

OPERATING AND MAINTENANCE INSTRUCTIONS FOR LIGHT OIL BURNERS

Burners without preheating

Junior Pro 1

- ☐ J10
- ☐ J18

Junior Pro 2

- ☐ J20
- ☐ J45
- ☐ J50

Burners with preheating

Junior Pro 1

- ☐ LJ10
- ☐ LJ18

Junior Pro 2

- ☐ LJ20
- ☐ LJ45
- ☐ LJ50



Read these instructions carefully before installation, commissioning or maintenance of the burner!

oilon®

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Electric diagrams

1. Conventions in this Manual

Read these instructions carefully before installation, commissioning or maintenance of the burner. The given instructions must be followed.

Throughout this manual, the following three symbols are used to point out very important information:



WARNING! A warning alerts you to possible danger to person, if the instructions are not followed.



CAUTION! A caution alerts you to something, that has the potential to cause damage to component, burner, process or surroundings, if the instructions are not followed.

Note! A note points out information of special interest. □

**KEEP THESE OPERATING AND MAINTENANCE INSTRUCTIONS
AS WELL AS THE ELECTRICAL SCHEMES AVAILABLE NEAR
THE BURNER!**

2. General

Oilon Junior Pro burners are fully automatic light oil burners.

The burners can be used on most heating appliances such as hot water boilers, steam boilers and air heaters.

A fan attached to the burner and dimensioned to provide a sufficiently high and even air pressure for efficient combustion in modern combustion chambers supplies the required air.

The burners are suitable for use on fuel oil (light fuel oil), with a viscosity of 4 - 6 mm²/s (cSt) at a temperature of +20 °C.

The oil supplied to the burner must be filtered before the burner oil pump. Filtration degree is from 20 - 40 µm. We recommend mounting of an Oilon Plus filter and deaerator unit.

Oil atomizing pressure 800 - 1400 kPa (8 - 14 bar). Factory setting approx. 10 bar.

"LJ" burners are equipped with a preheater.

Required combustion air quantity: 15 m³ combustion air for each burnt kg of oil.

Burner operation is controlled and monitored by the burner automation.

Boiler thermostats or pressurestats control the burner capacity.

Burner protection: IP20

Supply voltage 230 V (-15 %...+10 %) 50 Hz 1-phase

Consumption: approx. 135 W, 0,71 A, 230 VAC, 50 Hz, 1-phase (J10, J18, J20, J45, J50)
approx. 220 W, 1,0 A, 230 VAC, 50 Hz, 1-phase (LJ10, LJ18)
approx. 330 W, 1,7 A, 230 VAC, 50 Hz, 1-phase (LJ20, LJ45, LJ50)

The ambient temperature during burner operation must be +8...+40 °C.

The following should be checked before first start-up:

- connections are correct
- settings of boiler regulating and control devices are correct
- boiler and its equipment are in working condition
- boiler room is adequately ventilated
- valves in supply lines are open
- there is oil in the tank
- oil temperature is adequate so that the viscosity is 4 - 6 mm²/s (max. +60 °C).



CAUTION! The burner must be installed firmly. Vibrations may damage burner or its components.



CAUTION! Disconnect the plug connector before burner maintenance or removal from the boiler. See chapter "Connecting the Burner to the Mains".



WARNING! In case of fire or other danger:

- switch off the main switch
- close the main fuel shut-off valve outside the plant
- take appropriate actions.



WARNING! Never use a naked flame while checking the burner or the boiler. Never store any inflammable material in the boiler room.□



WARNING! Keep the boiler door closed while starting the burner and during burner operation.

Correct installation and adjustment together with regular servicing are the most reliable guarantees of trouble-free burner operation.

Note!□ Local regulations and requirements must be adhered to when installing or servicing the burner.

When ordering spare parts please give the burner type and serial number indicated on the burner nameplate.

[illegible]

3.2. Parts List

		PCs
1	Burner housing	1
2	Name plate	1
3	Gasket	1
4	Hinge pin	2
5	Fixing screw for combustion head	3
6	Combustion head	1
	J10	
	J18	
	J20	
	J45	
	J50 with adjustment ring	
7	Fixing screw for mounting flange	
	M10 x 25	2 and/or
	M8 x 25	4
8	Mounting flange	1
9	Flange gasket	1
10	Air adjustment ring	1
	Pro 1: 1/2-opening	
	Pro 2: 1/1-opening	
11	Fixing nut for adjustment ring	1
12	Air cone	1
13	Fixing screw for air cone	3
14	Fixing screw for fan wheel	1
15	Fan wheel	1
	Pro 1: Ø 120 x 52	
	Pro 2: Ø 133 x 52	
16	Motor	1
17	Fixing screw for oil pump	3
18	Plug connector for motor	1
19	Fixing screw for motor	4
20	Oil pump coupling	1
21	Plug connector for oil pump	1
22	Nipple for pressure pipe	1
23	Oil pump	1
24	Cover plate for motorbox	1
25	Motorbox	1
26	Fixing screw for motorbox	2
27	Grommet for preheater cable	1
28	Flame detector (photo resistor)	1
29	Holder for flame detector	1
30	Plug connector, socket	1
31	Fixing screw for socket	2
32	Plug connector, plug-in part	1
33	Limit switch	1
34	Fixing screw for limit switch	2
35	Limit switch cable	2
36	Air setting scale	1
37	Fixing screw for air setting	1
38	Fixing screw for air setting scale	1
39	Cable sleeve for ignition cable	2
40	Ignition transformer	1
41	Plug connector for ignition transformer	1
42	Fixing screw for ignition transformer	2
43	Self-closing air flap	1
44	Front plate	1
45	Insulation for air intake	1

		PCs
46	Air intake	1
47	Fixing screw for air intake	4
48	Clamp for run hour counter, optional extra	1
49	Locking nut for grommet	1
50	Grommet	3
51	Fixing screw for control unit bracket	1
52	Control unit bracket	1
53	Signal lamp indicating readiness for operation	1
54	Baseplate for control unit	1
55	Fixing and earth screws for control unit	3
56	Control unit	1
57	Run hour counter, optional extra	1
58	Fixing screw for ignition electrode holder	1
59	Ignition electrode holder	1
60	Nozzle	1
61	Preheater + nozzle conduit	1
	Pro 1: FPHB5	
	Pro 2: FPHB10	
	/ Nozzle holder + nozzle conduit, without preheating	
62	Fixing screw for nozzle conduit holder	1
63	Nozzle conduit holder:	1
	J10, J18, J20, J45, J50, LJ10, LJ18: Ø 10	
	LJ20, LJ45, LJ50: Ø 18,5	
64	Cover plate	1
65	Eccentric piece	1
66	Locking screw for eccentric piece	1
67	Ignition electrodes	1
68	Ignition electrode holder	1
69	Locking screw for ignition electrode holder	1
70	Sight glass	1
71	Plug connector for preheater	1
72	Protective sleeve for ignition cable nipple	2
73	Ignition cable	2
74	Fixing screw for cover plate	2
75	Pressure pipe	1
76	Gasket ring for oil hose nipple	2
77	Nipple for oil hose	2
78	Oil hose	2
79	Nipple for oil hose	2
80	Filter cover	1
81	Bracket for filter	1
82	Filter	1

3.3. General

- burner types:

<ul style="list-style-type: none"> • without preheating Junior Pro 1 J10 J18 Junior Pro 2 J20 J45 J50 	<ul style="list-style-type: none"> • with preheating Junior Pro 1 LJ10 LJ18 Junior Pro 2 LJ20 LJ45 LJ50
---	---
- the burner can be hinged to both sides
- the standard burner must be installed in such a position, that the motor shaft lies horizontally; but the burner must not, however, be installed upside down. In the case the burner must be installed upside down, a separate installation set with instructions must be ordered from the manufacturer.
- burner control unit internally connected
- safety switch (limit switch) on the hinged burner housing
- stepless adjustable air regulation
- oil pump atomizing pressure 800 - 1400 kPa (8 - 14 bar), factory setting approx. 10 bar
- electrical connection with a plug connector
- standard equipment for two pipe system
- recommended nozzle types:
 - solid 45° - 60° (Junior Pro 1 J10, J18, LJ10, LJ18)
 - solid 60° (Junior Pro 2 J20, J45, J50, LJ20, LJ45, LJ50)
- NO_x-class 2

Optional extra

- boiler dual thermostat
 - regulating thermostat max. 95 °C
 - limit thermostat 100 °C
- pocket for thermostat
- run hour counter
- deaerator Tigerloop
- oil flow meter
- Oilon Plus filter and deaerator unit:
 - filter
 - deaerator
 - pressure gauge
 - protective cover
 - multi-function meter, optional extra

3.4. Capacity Table

Burner	Burner capacity range	
	kg/h	kW
Junior Pro 1		
J10	1,4 - 2,3	17 - 27
J18	1,7 - 2,8	20 - 33
Junior Pro 2		
J20	2,3 - 4,1	27 - 48
J45	3,0 - 4,8	36 - 57
J50	2,3 - 6,5	27 - 77
Junior Pro 1		
LJ10	1,4 - 2,3	17 - 27
LJ18	1,7 - 2,8	20 - 33
Junior Pro 2		
LJ20	2,3 - 4,1	27 - 48
LJ45	3,0 - 4,8	36 - 57
LJ50	2,3 - 6,5	27 - 77

Burner capacities are achieved according to standard EN267.

3.5. Name Plate

Burner type is marked with a X. Example Junior Pro 1 LJ10.

Type	JUNIOR PRO 1	Teho kg/h	
Type		Capacity kg/h	
<input checked="" type="checkbox"/>	LJ10	1.4 - 2.3	
<input type="checkbox"/>	LJ18	1.7 - 2.8	
No.		Valmistettu	
No.		Manufactured	
230 V 1~50Hz 220W		1.0A	
IP20			
Kohdemaa			
Country of destination			
CE			
oflora		PL 5	
		15001 LAHTI FINLAND	

A-472L

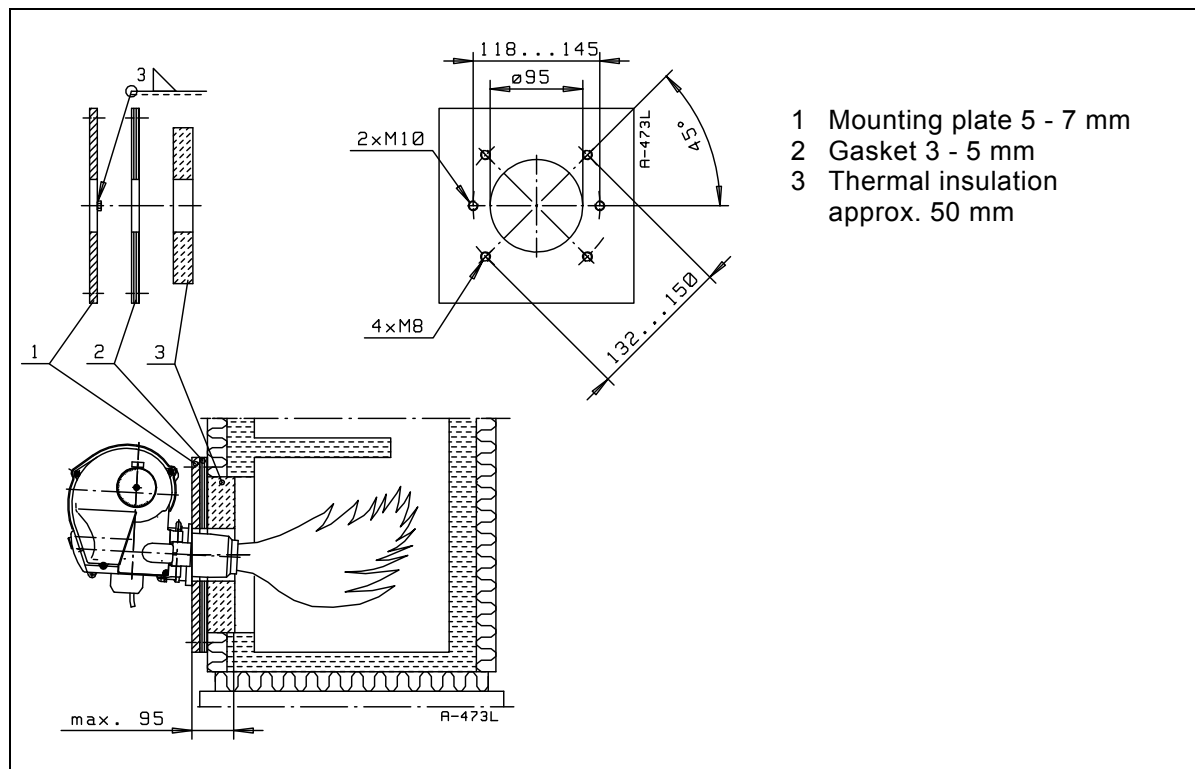
Use only original spare parts. When ordering spare parts please give burner type and serial number indicated on the burner nameplate.

4. Burner Installation

4.1. Burner Mounting

The furnace, which has a flame-shaped design, does not require refractory. Boilers without bottom cooling require refractory to prevent heat from reaching boiler foundations.

The flame must at no point come into contact with the furnace walls. If this cannot be avoided, such points must be covered with refractory. This applies especially to the refractory at the back wall of short furnaces.



The mounting plate must have either two M10 threaded holes or four M8 threaded holes for the mounting of the burner according to the drawing.

4.2. Hinged Burner Housing

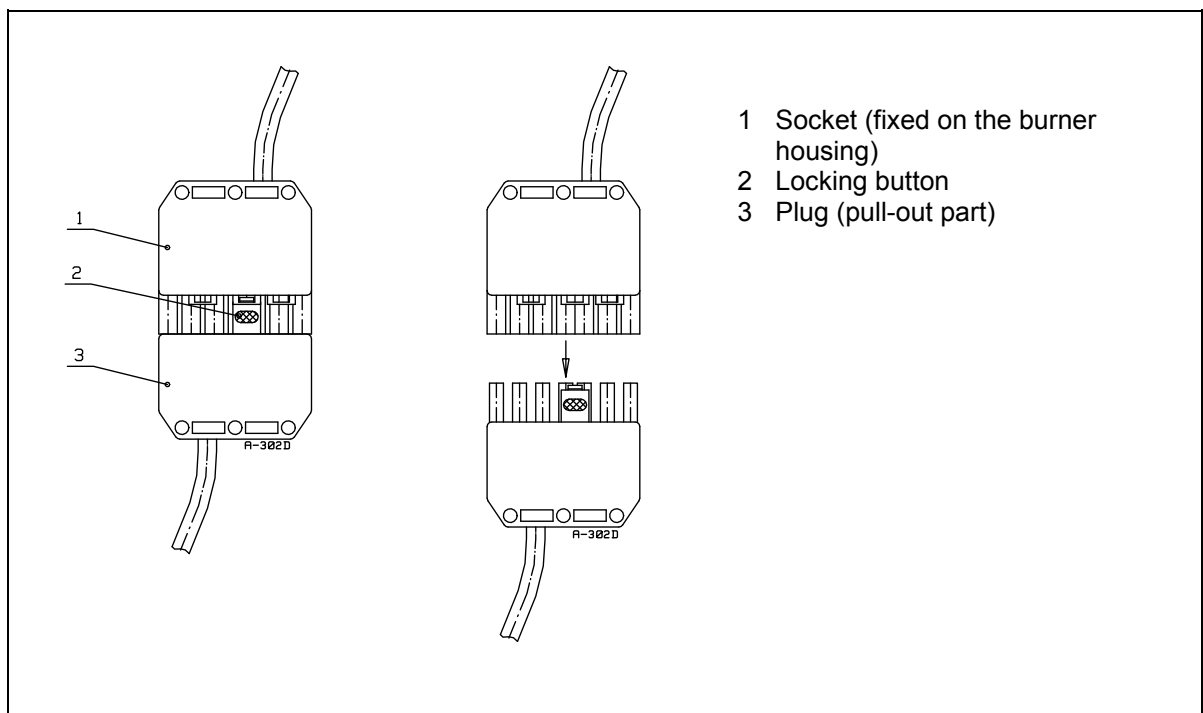
As standard the burner can be hinged to both sides.

4.3. Electric Connections

The burner must be connected according to the electrical diagrams delivered together with the burner. General and local standards and regulations as well as requirements of electrical equipment on electrical connections must be adhered to.

4.4. Connecting the Burner to the Mains

Electrical connection on burner is with a plug connector. Connect the cable of the plug supplied with the burner to the boiler thermostat or pressurestat. The socket has been firmly attached to the burner housing. Disconnect the burner from the mains (burner switch in position 0) by pressing the locking button and pulling out the plug from the socket at the same time.



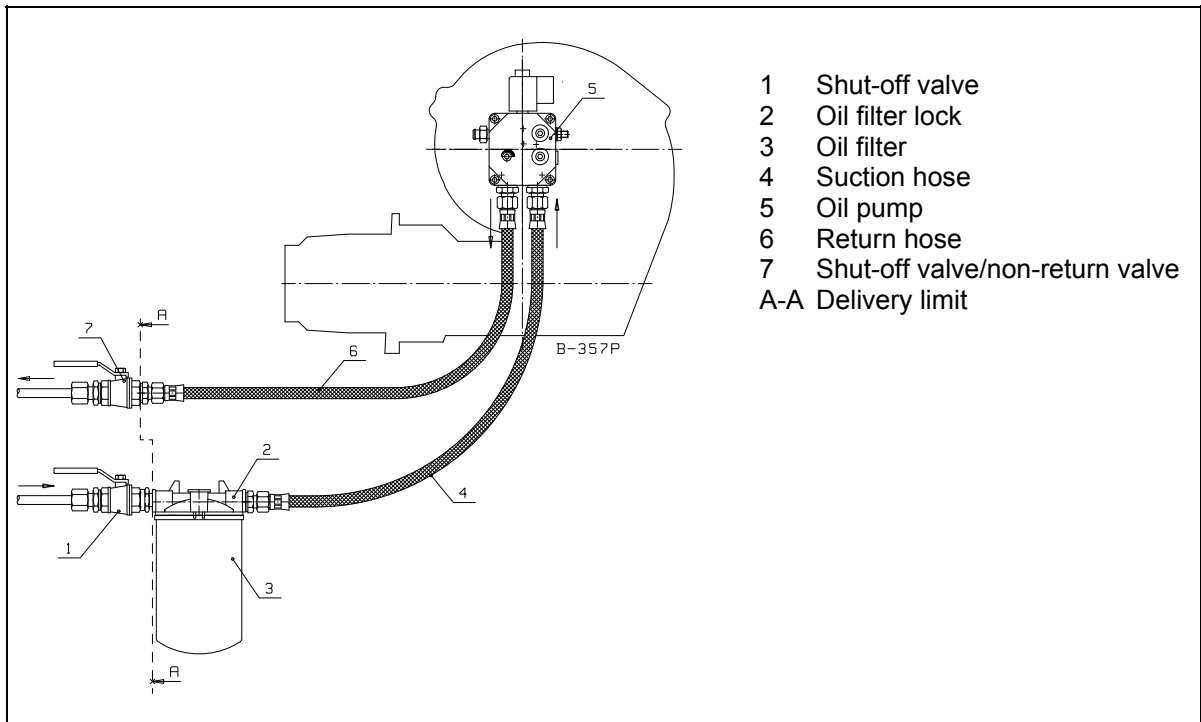
CAUTION! Disconnect the plug connector before burner maintenance or removal from the boiler.

4.5. Connecting the Burner to Oil Supply Line

The burner is equipped for two-pipe system.

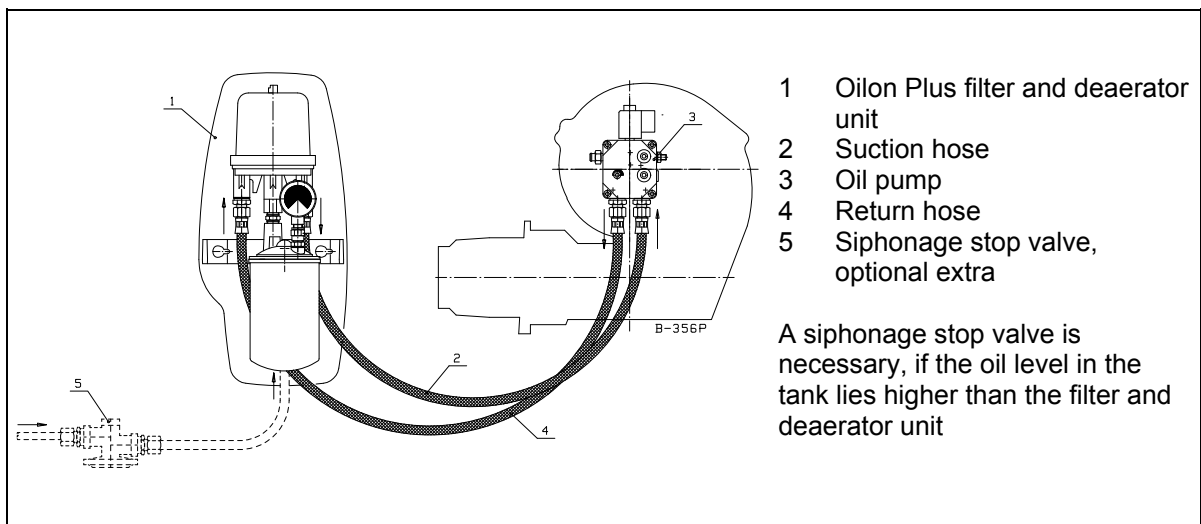
Two-pipe system

The piping must be done for two-pipe system according to the drawing, if no Oilon Plus -filter and deaerator unit is used. Two-pipe system has both suction and return lines for fuel oil to the tank.



Oilon Plus filter and deaerator unit

We recommend use of an Oilon Plus filter and deaerator unit, where the oil flows from the tank in one pipe to the unit. The oil pump is connected as in two-pipe system. The by-pass plug must be fixed in the oil pump. The pressure gauge of the unit indicates if the filter possibly clogs.



Filter

The filter should be changed in a two-pipe system at intervals of 1 - 1,5 years. If an Oilon Plus filter and deaerator unit is used, the time of use is longer.

5. Fuel System

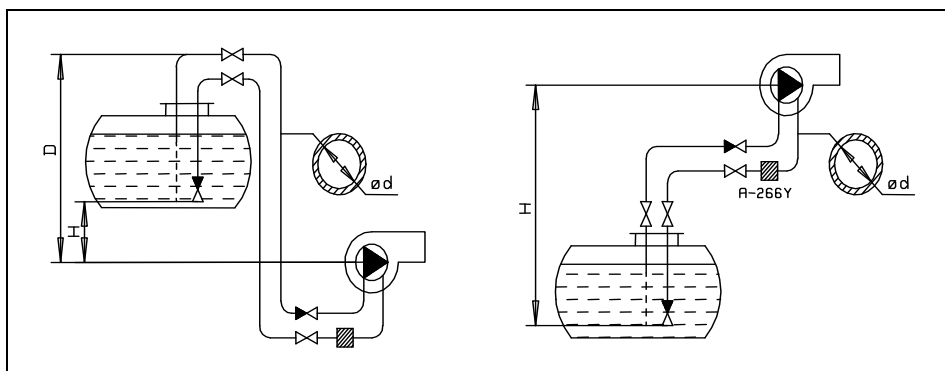
5.1. Oil Pipes

The oil tank and the oil pipes must be installed to avoid the risk of the oil cooling below cloud point. The cloud point of heating oil depends on the oil quality. If the oil is allowed to cool to the cloud point, valves and filters will block. The most suitable oil temperature is +15...+25°C.

Note! The viscosity of oil coming to the burner must be 4 - 6 mm²/s (cSt).

The maximum lengths for other viscosities can be calculated by the simple ratio of viscosities i.e. if the table shows lengths for 5 or 6 mm²/s (cSt) viscosity, multiply the length shown in the table by 5 or 6 and divide by the value of the new viscosity mm²/s (cSt).

Keep in mind that absolute tightness is the fundamental pre-requisite for secure operation. A leaking suction line may cause, among other things, afterspraying of oil into the boiler. It is advisable to use ball valves instead of needle valves.



The tables give the maximum lengths (in meters) of return and suction lines.

Overlying oil tank

H m	DANFOSS BFP/MS (ø d mm)		
	ø 6 mm	ø 8 mm	ø 10 mm
0	17	53	100
0,5	19	60	100
1,0	21	66	100
1,5	23	72	100
2,0	25	79	100
2,5	27	85	100
3,0	29	91	100
3,5	31	98	100
4,0	33	100	100

2800 rpm, 6 mm²/s (cSt)

Underlying oil tank

H m	DANFOSS BFP/MS (ø d mm)		
	ø 6 mm	ø 8 mm	ø 10 mm
0	17	53	100
0,5	15	47	100
1,0	13	41	99
1,5	11	34	84
2,0	9	28	68
2,5	7	22	53
3,0	5	15	37
3,5	-	9	22
4,0			6

2800 rpm, 6 mm²/s (cSt)

H m	SUNTEC 45/47 (ø d mm)			
	ø 6 mm	ø 8 mm	ø 10 mm	ø 12 mm
0	14	49	123	150
0,5	16	55	136	150
1,0	18	61	150	150
2,0	22	73	150	150
3,0	25	85	150	150
4,0	29	96	150	150

2850 rpm, 5 mm²/s (cSt)

Dmax = 20 m

(D-H)max. = 4,5 m

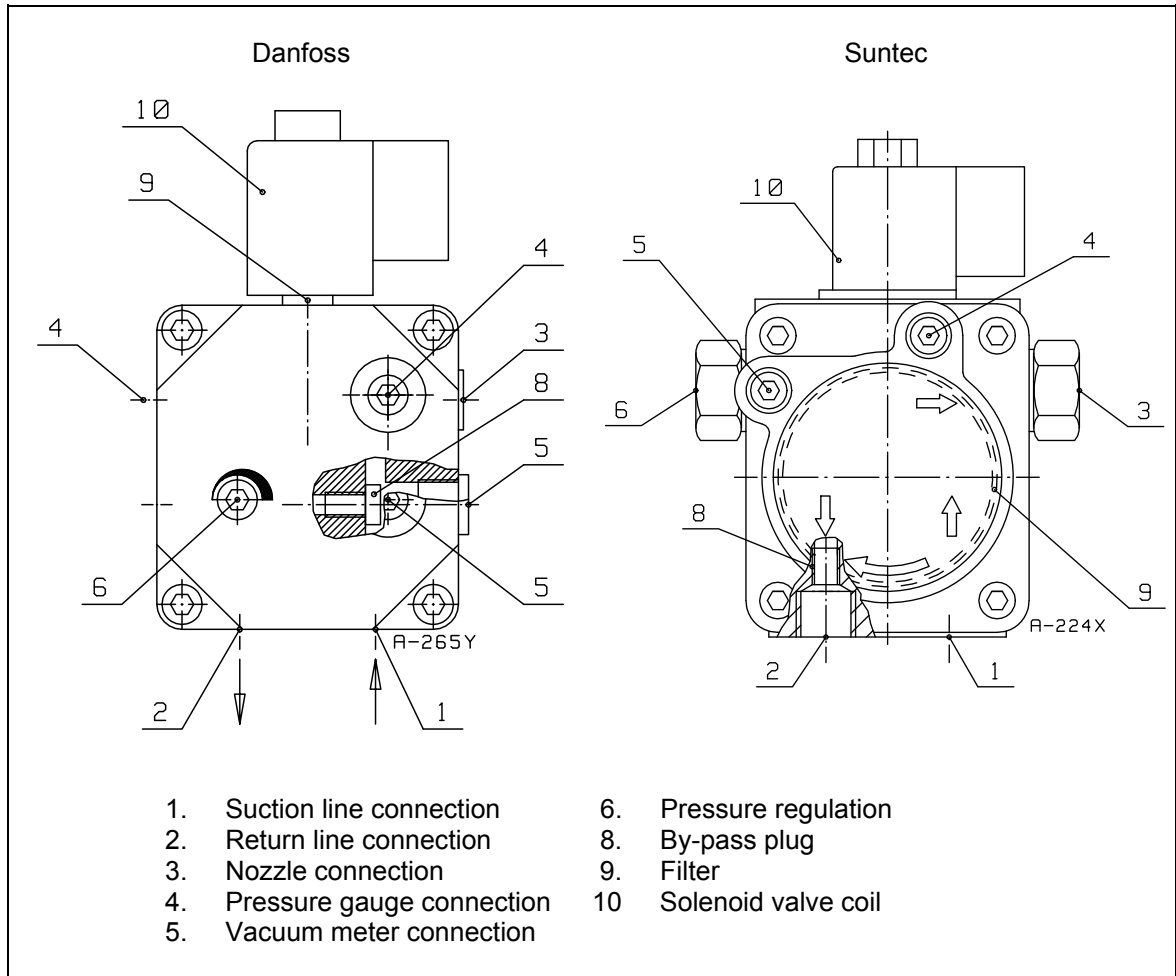
H m	SUNTEC 45/47 (ø d mm)			
	ø 6 mm	ø 8 mm	ø 10 mm	ø 12 mm
0	14	49	123	150
0,5	12	43	109	150
1,0	10	37	94	150
2,0	7	26	65	138
3,0	-	14	37	78
4,0	-	-	8	18

2850 rpm, 5 mm²/s (cSt)

Hmax = 4,5 m

See the oil piping dimensions from the Oilon Plus manual, if an Oilon Plus filter and deaerator unit is used.

5.2. Oil Pumps

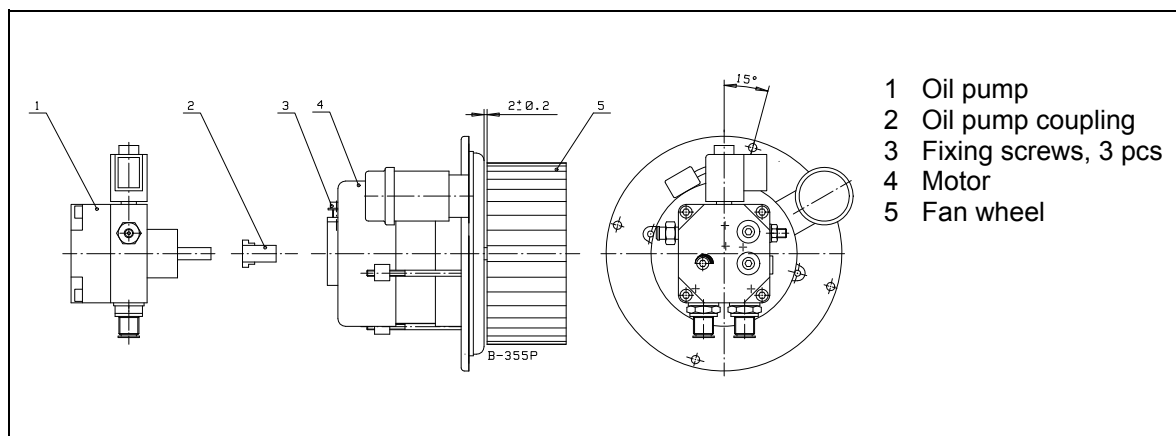


Oil pump venting

Two-pipe system needs no venting as the air comes away when starting the burner. In order to speed up the air removal, nipple (4) in the pressure gauge connection can be loosened.

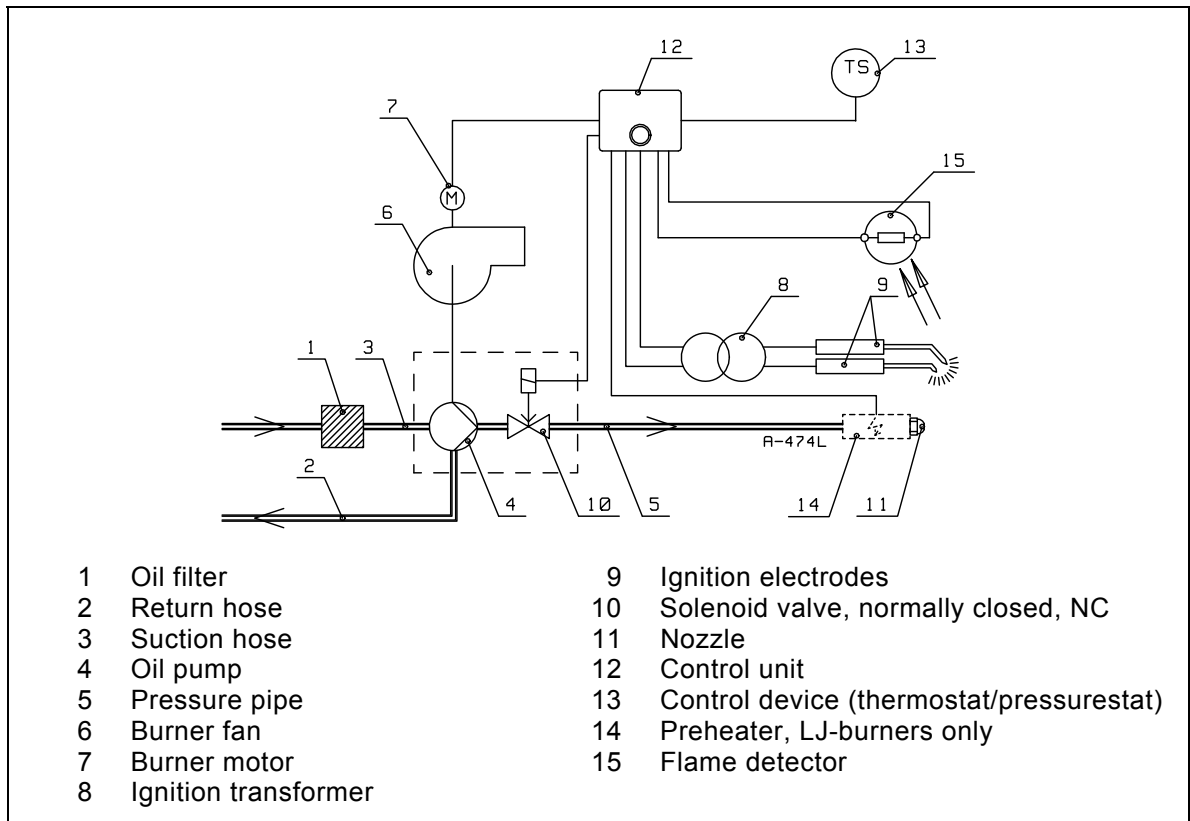
Removal of oil pump and pump coupling

Remove the oil pump (1) from the motor (4) by loosening three fixing screws (3) and withdraw the oil pump. Check the condition of the oil pump coupling (2) and replace, if necessary.

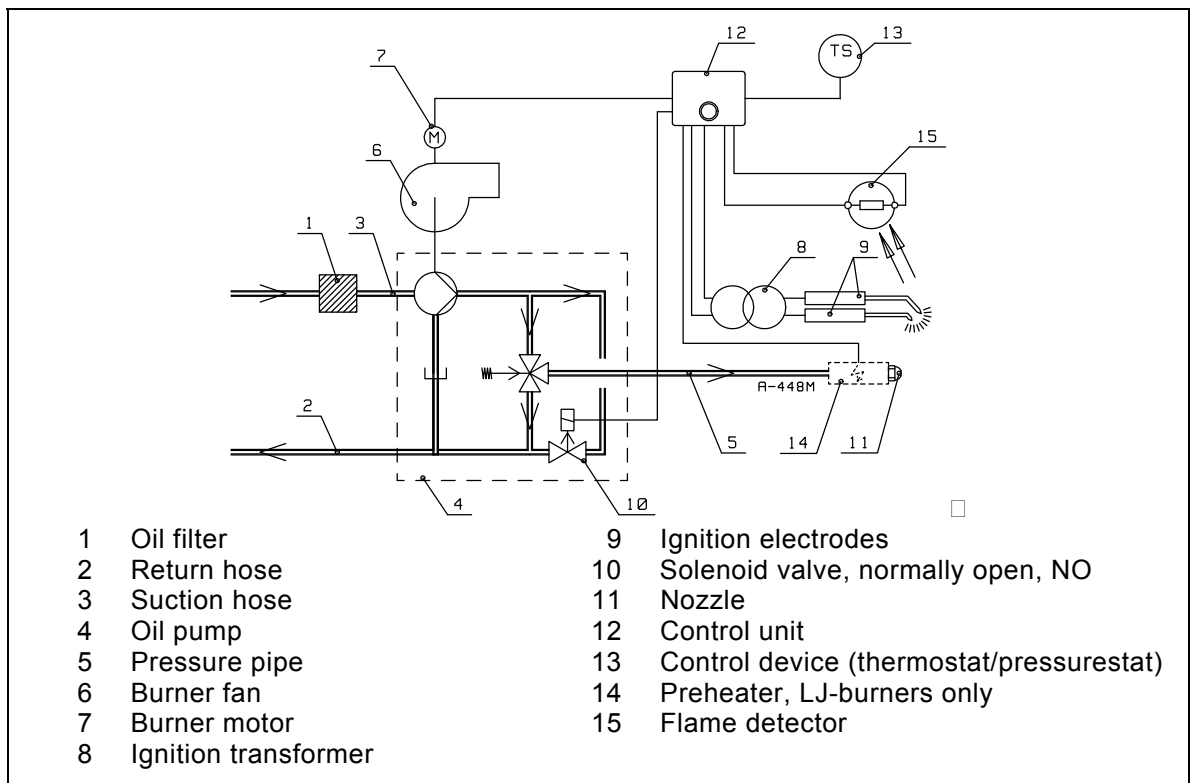


6. Burner Operation

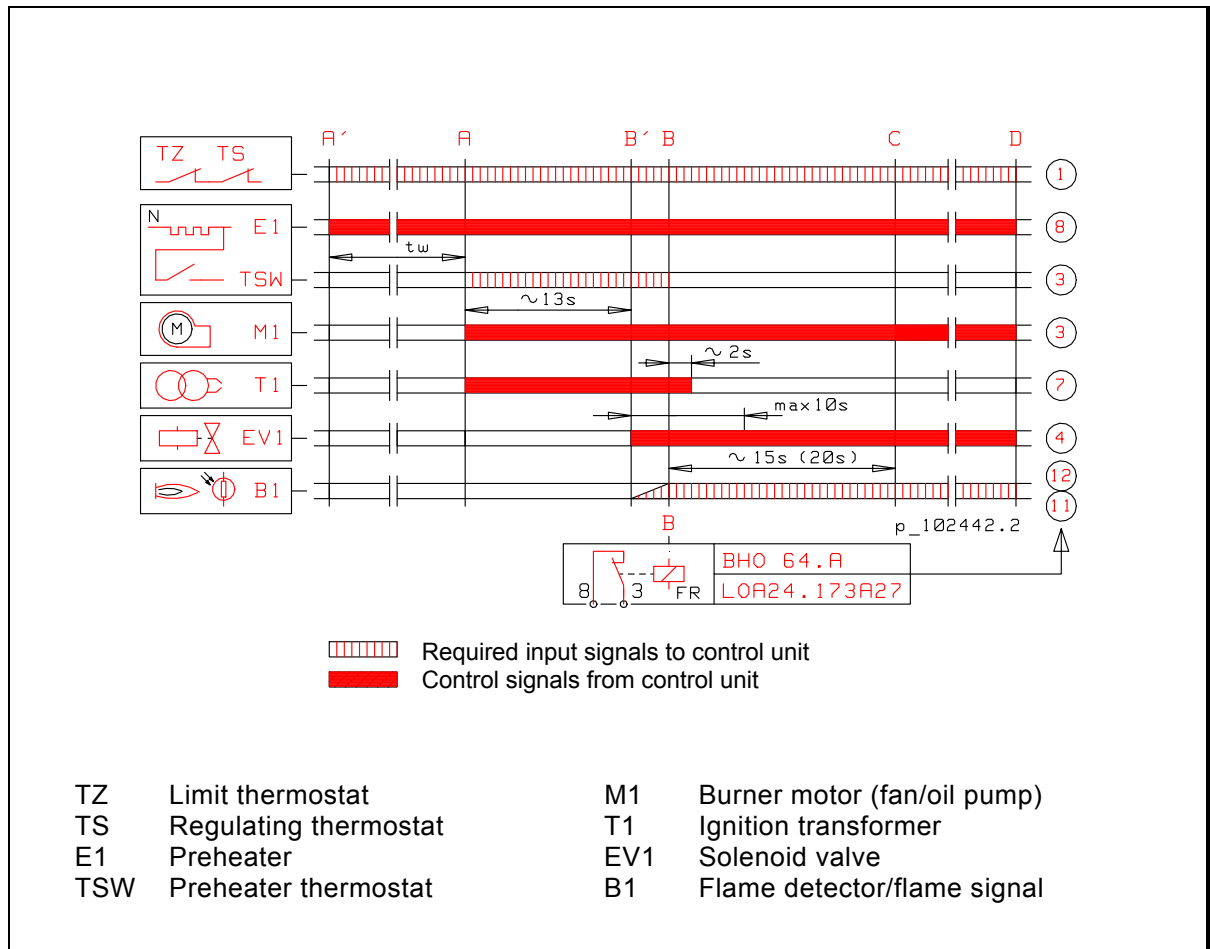
6.1. Operating Scheme, Oil Pump BFP 21 L3



6.2. Operating Scheme, Oil Pump AS 47C



6.3. Burner Operation Principle



Prerequisites for start-up

- burner is getting fuel
- failures and interlocks are reset
- contacts of switches of control voltage supply on control unit and contacts of thermostats are closed, whereby the control voltage is applied to terminal 1 in control unit.

A' Start on burner with preheating

- control signal from control unit terminal 8
- preheater begins to heat up the fuel
- contact of lower limit thermostat (TSW) in preheater closes after time "tw" (approx. 1 min), when the oil temperature has reached approx. 70 °C, whereby the control signal is applied to terminal 3 in control unit.

A Start on burner without preheating

- control signal is applied from terminal 8 to terminal 3 in control unit
- burner motor (fan/oil pump) starts
- pre-ignition begins
- pre-purge begins.

B' Solenoid valve receives control signal

- safety time begins (max. 10 s)
- solenoid valve opens (Danfoss) or closes (Suntec)
- atomizing of oil begins
- flame has to be ignited during safety time, otherwise control unit goes to lock-out

B Flame is established

- flame relay (FR) is energised, whereupon terminals 8 and 3 are linked. Opening of preheater thermostat contact does not shut down the burner during flame.
- burner has started
- post-ignition 2 s (control from terminal 7).

C Control unit/burner in normal operating condition

- control program of control unit ends
- burner remains operating supervised by control unit (flame) and controlled by regulating thermostat.

D Controlled shut-down with regulating thermostat

- burner motor stops
- solenoid valve closes
- flame extinguishes.

See chapter "Control Functions in the Event of Faults".

7. Burner Adjustment

7.1. Capacity Regulation

Adjust the burner thermal output by changing the size of the nozzle or the oil pump pressure. Combustion air quantity (and position of the adjustment ring on burner types J50 and LJ50) must be checked after having changed the nozzle. See chapter "Change of Nozzle".

7.1.1. Nozzle Selection

Select the nozzle size according to the boiler capacity.

Nozzle selection according to CEN-standard

The marking according to CEN standard. Kg/h is valid at an atomizing pressure of 10 bar, viscosity of 3,4 mm²/s (cSt) and density of 840 kg/m³. In this case the nozzle is marked with EN.

$$\text{kg/h} = \frac{P}{H_a \times \eta \times k_p}$$

Also the following formula gives the pressure factor:

$$k_p = \sqrt{\frac{P_2}{P_1}}$$

P = boiler capacity in kW
 H_a = lower calorific value for fuel oil in kWh/kg
 η = 0,80 - 0,95 (efficiency 80 - 95 %)
 k_p = pressure factor (see table)
 P₁ = 10 bar (according to CEN standard)
 P₂ = pressure to be used

Calculation example:

Nozzle for a boiler of 25 kW with an efficiency of 0,90 and pressure to be used is 10 bar.

$$\text{nozzle kg/h} = \frac{25}{11,86 \times 0,90 \times 1,00} = 2,34 \text{ kg/h} \Rightarrow \text{select nozzle 2,37 kg/h}$$

Nozzle selection according to USgal/h

The marking according to USgal/h. US gallon is valid at an atomizing pressure of 7 bar, viscosity of 3,4 mm²/s (cSt) and density of 820 kg/m³.

$$\text{USgal/h} = \frac{P}{H_a \times \eta \times 3,2 \times k_p}$$

1 USgal = approx. 3,2 kg of oil
 P₁ = 7 bar (according to USgal/h)

Calculation example:

Nozzle for a boiler of 25 kW with an efficiency of 0,90 and pressure to be used is 10 bar.

$$\text{nozzle USgal/h} = \frac{25}{11,86 \times 0,90 \times 3,2 \times 1,20} = 0,61 \text{ USgal/h} \Rightarrow \text{select nozzle 0,60 USgal/h}$$

Pressure factor table

Oil pressure	bar	7	8	9	10	11	12	13	14	15	16
P ₂	kPa	700	800	900	1000	1100	1200	1300	1400	1500	1600
Pressure factor	CEN	0,84	0,89	0,95	1	1,05	1,10	1,14	1,18	1,22	1,26
k _p	P ₁ =10 bar										
	USgal/h	1	1,07	1,13	1,20	1,25	1,31	1,36	1,41	1,46	1,51
	P ₁ =7 bar										

To convert kg/h into l/h, divide kg/h by the density of fuel oil (0,833 g/cm³).

On burners with preheating the nozzle capacities are approx. 10 - 15 % lower than on burners without preheating.

7.1.2. Oil Pump Pressure Regulation

Fit a pressure gauge in the connection (see chapter "Oil Pumps"). Adjust the oil pressure by turning the pressure regulating screw. The pressure increases by turning the screw clockwise and decreases counter-clockwise. Oil pump pressure is set at the factory during testing at approx. 1000 kPa (approx. 10 bar). Pressure setting range is from 700 to 1400 kPa (7 - 14 bar).

When the pressure is changed the oil flow and pressure follow the following formula:

$$\frac{V_1}{V_2} = \sqrt{\frac{P_1}{P_2}}$$

V1 =	capacity marked on the nozzle
V2 =	nozzle capacity at a pressure of P2
P1 =	10 bar gives kg/h according to CEN standard 7 bar gives USgal/h
P2 =	pressure to be used

Calculation example

Calculate the nozzle capacity when the nozzle size is 2,37 kg/h (0,6 USgal/h) and pressure is set at 13 bar.

According to CEN standard

$$\frac{V_1}{V_2} = \sqrt{\frac{P_1}{P_2}} \Rightarrow V_2 = V_1 \times \sqrt{\frac{P_2}{P_1}} = 2,37 \text{ kg/h} \times \sqrt{\frac{13 \text{ bar}}{10 \text{ bar}}} = 2,37 \text{ kg/h} \times 1,14 = 2,7 \text{ kg/h}$$

According to USgal/h

$$V_2 = V_1 \times \sqrt{\frac{P_2}{P_1}} = 0,6 \text{ USgal/h} \times \sqrt{\frac{13 \text{ bar}}{7 \text{ bar}}} = 0,6 \text{ USgal/h} \times 1,36 = 0,82 \text{ USgal/h} \Rightarrow \text{approx. } 2,7 \text{ kg/h}$$

7.1.3. Calculation of Burner Capacity

If the nozzle size is known, the burner capacity can be calculated as follows:

Example:

Nozzle size 1,87 kg/h (0,5 USgal/h) and pressure to be used 10 bar.

According to CEN standard

Burners without preheating

$$P = \text{kg/h} \times H_a \times k_p$$

$$P = 1,87 \times 11,86 \times 1 = 22 \text{ kW}$$

On burners with preheating the capacity decreases by 10 - 15 %

$$P = 22 \text{ kW} - \left(\frac{22 \text{ kW} \times 15}{100} \right) = 19 \text{ kW}$$

According to USgal/h

Burners without preheating

$$P = \text{USgal/h} \times H_a \times 3,2 \times k_p$$

$$P = 0,5 \times 11,86 \times 3,2 \times 1,2 = 22 \text{ kW}$$

On burners with preheating the capacity decreases by 10 - 15 %

$$P = 22 \text{ kW} - \left(\frac{22 \text{ kW} \times 15}{100} \right) = 19 \text{ kW}$$

7.2. Nozzle Table

Nozzle capacities at different nozzle pressures.

Calorific value 11,86 kWh/kg

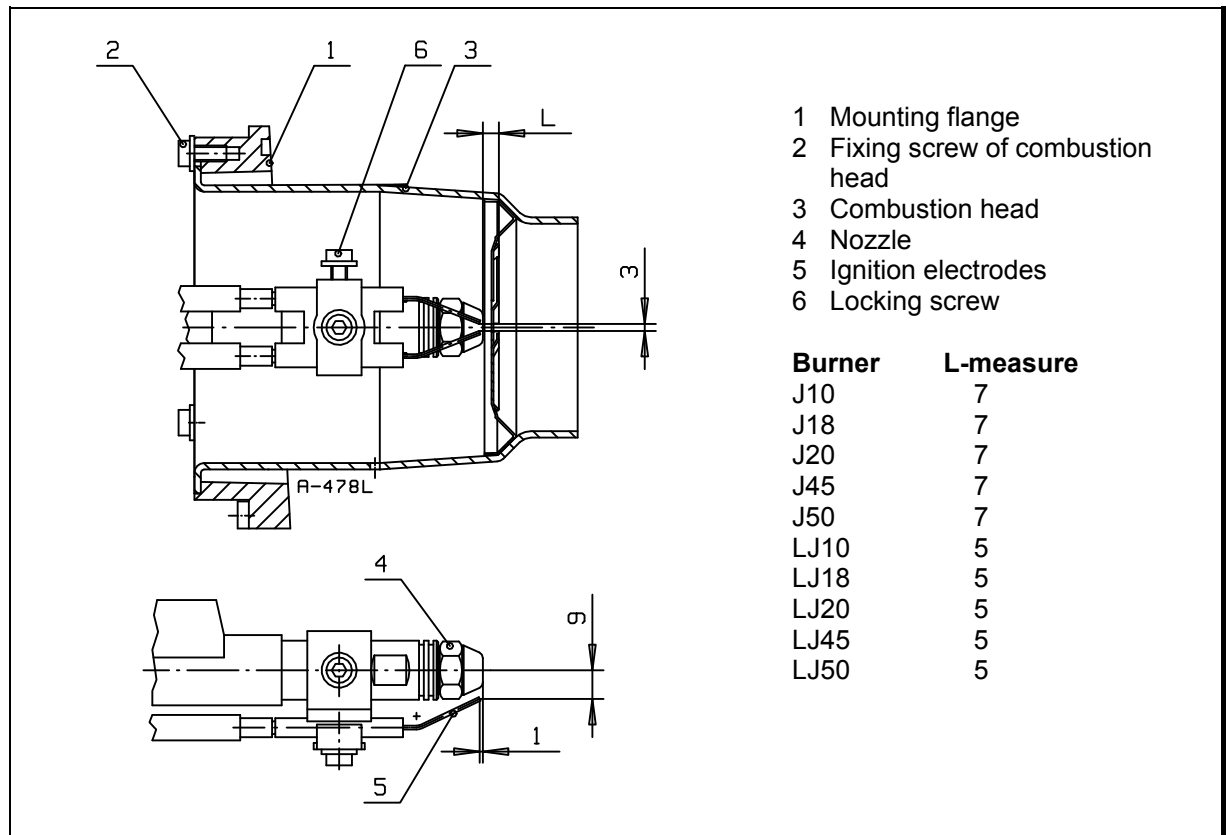
Density 0,833 kg/m³

Efficiency 0,9 (90 %)

CEN kg/h	USgal/h	Capacity kW Atomizing pressure			
		8 bar	10 bar	12 bar	14 bar
1,46	0,40	14	16	17	19
1,66	0,45	16	18	20	21
1,87	0,50	18	20	22	24
2,11	0,55	20	22	24	26
2,37	0,60	21	24	26	28
2,67	0,65	23	26	29	31
2,94	0,75	27	30	33	36
3,31	0,85	31	34	37	40
3,72	1,00	36	40	43	48
4,24	1,10	40	45	50	53
4,45	1,20	43	48	52	57
4,71	1,25	45	51	56	60
5,17	1,35	49	55	60	65
5,84	1,50	54	61	67	72
6,08	1,65	60	66	72	77
6,55	1,75	64	71	77	-
-	2,00	73	77	-	-

7.3. Nozzle and Ignition Electrode Settings

The measures shown are for guidance. They may vary according to the nozzle type being used. The oil spray must not come into contact with the electrodes and the diffuser disc. The electric arc should be created at that point in the oil where the spray begins. The ignition electrodes must not come into contact with diffuser disc.



7.4. Change of nozzle

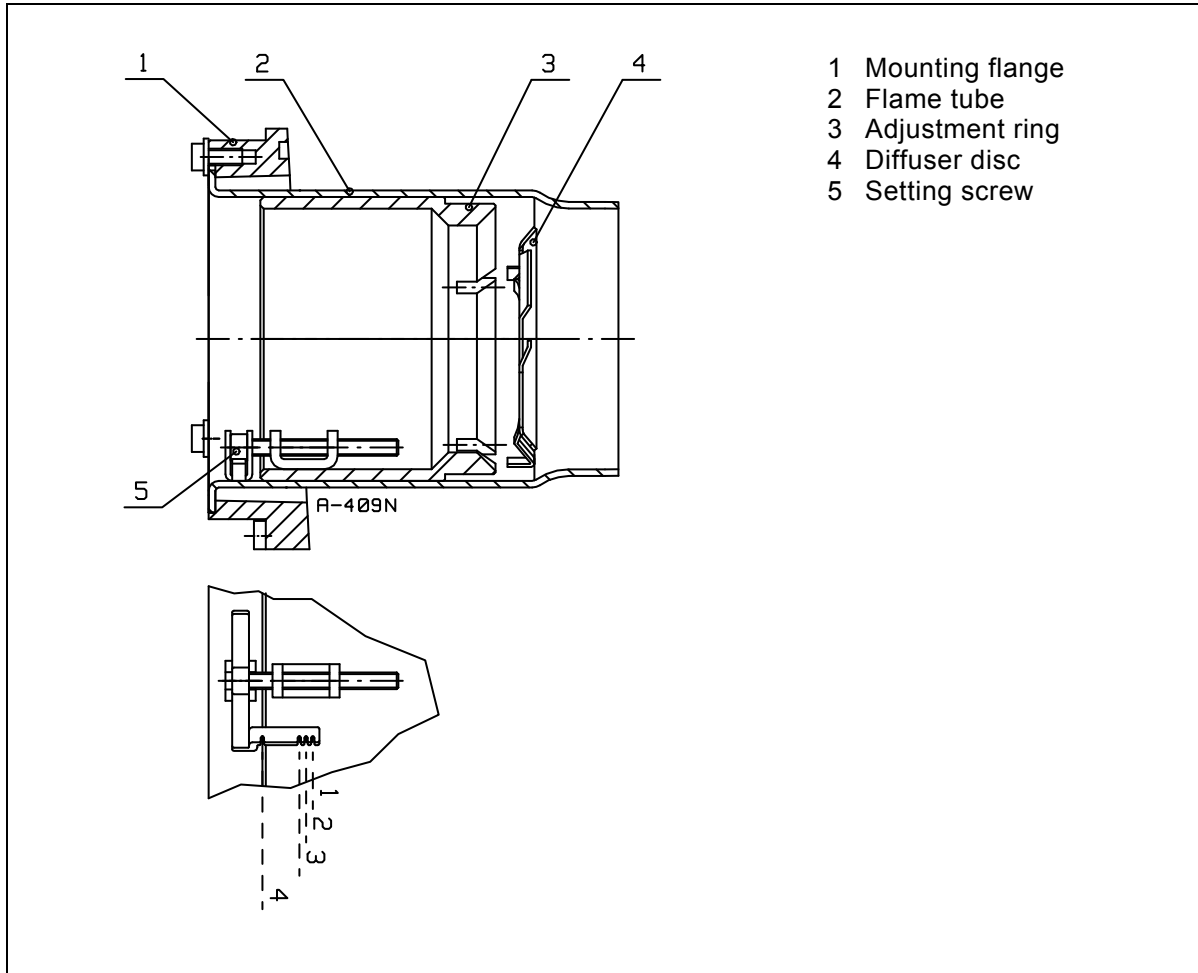
Loosen the screw (6) and withdraw the ignition electrodes (5) with holder and ignition cables forward. When removing nozzle, two set spanners of 16 mm are needed. After having changed the nozzle adjust the ignition electrodes according to the drawing.



CAUTION! When removing nozzle, two set spanners of 16 mm are needed; one to support the preheater/nozzle holder and the other for turning on the nozzle.

7.5. Adjusting the Air Velocity in the Combustion Head J50, LJ50

Adjust the air velocity in the combustion head by turning the setting screw (5), to change the distance between the adjustment ring and the edge of the diffuser disc (4). There is a scale with four grooves in the combustion head, which is directed to the back edge of the adjustment ring according to the capacity. At low capacity the adjustment ring is advanced and at high capacity retracted. If the adjustment ring is too far forward with respect to the capacity, the air velocity in the combustion head is too high. Hence it follows, that the ignition is more difficult and/or there is not enough air to support combustion at full load. If the adjustment ring is too far back, the air velocity in the combustion head is too low. Hence it follows, that the combustion values become worse. Check burner combustion characteristics by means of flue gas analysis.



Normative positions of the adjustment ring, when the nozzle pressure is 10 bar (factory setting).

Capacity kg/h	Position of adjustment ring	Nozzle Usgal/h	
		LJ50	J50
2,5 - 3,0	1	0,75 - 1,00	0,65 / 0,75
4,0	2	1,25	1,00
5,0	3	1,50	1,25
6,0 / 6,5	4	1,75 / 2,00	1,50 / 1,75

Note! □ If the position of the adjustment ring has to be altered in relation to the diffuser disc, the air velocity and quantity in the combustion head will change. Check the combustion values by flue gas analysis and, if necessary, adjust the combustion air quantity to be adequate.

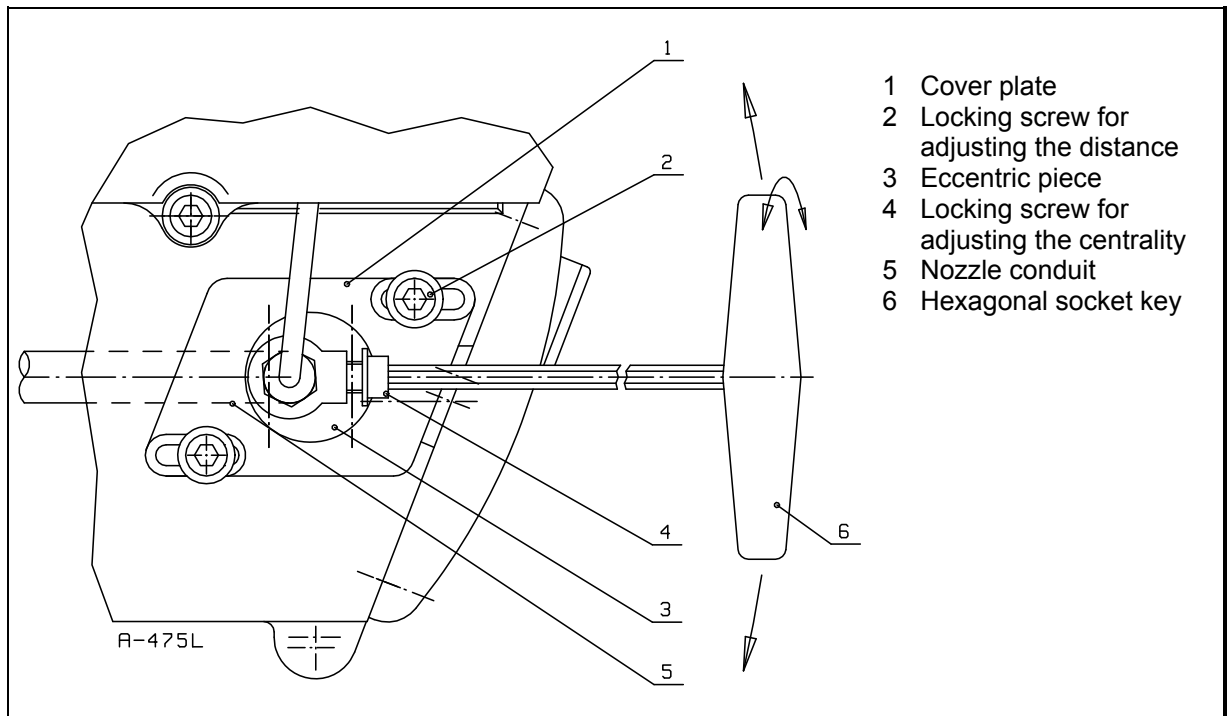
7.6. Adjusting the Distance and Centrality of the Nozzle

Distance

Loosen the locking screws (2) but not more than that the cover plate keeps contact with the burner housing. Move the cover plate in the direction of slots (see for L-measure the chapter "Nozzle and Ignition Electrode Settings") and tighten locking screws (2).

Centrality

Loosen the screw (4) in the eccentric piece. Adjust the vertical centrality of the nozzle by turning the eccentric piece by key. Adjust the horizontal centrality of the nozzle by moving the nozzle conduit (5) in the hole of the eccentric piece. Check the centrality of the nozzle in comparison with the hole of the diffuser disc. Screw the screw (4) of the eccentric piece and tighten. Screw the cover plate's screws (2) and tighten.

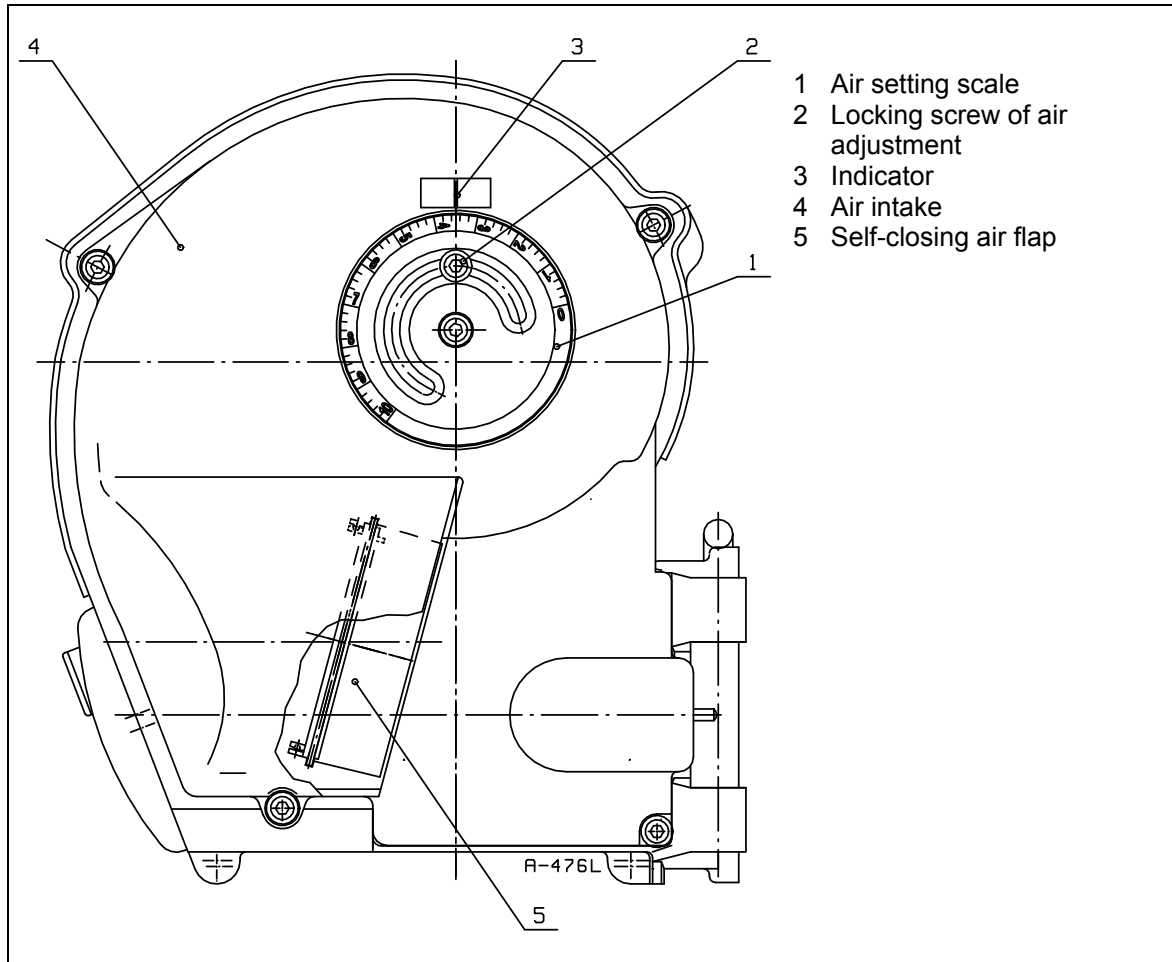


7.7. Combustion Air Adjustment

Make sure that air, required by the burner, enters the boiler room through the fresh air ventilator. The ventilator must not be closed. The fresh air inlet must be led to the top of the room. Eventual outlet valve has to be closed in wintertime.

Check, that the self-closing air flap (5) moves easy and that it is positioned according to the drawing.

Loosen the locking screw (2) and turn the setting scale (1). Tighten the locking screw after having found the right combustion air quantity.



Coarse combustion air setting, as example burner LJ 10

Oil pump pressure 10 bar (factory setting).

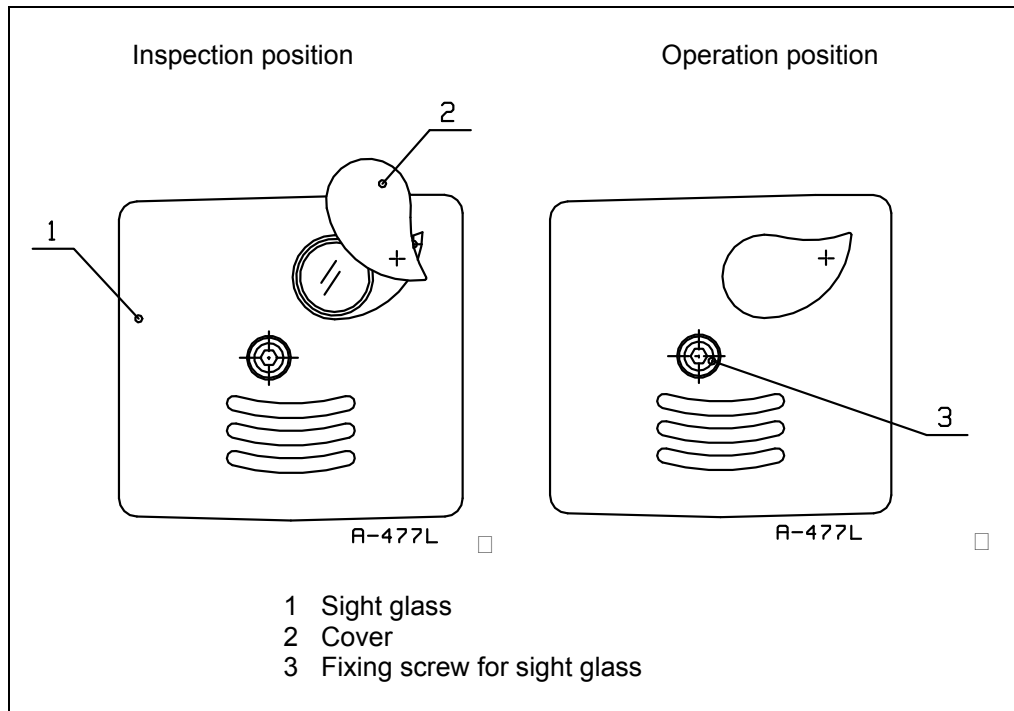
Nozzle USgal/h	Position of air setting scale
0,50	approx. 3,5
0,55	approx. 5,0
0,60	approx. 10,0

Note! Only coarse adjustment can be made by observation. Fine setting usually needs flue gas analysis. The burner has to reach in modern oil heating appliances as far as combustion is concerned, the following performance characteristics:

Residual oxygen content (O ₂)	3 - 5 %
Carbon dioxide content (CO ₂)	12 - 13,5 %
Carbon monoxide content (CO)	< 100 ppm
Smoke number	< 1 BH

7.8. Flame Inspection

The ignition process may be observed through the sight glass by turning aside the cover in the shape of a drop. It must be replaced in the normal operating position after inspection.

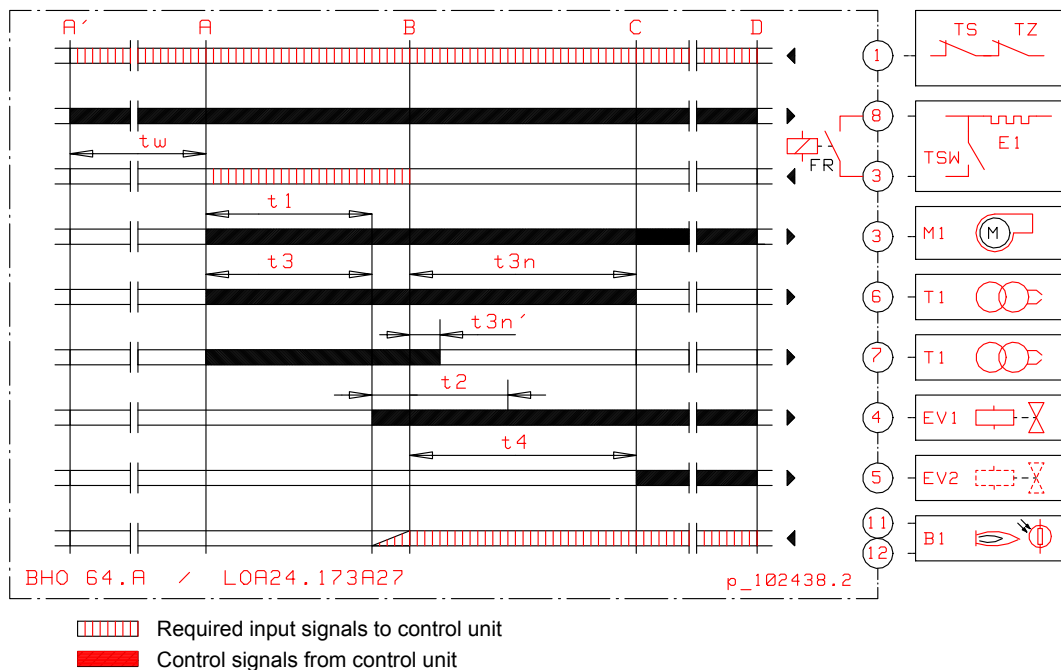


Removal of sight glass

Unscrew the fixing screw (3) approx. 4 turns. Move the sight glass to the right and withdraw. The sight glass is now loose. Mounting of the sight glass in reverse order. Check, that the sight glass is tight.

8. Control Unit BHO 64.A/LOA 24.173A27

8.1. Time Sequence Diagram (Control Program)



Legend

TZ	Limit thermostat
TS	Regulating thermostat
E1	Preheater
TSW	Preheater thermostat
M1	Burner motor (fan/oil pump)
T1	Ignition transformer
EV1	Solenoid valve 1
EV2	Solenoid valve 2
B1	Flame detector/flame signal
FR	Flame relay

	BHO 64.A	LOA 24.173A27
tw	Heating up time of oil preheater (from cold condition) up to connecting of contact "TSW"	approx. 1 min
t1	Pre-purge time	approx. 13 s
t3	Pre-ignition time	approx. 13 s
t3n	Post-ignition time (control from terminal 6)	approx. 15 s
t3n'	Post-ignition time (control from terminal 7)	approx. 20 s
t2	Safety time	approx. 2 s
t4	Interval between detection of flame and release of terminal 5	max. 10 s
---	Reaction time on loss of flame	approx. 15 s
		< 1 s
A'	Commencement of start-up with burners with oil preheater.	
A	Commencement of start-up with burners without preheater.	
B	Time, when flame is detected (burner started).	
C	Control unit (burner) in normal operating position (control program has ended).	
D	Controlled shut-down by control thermostat TS	

8.2. Control Functions in the Event of Faults

Extraneous light / premature flame signal

During pre-purge and/or pre-ignition period there must never be a flame signal. If there is a signal during this period, caused possibly by premature ignition due to a leaking oil valve, extraneous light, a short-circuit in the flame detector (photo resistor) or its wiring, a fault in the flame signal amplifier, etc., the control unit locks out on expire of the pre-purging and safety period. Under these circumstances the oil valve does not open during the safety time.

Non-appearance of the flame signal

If no flame signal has appeared by the end of the safety period, the control unit immediately locks out.

Flame failure during operation

On flame failure during operation the control unit immediately shuts down the fuel supply and automatically attempts to restart. On completion of "t4" the control unit performs the full starting sequence.

With every lock-out control outputs 3 to 8 and terminal 11 are de-energized in less than 1 second, while terminal 10 for the remote signalling of lock-outs receives voltage. Resetting the control is possible only when, after lock-out, at least 50 seconds have elapsed.

Protection against under-voltages

The electronic protection against under-voltages ensures that in the event of mains disturbances with dangerous under-voltages (< 165 V) the control unit shuts down the burner and prevents a new start-up.

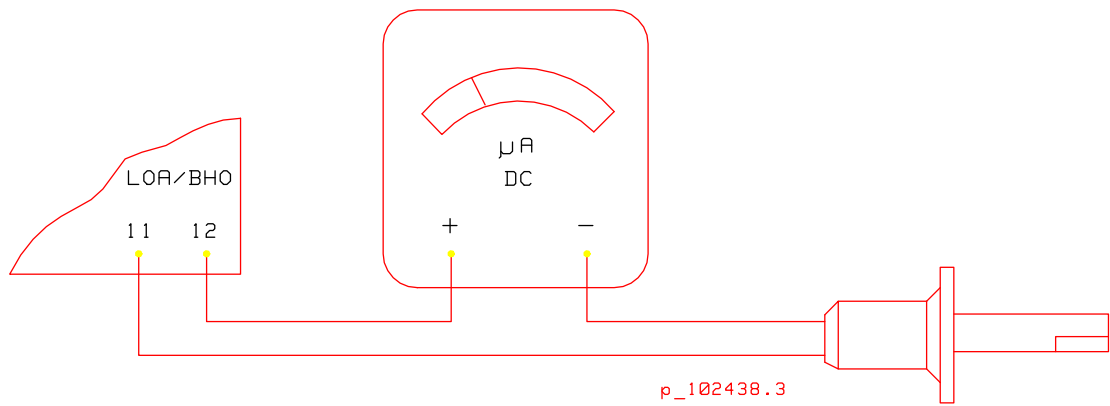
8.3. Technical Data of Control Unit

Supply voltage	220 VAC -15 %...240 VAC +10 %
Protection against under	< 165 V
Frequency	50 - 60 Hz, ± 6 %
External fuse	max. 10A
Permissible ambient temperature	-20...+60 °C

8.4. Current through Flame Detector

	220 VAC	230 VAC
Photo resistor (flame detector) QRB		
Min. required detector current with flame	35 μ A DC	40 μ A DC
Max. permissible detector current without flame	5 μ A DC	6 μ A DC
Max. possible detector current with flame	40 μ A DC	45 μ A DC
Internal resistance of the d.c. measuring instrument	max. 5 kOhm (+pole to terminal 12)	

8.5. Measurement of Flame Signal



WARNING! This control unit is a safety unit! Do not open it. Any unauthorized tampering can result in unforeseen detrimental consequences.

9. Maintenance



WARNING! Always switch off the electric power from your burner and close the manual shut-off valves in the fuel supply line before servicing your burner. When inspecting your burner you only have to switch off the electric power from your burner. The manual shut-off valves in the fuel supply line can then be open.

Burner maintenance

In order to ensure reliable operation clean the ignition electrodes and check their setting.

Flame detector has to be kept clean.

Replace the filter, if necessary.

Clean or replace, if necessary, the filter of the oil pump.

Change the nozzle if it is worn, damaged or blocked.

Clean your burner from damp and other airborne impurities and keep the burner clean.

Clean the air flap during the annual maintenance or when needed. Use for ex. normal washing-up liquid as cleaning agent.

Clean oil and grease spots from burner housing and plastic cover surfaces with a clean wet cloth. Use as cleaning agent a slightly alkaline washing agent or normal hand washing-up liquid.

Check regularly the combustion characteristics by flue gas measurements.

An authorized person should inspect the burner at least once a year.

Heating appliance control

Keep the boiler room always clean and the door closed.

Make sure, that there is always sufficient water (pressure) in the heating system.

Have the furnace and the chimney swept regularly.

Check regularly, that the smoke damper is correctly adjusted.

Protect your burner against splash water.

The oil tank must be cleaned when needed, at least every 4 - 5. years.

The boiler room fresh air ventilator must be open.

Check safety devices of heating appliance and burner according to the local requirements.

Check that the boiler and its equipment are on working condition.

10. Fault Conditions and Procedures

In the event of fault conditions the basic requirements for correct operation must be first examined:

1. Is the signal lamp indicating the readiness for running going on (burner switch in position "operation")?
2. Check, that fuse is not blown or loose.
3. Check the electric supply.
4. Check that all regulating and control devices are correctly set.
5. Are the safety devices in normal operating condition?
6. Is the burner getting fuel, are the valves in fuel line open, is there oil in the tank?

When it is established, that the fault is not due to above mentioned, the individual burner functions must be checked. Reset the burner control unit if it is in lock out position (the signal lamp is lit). Burner starts. Observe the burner functions. Measuring instruments can be used while finding the fault.

CONDITION	POSSIBLE CAUSE	REMEDY
1. Motor		
Burner motor does not start□	Faulty motor	Replace
	Faulty control unit	Replace
	Faulty preheater on LJ-burners	Replace□
2. Ignition failure		
Burner motor starts, control voltage from control unit to ignition transformer is switched on, no ignition and after a short time burner goes to lock out.	Dirty or worn ignition electrodes. Insulator cracked	Clean or replace
	Ignition electrodes wrong positioned	Adjust according to instructions
	Incorrect setting of nozzle distance	Adjust according to instructions
	Damaged or loosened ignition cable	Replace or fix
	Faulty ignition transformer	Replace
3. No flame establishment		
Burner motor starts, ignition is in order, after a short time burner goes to lock out. □ Nozzle does not supply oil	Solenoid valve does not function: - faulty solenoid valve or coil or cable damaged - faulty control unit	Replace faulty part
	Atomizing pressure of oil is too low	See chapter "4 Oil pump"
	Blocked or worn nozzle	Replace
	Blocked preheater ("LJ" burners)	Replace

CONDITION	POSSIBLE CAUSE	REMEDY
4. Oil pump		
Supplies no oil or atomizing pressure is too low	Dirty filter in pump	Clean or replace
	Leaking suction line	Seal
	Filter in piping is dirty	Replace
	Pump capacity decreases: - faulty or worn pump - damaged pump coupling	Replace Replace
Severe mechanical noise	Pump sucks air	Tighten joints
	Vacuum in oil line too high	Replace filter Check the size of the suction line
Nozzle supplies no oil	Solenoid valve in pump does not function	Replace coil or pump
5. Premature flame formation		
Burner motor starts, flame forms under pre-purge period, then lock-out occurs.	Leaking solenoid valve (Danfoss) / leaking shut-off valve (Suntec) <input type="checkbox"/>	Clean or replace pump <input type="checkbox"/>
6. Flame monitoring fault		
Burner motor starts, flame forms, then lock-out occurs.	Flame detector wrong positioned	Adjust
	Dirty flame detector	Clean
	(Flame) illumination too weak	Check burner settings
	Faulty flame detector	Replace
	Faulty control unit	Replace
Lock-out during pre-purge period <input type="checkbox"/>	Faulty flame detector	Replace
	Faulty control unit	Replace <input type="checkbox"/>

CONDITION	POSSIBLE CAUSE	REMEDY
7. Combustion head		
Inside oily or has heavy carbon deposits <input type="checkbox"/>	Distance between diffuser disc and nozzle incorrect	Adjust
	Incorrect combustion air adjustment	Adjust
	Nozzle wrong sized or of wrong type	Replace as appropriate
	Nozzle worn	Replace
8. Other possible causes		
Control unit goes to lock-out <input type="checkbox"/> No smoke comes out of chimney, only bluish smoke and heat noticeable as a rippling effect at the chimney mouth. An oily smell in the yard. Dark, oil-bearing smoke is coming out of chimney	Boiler smoke damper is closed	Adjust
	Boiler or chimney is blocked	Clean
	Boiler room not adequately ventilated	Add supply of air
	Excessive air supply	Adjust
	Not enough air to support combustion <input type="checkbox"/>	Adjust <input type="checkbox"/>

