Ljungby September 26th, 2017

Håkan Lennartsson

Managing Director

Enertech AB

10. OIL BURNERS MAINTENANCE INSTUCTIONS

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.

Installed by:

.....

Tel:

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.

