Bentone®

Installation and Maintenance Manual

B 45 A2.2H

LMO24.255C2E

ALEV 75 CK

MADE IN SWEDEN

Translation of the original instructions.

Keep for future use.

Read carefully before use.

178 089 56-7 CR00688 2024-11-22

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exempel example Beispiel

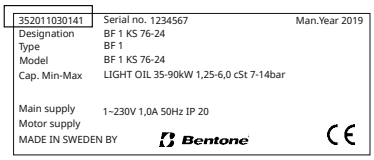

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Table of contents

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 CTC 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.

2. Technical data

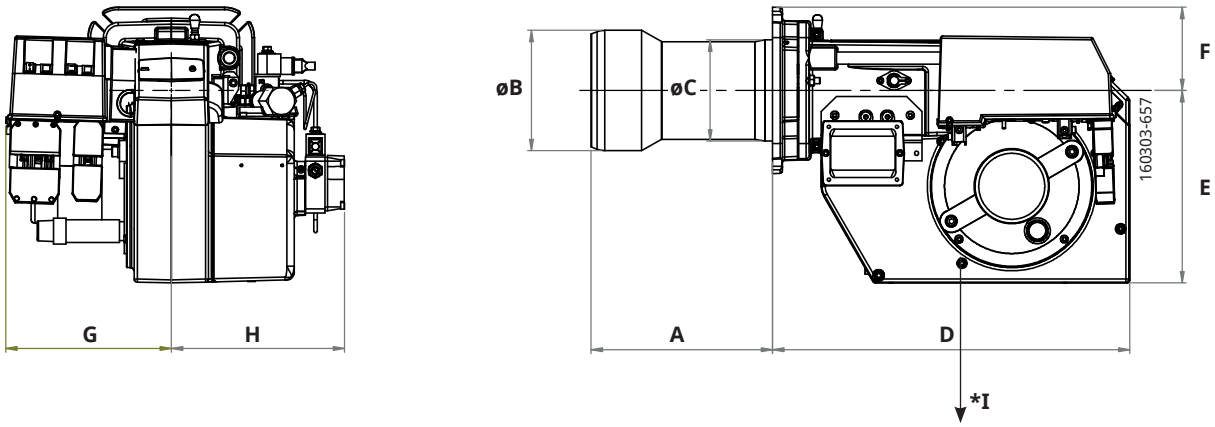
The burner is intended for:

- 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:

- 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 B 45 A2.2H



A	Ø B	Ø C	D	E	F	G	H	*I
240/340	159	134	472	255	110	219	229	200

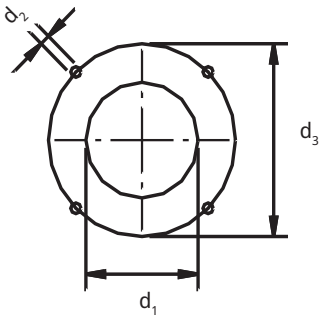
* Min. recommended distance to floor.

2.2 Burner installation

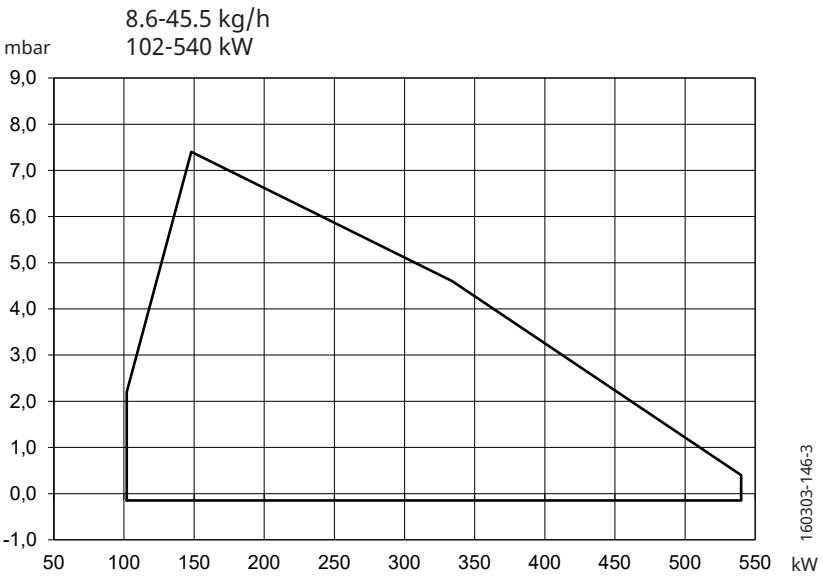
2.2.1 Hole patten

Make sure the hole pattern on the boiler is designed for burner flange.

d1	d2	d3
ø (135) 165	14	ø (200) 224-260



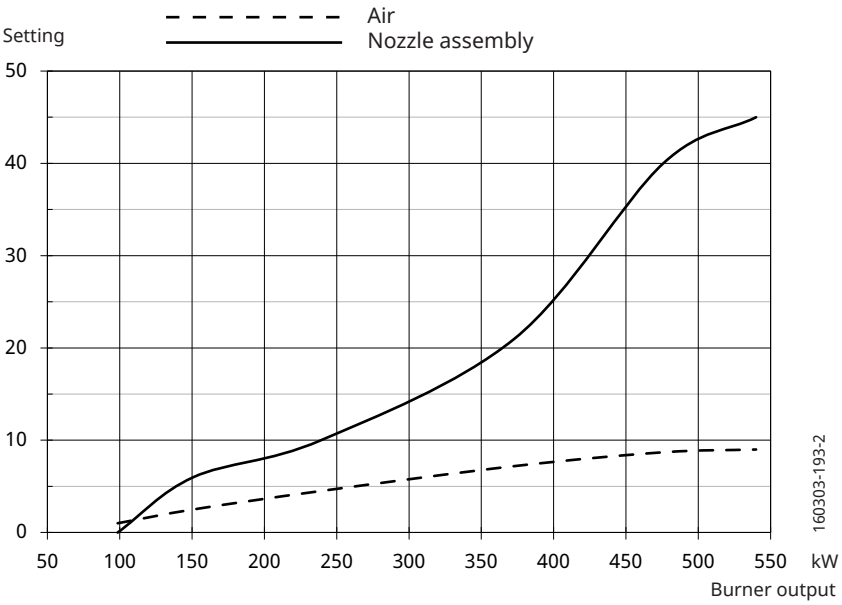
2.3 Working field



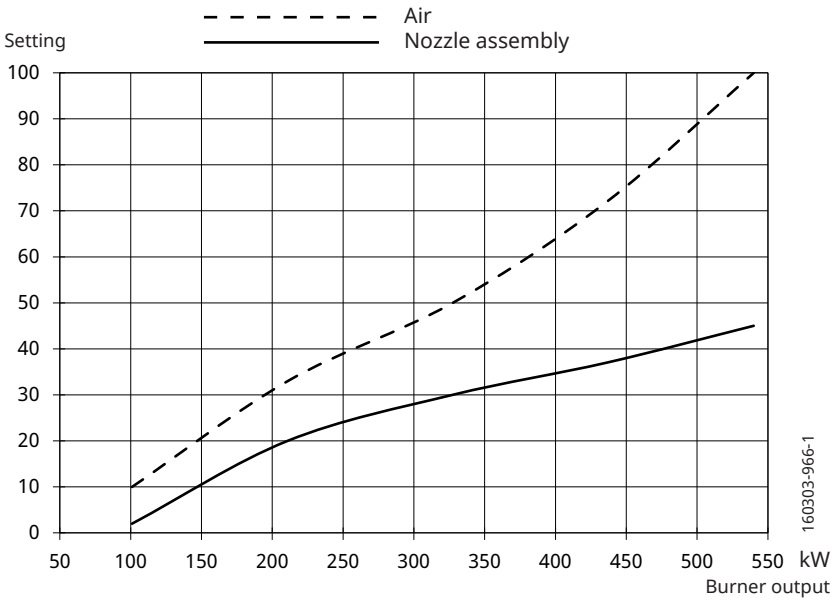
Do not exceed working field.

2.4 Basic settings - Fuel oil

Basic settings should only be seen as setting values to get burner to start. Once the burner has started and established flame, it is necessary to adjust the settings so that they are adapted to the installation and the fuel used.



2.5 Basic settings - HVO/XTL



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 QRC, the flame signal can be improved.

2.6 Technical specification

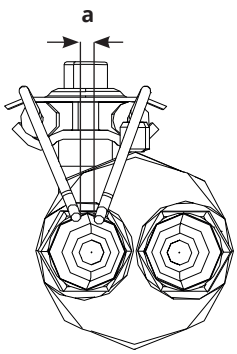
	B 45 A2.2H
Main supply	230V, 1~, 4.6A, 50Hz, IP20
Max fuse rating, Operation	6.3A
Max fuse rating, Motor	-
EI_{min}	2.50A, 575W
EI_{max}	3.70A, 851W
P_{SB}	-
NO_X-class	2
Sound power (dBA) L_{WA}	89dBA

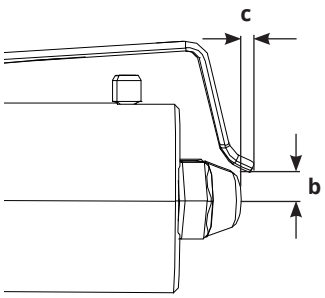
Measurements according to EN 15036-1:2006

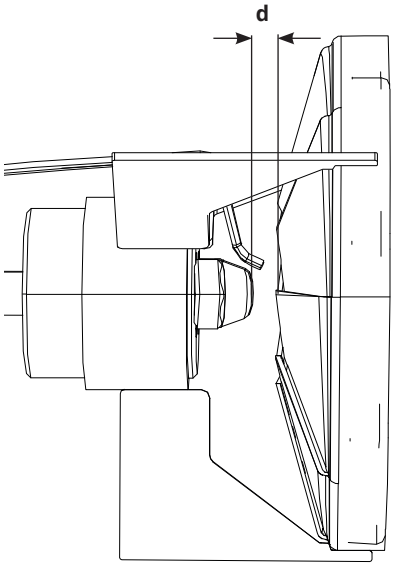
Alt.1 The noise level of the burner can be reduced by equipping the burner with silencer. Installation must be done so it does not prevent air supply to the burner.

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.

2.7 Setting of ignition electrodes and brake plate







a	b	c	d
3.5-4.0	7.0-9.0	2.0-3.0	5.0-6.0

! *NB It is important that the spark does not strike against the brake plate or nozzle.

2.8 Nozzle and pump pressure

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

Nozzle:	45° Solid/semisolid
	60° Solid/semisolid
	80° Solid/semisolid
Pump pressure:	Min. 14 bar

2.9 Nozzle table

Pump pressure bar

	8		9		10		11		12		13		14		15	
Gph	**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
2,50	8,32	99	8,82	105	9,31	110	9,76	116	10,19	121	10,61	126	11,01	130	11,39	135
2,75	9,15	108	9,71	115	10,24	121	10,73	127	11,21	133	11,67	138	12,11	144	12,53	148
3,00	9,98	118	10,59	126	11,16	132	11,71	139	12,23	145	12,73	151	13,21	157	13,67	162
3,50	11,65	138	12,35	146	13,03	154	13,66	162	14,27	169	14,85	176	15,42	183	15,95	189
4,00	13,31	158	14,12	167	14,89	176	15,62	185	16,31	193	16,97	201	17,62	209	18,23	216
4,50	14,97	177	15,88	188	16,75	198	17,57	208	18,35	217	19,10	226	19,82	235	20,51	243
5,00	16,64	197	17,65	209	18,62	221	19,52	231	20,39	242	21,22	251	22,03	261	22,79	270
5,50	18,30	217	19,42	230	20,48	243	21,47	255	22,43	266	23,34	277	24,23	287	25,07	297
6,00	19,97	237	21,18	251	22,34	265	23,42	278	24,47	290	25,46	302	26,43	313	27,49	326
6,50	21,63	256	22,94	272	24,20	287	25,37	301	26,51	314	27,58	327	28,63	339	29,63	351
7,00	23,29	276	24,71	293	26,06	309	27,33	324	28,55	338	29,70	352	30,84	366	31,91	378
7,50	24,96	296	26,47	314	27,92	331	29,28	347	30,59	363	31,83	377	33,04	392	34,19	405
8,00	26,62	316	28,24	335	29,79	353	31,23	370	32,63	387	33,95	403	35,25	418	36,47	432
8,50	28,28	335	30,00	356	31,65	375	33,18	393	34,66	411	36,07	428	37,45	444	38,74	459
9,00	29,95	355	31,77	377	33,59	398	35,14	417	36,71	435	38,19	453	39,65	470	41,02	486

The table applies to oil with a viscosity of 4.4 mm^2/s (cSt) at a density of 830 kg/m^3.

Pump pressure bar

	16		17		18		19		20		21		22		23	
Gph	**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
2,50	8,32	99	8,82	105	9,31	110	9,76	116	10,19	121	10,61	126	11,01	130	11,39	135
2,75	9,15	108	9,71	115	10,24	121	10,73	127	11,21	133	11,67	138	12,11	144	12,53	148
3,00	9,98	118	10,59	126	11,16	132	11,71	139	12,23	145	12,73	151	13,21	157	13,67	162
3,50	11,65	138	12,35	146	13,03	154	13,66	162	14,27	169	14,85	176	15,42	183	15,95	189
4,00	13,31	158	14,12	167	14,89	176	15,62	185	16,31	193	16,97	201	17,62	209	18,23	216
4,50	14,97	177	15,88	188	16,75	198	17,57	208	18,35	217	19,10	226	19,82	235	20,51	243
5,00	16,64	197	17,65	209	18,62	221	19,52	231	20,39	242	21,22	251	22,03	261	22,79	270
5,50	18,30	217	19,42	230	20,48	243	21,47	255	22,43	266	23,34	277	24,23	287	25,07	297
6,00	19,97	237	21,18	251	22,34	265	23,42	278	24,47	290	25,46	302	26,43	313	27,49	326
6,50	21,63	256	22,94	272	24,20	287	25,37	301	26,51	314	27,58	327	28,63	339	29,63	351
7,00	23,29	276	24,71	293	26,06	309	27,33	324	28,55	338	29,70	352	30,84	366	31,91	378
7,50	24,96	296	26,47	314	27,92	331	29,28	347	30,59	363	31,83	377	33,04	392	34,19	405
8,00	26,62	316	28,24	335	29,79	353	31,23	370	32,63	387	33,95	403	35,25	418	36,47	432
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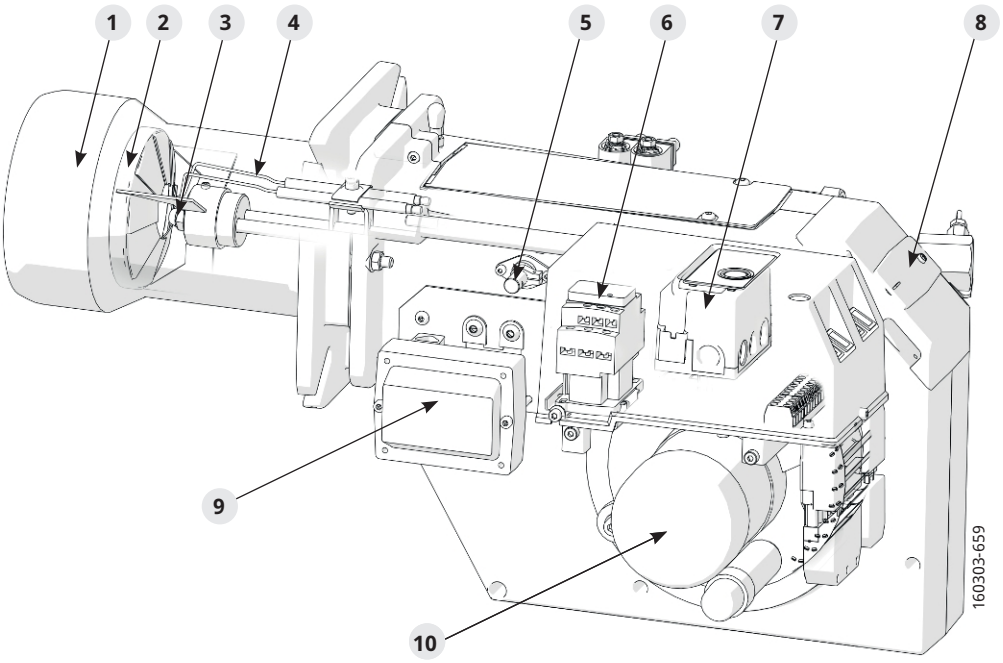
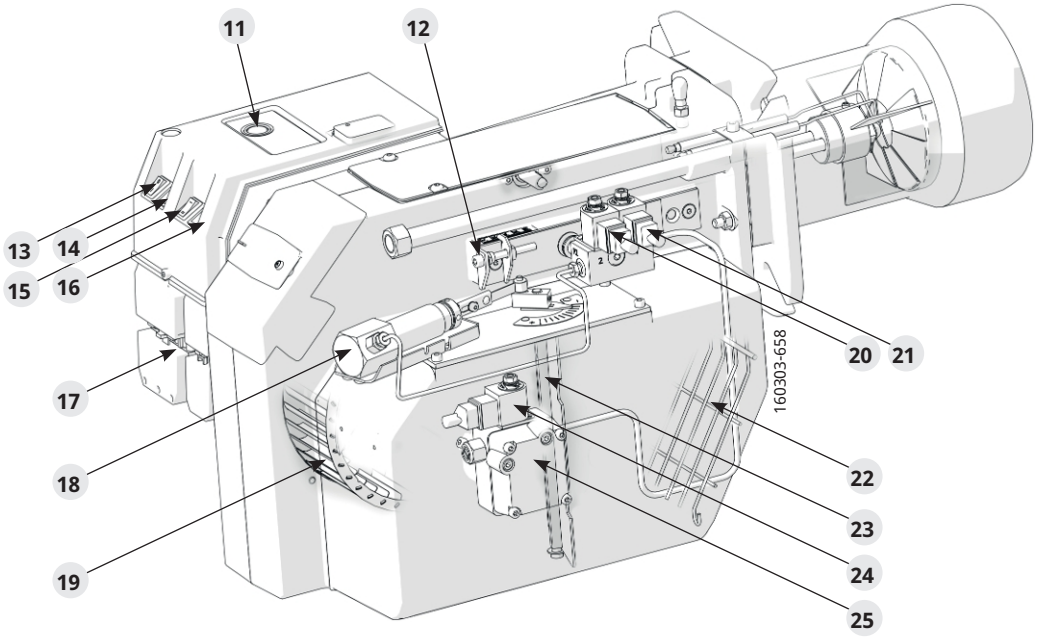
The table applies to oil with a viscosity of 4.4 mm^2/s (cSt) at a density of 830 kg/m^3.

2.10 Components





1.	Flame tube	10.	Motor	19.	Fan wheel
2.	Brake plate	11.	Reset button	20.	Solenoid valve, Stage 2
3.	Nozzle	12.	Nozzle assembly adjustment	21.	Solenoid valve, Stage 1
4.	Ignition electrodes	13.	Switch I-0	22.	Air intake
5.	Flame detector	14.	Indicator lamp, Stage 1	23.	Air damper
6.	Contactor	15.	Switch I-II	24.	Safety valve
7.	Burner control	16.	Indicator lamp, Stage 2	25.	Pump
8.	Cover, inspection glass	17.	Electrical connection		
9.	Transformer	18.	Regulator, air damper		

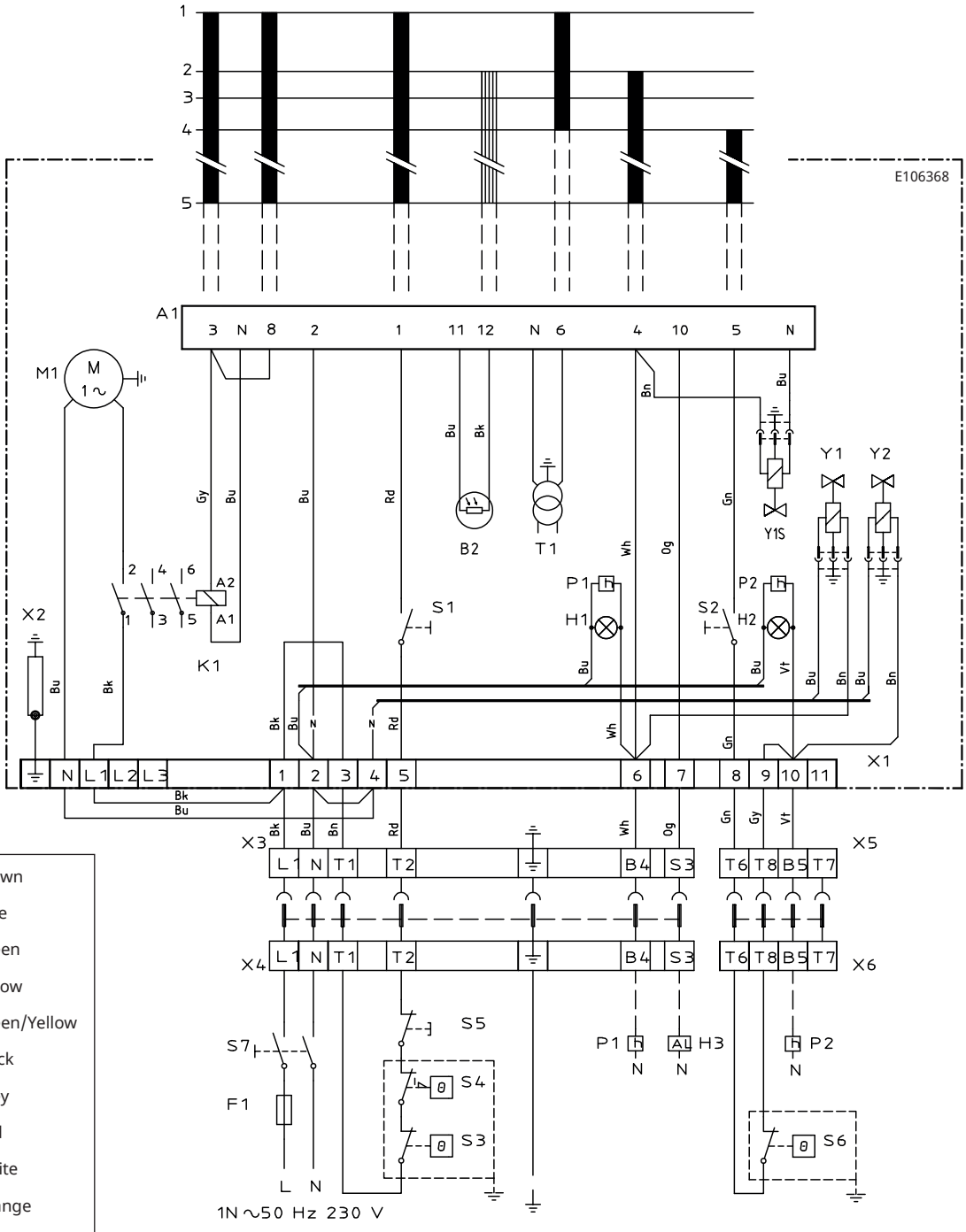
3. Electric equipment

3.1 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.

3.2 Wiring diagram



Bn	Brown
Bu	Blue
Gn	Green
Ye	Yellow
Gn/Ye	Green/Yellow
Bk	Black
Gy	Grey
Rd	Red
Wh	White
Og	Orange
Vt	Violet

165 105 58-2

3.2.1 Components

A1	Burner control
B2	Flame detector
F1	Fuse
H1	Lamp, Low load
H2	Lamp, High load
H3	Lamp, Lock-out signal 230V
K1	Contactor+Overload protection
M1	Motor
P1	Time meter, Low load (optional)
P2	Time meter, High load (optional)
S1	Operating switch
S2	Switch, High/Low load
S3	Control thermostat
S4	Temperature limiter
S5	Safety switch for hinged door
S6	Control thermostat, High/Low load
S7	Main switch
T1	Transformer
X1	Connection terminal board
X2	Earth terminal
X3	Plug-in contact ”Euro”, burner
X4	Plug-in contact ”Euro”, boiler
X5	Plug-in contact ”Euro”, High/Low load, burner
X6	Plug-in contact ”Euro”, High/Low load, boiler
Y1	Solenoid valve 1
Y2	Solenoid valve 2
Y1S	Safety valve

3.3 Function

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 below).

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.

3.3.1 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

160303-333

3.4 Colour codes

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

3.5 Fault codes

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.

4. Installation

4.1 General instructions

Oil burners must be installed in accordance with local regulations. The installer must therefore be knowledgeable of the regulations pertaining to oil and combustion.

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

If the burner is replacing an existing burner, ensure that the oil filter is replaced or cleaned. Installation may only be performed by qualified personnel.

Care should be taken by the installer to ensure that electrical cables and oil lines are not pinched or otherwise damaged during installation or servicing.

4.2 Inspection and maintenance

The system must be maintained at the interval specified in the service schedule. If the burner is in a dirty environment, service should be done at more frequent intervals.

4.3 Start-up

In order to obtain the correct setting, a flue gas analysis and temperature measurement must be carried out. Otherwise, there is a risk of soot build up, poor efficiency or condensation in the chimney. The system must be fine-tuned at start-up. The temperature in the chimney at a depth of 0.5 m must be at least 60 °C to prevent condensation.

4.4 Preparing for installation

Check that the burner's dimensions and capacity range are suitable for the relevant boiler. The power data on the rating plate refers to the burner's minimum and maximum power.

4.5 Oil distribution

In order to achieve good reliability, it is important that the oil distribution system is designed correctly.

Take the following into account:

- Selection of pipe diameter, pipe length and height difference; see Pump instruction.
- Pipelines are to be laid with the fewest possible number of glands.
- The pipes are to be laid so that the oil supply hoses are not subjected to tensile stresses or become excessively bent when the burner is swung out or removed for servicing.
- The oil filter should be installed so that the filter cartridge can easily be replaced or cleaned.
- Parts in contact with oil must be selected in materials that are capable of withstanding the medium's physical properties.
- When installing oil hoses, check that the inlet and return hoses are fitted to the appropriate connection on the oil pump. The hoses must be located so that they do not bend or become subject to tensile load.
- Bleed the oil system. The oil pump/oil preheater may be damaged if run dry. The vacuum in the suction line should not fall below 0.3 bar during start-up.

! The oil filter must be installed before the burner's oil pump.

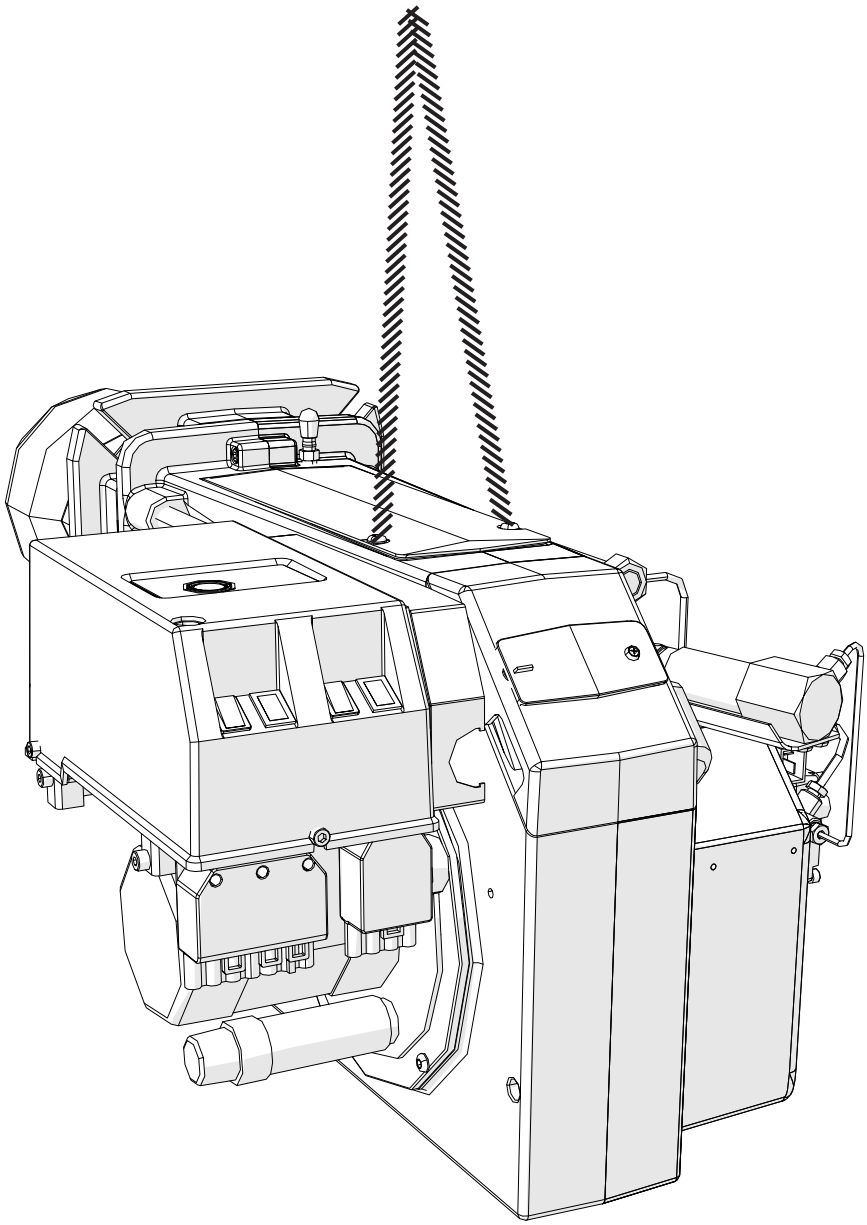
! Be sure to fill the burner oil system before starting it for the first time.

4.6 Electrical connection

- Before work on the electrical connection, the current must be disconnected so that the installation is isolated.
- Electrical connection must be done in accordance with the applicable regulations.
- Burners must be connected to an all-pole switch.
- Connection must conform to the wiring diagram.
- Use appropriately sized fuses.

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

4.7 Handling and lifting instruktion



The lifting aid are available as accessories.

5. Mounting

1. Remove fan housing from fixing flange by loosening nuts (F) and end stop (T) for guides.
2. Install the selected nozzle, (see Technical data).
3. Remove the flame tube from the fixing flange by loosening screws (U).
4. Install the fixing flange with the enclosed gasket (V) to the boiler.
5. Install the flame tube, be sure to install the drainage hole downwards (not available on all flame tubes) so that any oil spills can drain out.

If the burner tube must be installed from the inside of the boiler, this means that the boiler must be opened or have a spectacle flange that is designed so that it can be reconnected with the burner tube mounted.

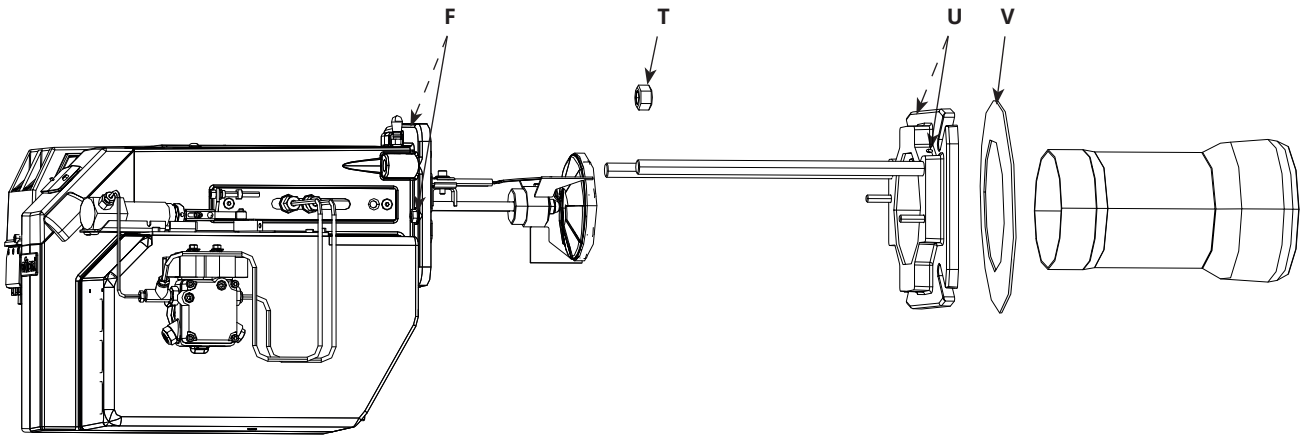
6. Insulate between flame tube and boiler door for reduced heat radiation.
7. Install the fan housing on the flange and lock with nuts.
8. Connect oil lines to the pump.
9. Connect the burner electrically.

NOTE! The nut (T) must always be refitted in the end stops of the guides.

5.1 Check oil line seals

When the burner has been installed and put into operation, the tightness of the various coupling elements should be checked, in case of leakage - tighten the coupling elements.

Use Loctite 5188 on threaded oil lines.



5.2 Example of Basic settings

Basic settings should only be seen as setting values to get burner to start. Once the burner has started and established flame, it is necessary to adjust the settings so that they are adapted to the installation and the fuel used.

B 45 A2.2H

Burner output:	418 kW		
Estimated nozzle output:	418 / 11.86*	=	35.2 kg/h
(* Calorfic value Fuel oil		=	11.86 kWh/kg)

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

418 kW distributed over 2 nozzles:		
Nozzle Step 1:	5.00 Gph	261 kW
Nozzle Step 2:	3.00 Gph	157 kW
Pump pressure:	14.0 bar	

Setting values for 418 kW according to basic setting diagram, (see Technical data).

Air setting Step 1:	=	5.7
Air setting Step 2:	=	8.2
Insert setting:	=	2.7

Selection of output and connection between the different power stages must be selected and adjusted so that the system achieves good functionality.

5.3 Air setting

1. Set the control switch (S2) to Low Load (I).
2. Loosen the screw (A), turn the damper to the desired position, and retighten the screw.
3. Set the control switch (S2) to High Load (II).
4. Use a hex key to screw the socket (C) in to decrease or out to increase.
5. The damper position can be read on the scale.
6. Start burner and check/adjust combustion.

Recommended excess air

Excess air flue gases			Max. % CO_2
% O_2	% CO_2	Lambda 1.2	
3–5	≈12.5		15.4

5.4 Nozzle assembly adjustment

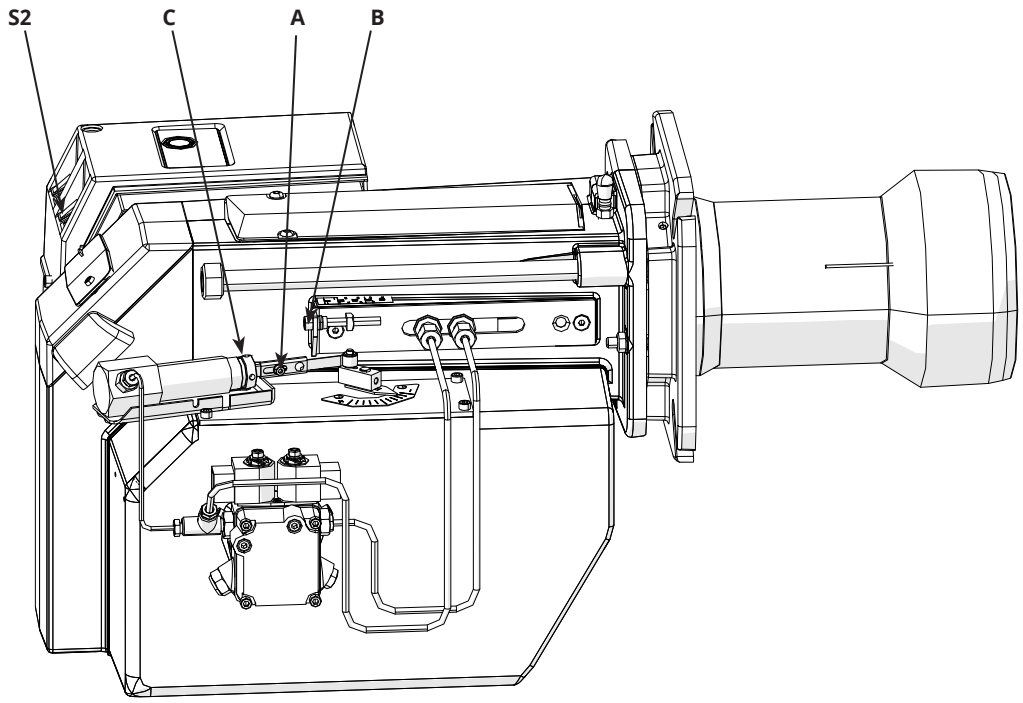
The burner is equipped with controls that change the position of the brake plate in the combustion device. This is used to set the correct pressure drop across the brake plate and thus obtain good combustion without pulsations. Adjustment is made with screw (B).

The position to be used depends, among other things, on the power input and the overpressure in the boiler. In general, the smaller the capacity, the smaller the gap between the brake plate and the burner.

The position of the brake plate also has an effect on the amount of air to the combustion. Therefore, after adjusting the brake plate, the combustion must be checked and, if necessary, the air damper setting adjusted to achieve good combustion.

Left-hand rotation opens the brake plate, resulting in a lower pressure drop and more air for combustion.

Right hand rotation closes the brake plate, giving a higher pressure drop and less air to the combustion.

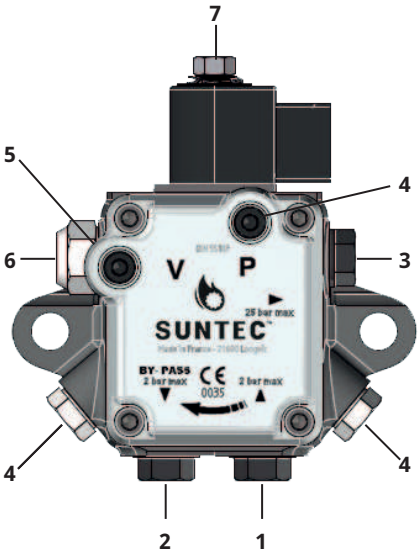


6. Pump ALEV 75 CK

6.1 Technical data

One or two-pipe system		
Viscosity range::	1.25-12 mm^2/s	
Pressure range::	8-15 bar	
Rated voltage of coil:	220/240V	50/60 Hz
Oil temperature::	max 60°C	

6.2 Components



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

6.3 Pump operating principle

Pump operating principle

The gear pump draws oil from the tank through the built-in filter and transfers it to the nozzle line via the cut-off solenoid valve. A pressure regulating valve is used to bypass all oil which is not required at the nozzle.

In two-pipe operation, the by-pass plug must be fitted in the return port, which ensures that the oil by-passed by the regulating valve is returned to the tank and the suction line flow is equal to the gear set capacity.

In one-pipe operation, the oil which does not go through the nozzle line is returned directly to the gear inlet and the suction line flow is equal to the nozzle flow. In that case, the by-pass plug must be removed from the return port, and the return port sealed by steel plug and washer.

Bleed

Bleeding in two-pipe operation is automatic : this is ensured by venting through the pressure regulator valve. In one-pipe operation, the plug of the pressure gauge port must be loosened until the air is evacuated from the system.

Cut-of

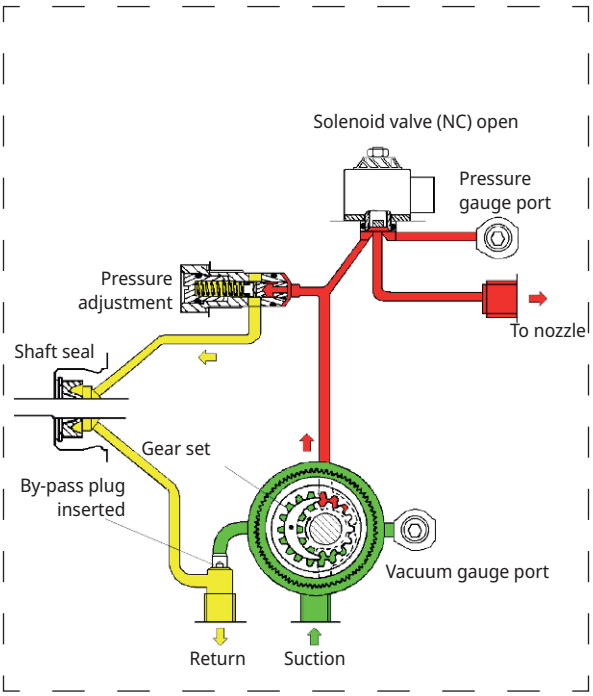
The solenoid valve of the ALE pump is of the “normally closed” (NC) type and is situated in the nozzle line. This design ensures extremely fast response and the switching can be selected according to the burner operating sequence and is independent of motor speed.

When the solenoid is non-activated, the valve is closed and all oil pressurized by the gear pump passes through the regulator to the suction or return line, depending upon pipe arrangement.

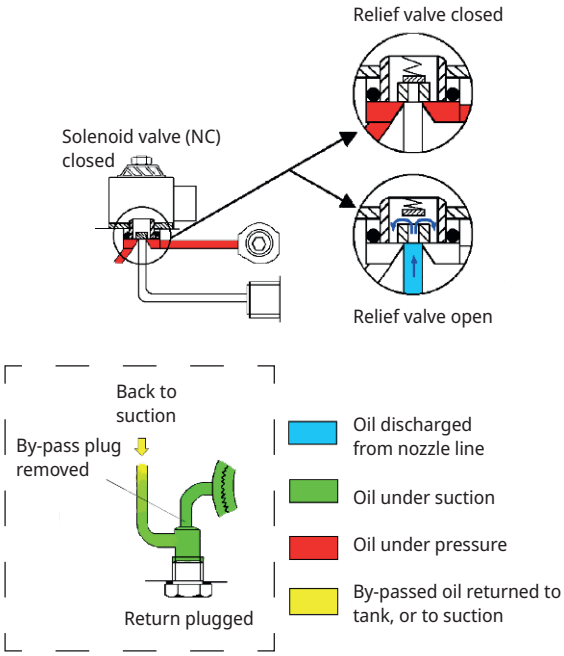
As soon as the solenoid is activated, oil passes to the nozzle line at the pressure set by the pressure regulating valve.

Nozzle line pressure relief

The nozzle line pressure relief function operates only when the installation is fitted with a component/nozzle with a shut-off function which opens at 4 bar or above. Any subsequent expansion of the oil, due to residual heat from the pre-heater or boiler, is discharged through the relief valve in the pump which opens at a lower pressure than the opening pressure of the component/nozzle.



Two pipe installation



One pipe installation

6.4 Suction line tables

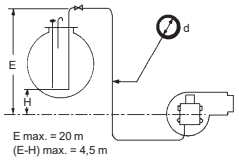
6.4.1 Overlying tank

1-pipe system

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

**A2L pumps : sum up the 2 nozzles / A2L-Pumpen : Summe der zwei Düsen*
pompe A2L : somme des 2 gicleurs / Per le pompe A2L aggiungere n.2 ugelli

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



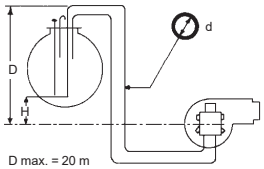
E max. = 20 m
(E-H) max. = 4,5 m

Two-pipe system

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

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

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



D max. = 20 m
(D-H) max. = 4,5 m

6.4.2 Underlying tank

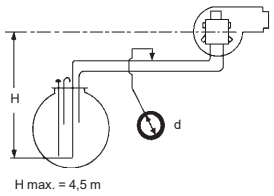
1-pipe system

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

Two-pipe system

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

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



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

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

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

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

6.5 Check oil line seals

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

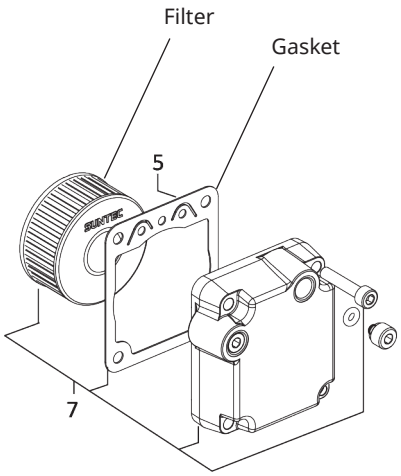
When a leak is detected, it is usually sufficient to tighten the coupling element that is leaking.

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

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

6.6 Replacement of pump filter

1. Disconnect the main power and shut off the fuel supply.
2. Loosen the pump cover's screws.
3. Remove the filter and gasket
4. Mount new gasket and filter
5. Refit the cover
6. Switch on the main power and open the fuel supply.
7. 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.

6.7 Replacing the solenoid valve (pump)

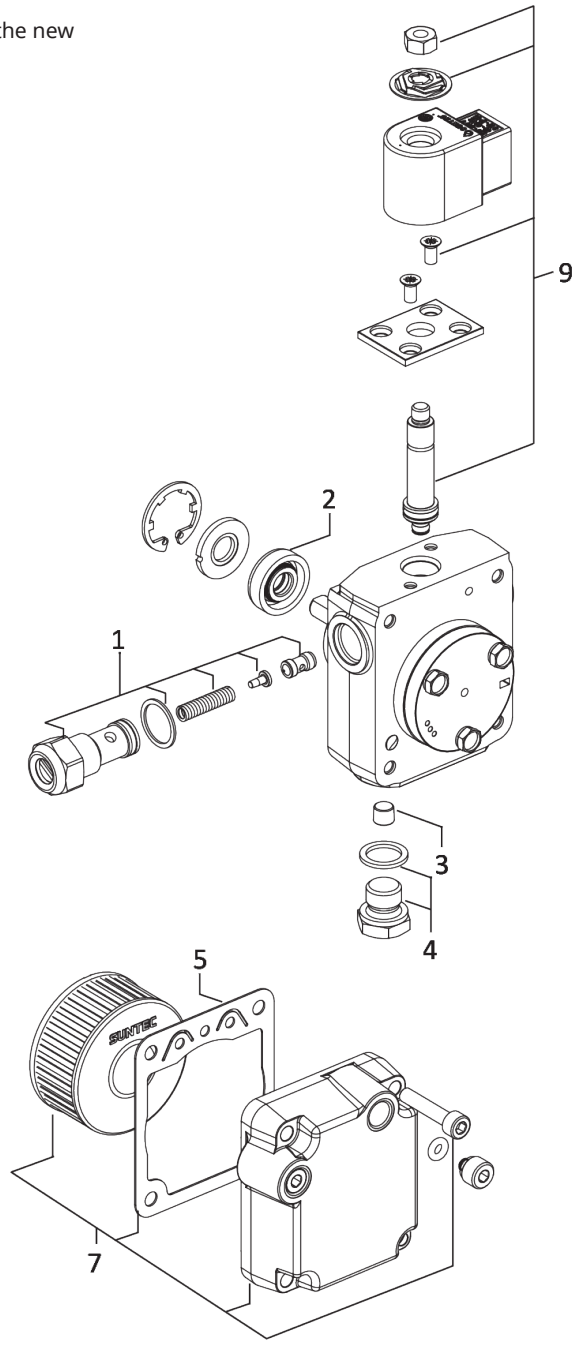
1. Disconnect the main power and shut off the fuel supply.

> **Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.**

2. Disconnect the cables to the solenoid valve.
3. Loosen the nut holding the magnet terminal
4. Loosen the screws securing the valve's mounting plate
5. Remove the valve
6. Make sure it is the right valve, NC.
7. Install the new valve and refit the other parts in the reverse order.
8. Switch on the main power and check the operation of the new component.
9. Start burner and check/adjust combustion.

6.8 Replacing the gasket seal (pump)

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



Oil pump component list

1. Pressure regulator kit 5-25 bars
2. Shaft seal kit
3. By-pass plug
4. Gasket + plug kit
5. Cover gasket
6.
7. Cover kit
8.
9. Solenoid valve kit

7. 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 CTC original parts should be used when replacing components.

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

7.1 Burner Service Schedule, Oil

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

If the burner is in a dirty environment, service should be done at more frequent intervals.

Burner	1 year	3,000 h
Filter	1 year replacement	3,000 h replacement
Oil hose	1 year inspection/replacement	
Nozzle	1 year replacement	3,000 h replacement
Electrodes	Replacement/cleaning 1 year	Replacement/ceaning 3,000 h
Brake disc	Replacement/cleaning 1 year	Replacement/ceaning 3,000 h
Motor	1 year	3,000 h
Drive shaft	Check/replace in the event of damage	Check/replace in the event of damage
Fan wheel	1 year “Replace if need for cleaning/imbalance”	3000 h “Replace if need for cleaning/imbalance”
Oil filter	Once a year	3,000 h replacement
Oil valve	Tightness check once a year	Replace if leakage detected

7.2 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
Contactor	10 years	500,000 cycles

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

7.3 Combustion device

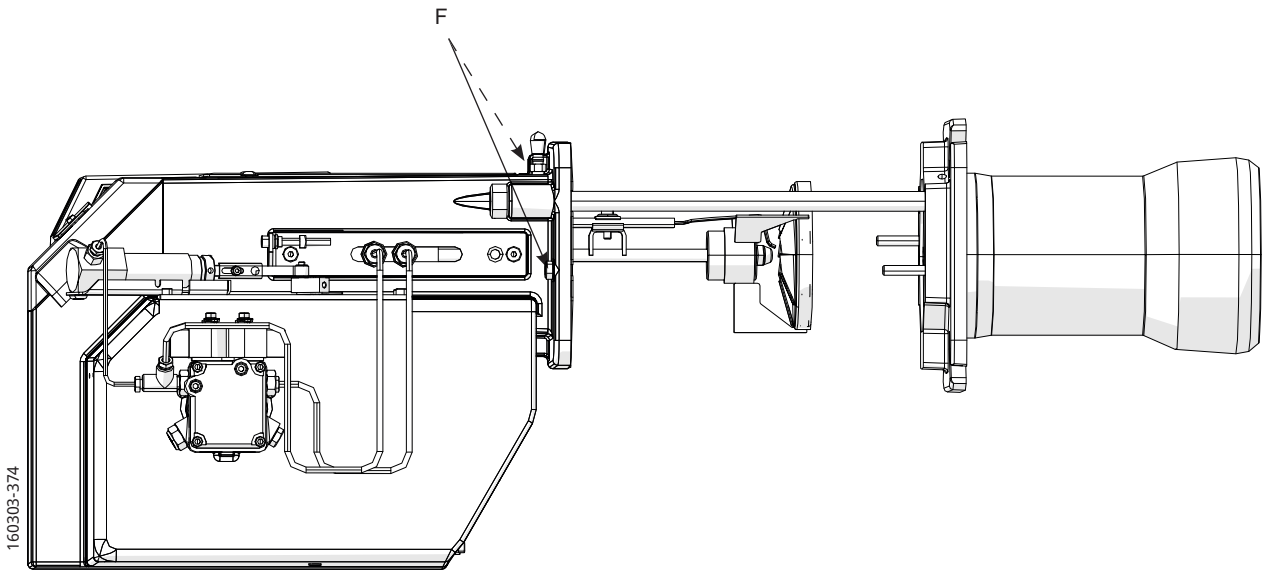
1. Disconnect the main power and shut off the fuel supply.

Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen nut (F) and pull out the fan housing from fixing flange.
3. Remove brake plate from the oil pipe.
4. Replace nozzle.
5. Clean or replace brake plate.
6. Fit brake plate (see Technical data for adjustment).
7. Check ignition electrodes, replace if necessary (see Technical data for adjustment).
8. Refit fan housing and fixing flange, lock with nut (F).
9. Open boiler/hinged flange to access the burner tube, remove and clean.
10. Install flame tube, be sure to install the drainage hole downwards (not available on all flame tubes) so that any oil spills can drain out.
11. Close boiler/hinged flange.
12. Switch on the main power and open the fuel supply.
13. Start burner and check/adjust combustion.

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

NB: When soiled, always replace nozzles with new nozzles. Do not clean.



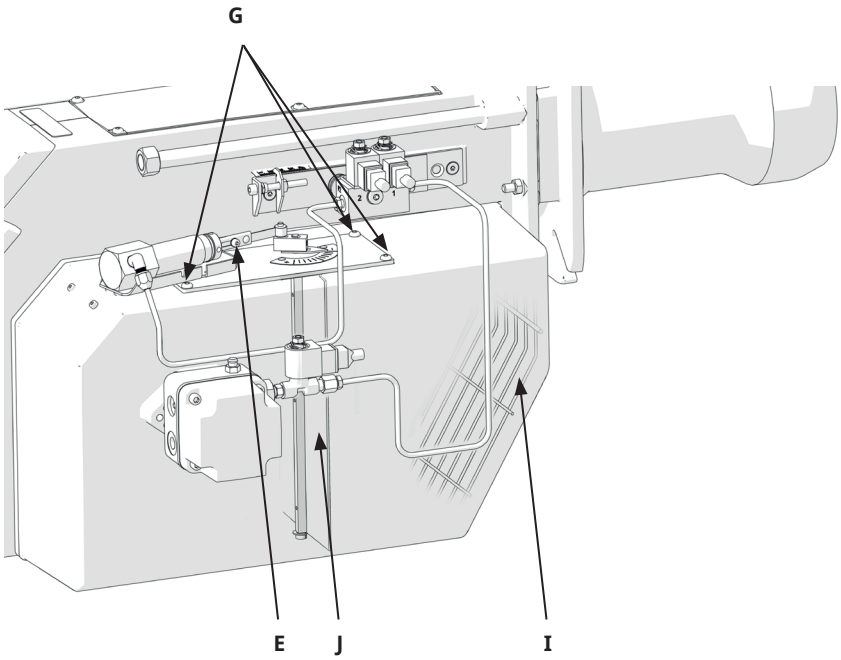
When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

7.4 Air damper

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

Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Note the setting of the air damper and loosen the regulator locking screw (E).
3. Loosen the screws (G) holding the fixing plate.
4. Loosen the connecting pipe.
5. Set the scale to 7 and lift the air damper (J).
6. Remove the intake grille at the air intake. (I).
7. Clean air damper and air intake, lubricate damper shaft if necessary.
8. Refit air damper and regulator.
9. Refit the intake grille.
10. Switch on the main power and open the fuel supply.
11. Start burner and check/adjust combustion.



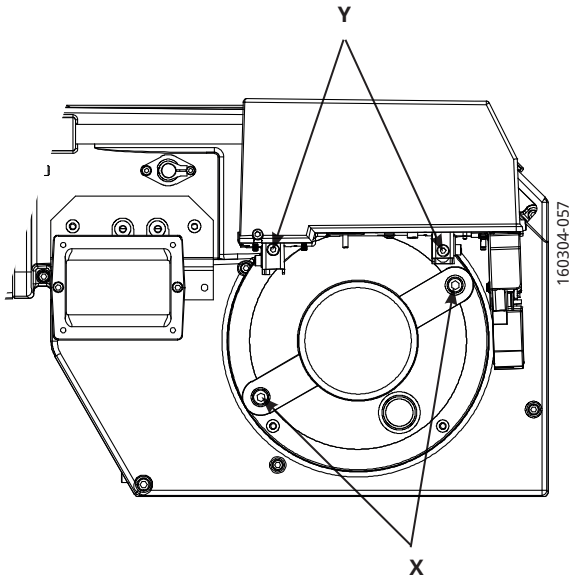
When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

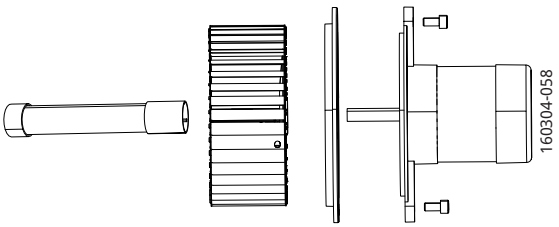
7.5 Fan

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

Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Detach the electrical panel (Y).
3. Loosen the motor's electrical connection and screws (X) and lift out the motor.
4. Check the fan wheel attachment and any skew, replace if damaged.
5. Clean or replace the fan wheel.
6. Refit the parts, making sure that the drive shaft is correctly connected at both ends.
7. Switch on the main power and open the fuel supply.
8. Start burner and check/adjust combustion.





7.5.1 Replace drive shaft

1. Disconnect the main power and shut off the fuel supply.
2. Detach the electrical panel (Y).
3. Loosen the motor electrical connection and screws (X) enough to turn and lift out the motor.
4. Remove drive shaft and drive coupling from motor.
5. Replace drive shaft coupling on pump.
6. Refit coupling, pump and motor, making sure drive shaft is connected correctly at both ends.
7. Switch on the main power and open the fuel supply.

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

7.6 Replace oil pump

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

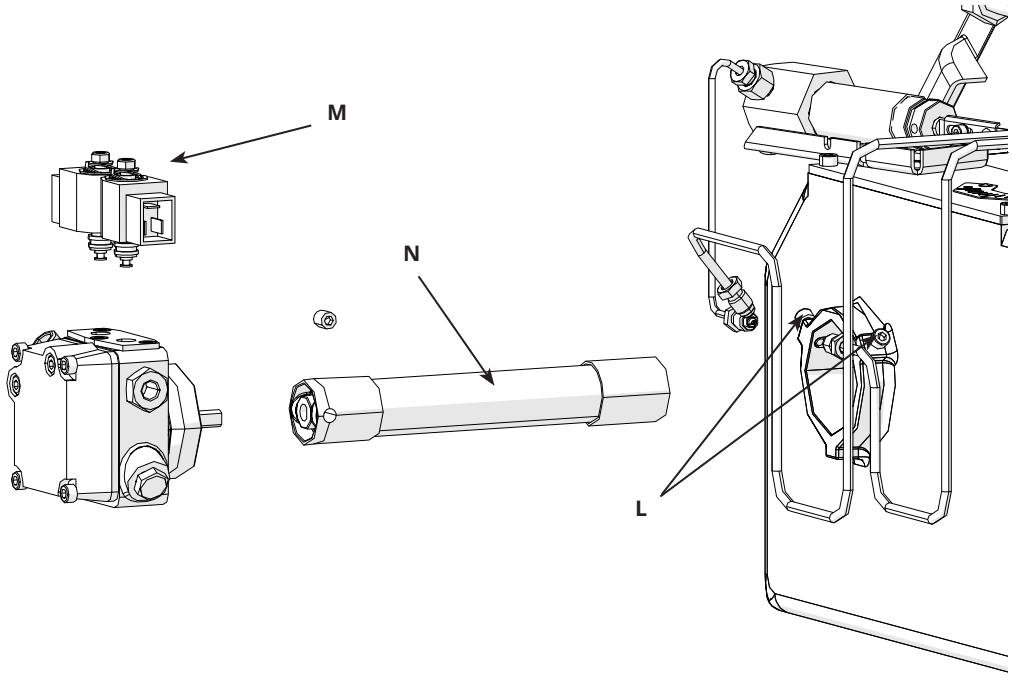
Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Disconnect oil lines and electrical connections from pump and valves.
3. Loosen screws (L) and pull out oil pump.
4. Remove safety valve (M) from pump.
5. Move the pump coupling (N) to the new pump.
6. Install safety valve on new pump.
7. Install oil pump on burner and tighten screws (L). (Important that the pump shaft splines fit correctly in the pump coupling).
8. Connect oil lines and electrical connection.
9. Switch on the main power and open the fuel supply.
10. Bleed the pump, start the burner and set the correct oil pressure (see Technical data for correct output).
11. Start burner and check/adjust combustion.

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

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

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



7.7 Tightness check of solenoid valves

7.7.1 Burners with single solenoid valve

- Disconnect the power supply to solenoid valves Y1, Y2 and Y3.
- Run motor and pump - check that no oil is coming out of the nozzle, replace solenoid valve if necessary.

7.7.2 Burner with safety solenoid valve Y1S

Check safety solenoid valve Y1S

- Disconnect power supply to safety solenoid valve Y1S.
- Provide power to solenoid valve Y1.
  On multi-stage burners, it is sufficient to power one valve.
- Run motor and pump - check that no oil is coming out of the nozzle, replace solenoid valve if necessary.

Check solenoid valves Y1, Y2 and Y3

- Disconnect the power supply to solenoid valves Y1, Y2 and Y3.
- Provide power to safety solenoid valve Y1S.
- Run motor and pump - check that no oil is coming out of the nozzle, replace solenoid valve if necessary.

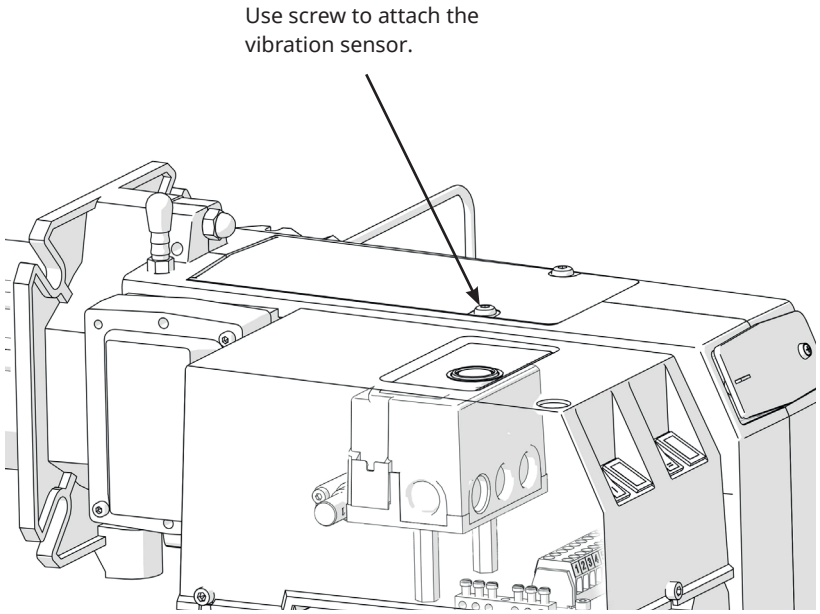
! Use Loctite 5188 on threaded oil pipelines.

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

7.8 Vibrations

Maximum permitted vibration level is 5.0 mm/s^2.

- Check tightness of fasteners.
- Check fan wheel for damage and contamination (replace if necessary).
- Check motor shaft and bearings. If they are worn, replace the motor.



7.9 Replacement of electrical components

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

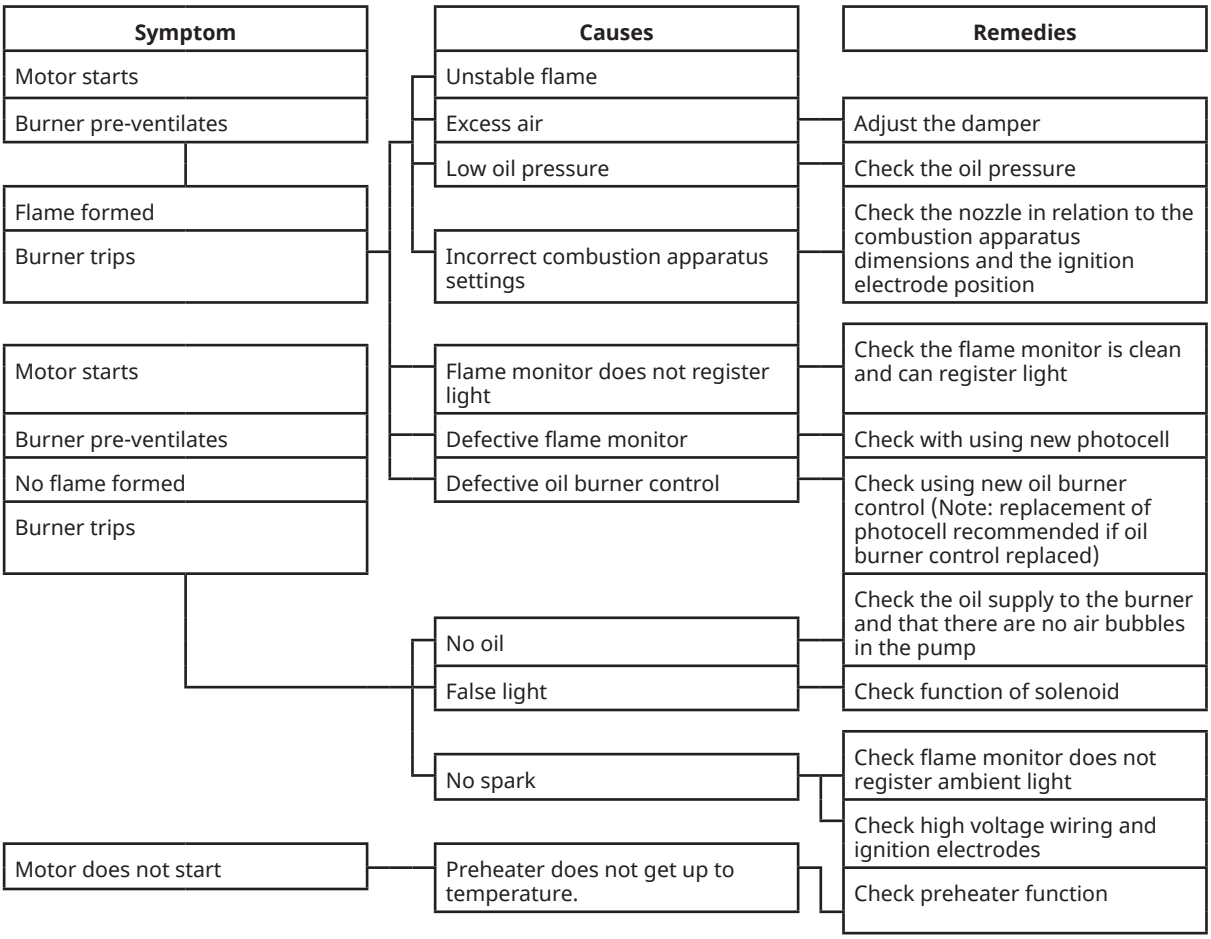
Before obtaining access to terminals, all supply circuits must be disconnected.

2. Note the connection of the existing component and disassemble.
3. Fit new component with same connection or with specified alternative connection.
4. Switch on the main power and check the operation of the new component.
5. 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. Fault Location

8.1 Burner will not start



8.2 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.

8.3 Delayed ignition

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

8.5 Noise in pump

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

8.4 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

9. 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_2			
O_2			
NOx			
CO			
Flue gas temp. °C			
Setting brake disc			
Setting Air damper			
Pump pressure bar			
Nozzle			

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

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**
- **LVD 2014/35/EU**
- **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 K. Automatic forced draught burners for liquid fuels.

Additional information can be downloaded at: www.bentone.com

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Sweden

Ljungby, 2024-01-01

Joachim Hultqvist
Technical Manager
CTC AB

Ola Karlsson
Quality Manager
CTC 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**
- **Electrical Equipment (Safety) Regulations 2016**
- **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:

BS EN 267:2020	Excluding the requirements of Annex K. Automatic forced draught burners for liquid fuels.

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