CR00145 178 060 63-2 2020-10-19

Installation- and maintenance instruction

B 70-3

BP S3

Bentone®

Translation of the original instructions.

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exempel example Beispiel

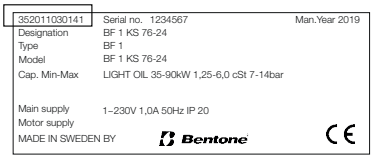

Table of contents

1. General Information

This Installation and Maintenance manual:

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

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- The electrical installation must be professionally carried out in accordance with applicable high voltage regulations, as per Enertech's recommendations.
- Before servicing, shut off the fuel supply and turn off the power to the burner.
- Leak checks must be performed during installation and servicing to prevent fuel leakage.
- Care should be taken by the installer to ensure that no electrical cables or fuel lines are crushed or otherwise damaged during installation or servicing.
- If the boiler is equipped with an access hatch, this must be equipped with a hatch opening switch connected to the burner's safety system.
- When in operation, the burner's noise level can exceed 85 dBA. Use hearing protection.
- The burner must not be put into operation without proper safety and protection devices.
- A Class BE fire extinguisher is recommended.
- It is forbidden to alter thedesign or use accessories which have not been approved by Enertech in writing.
- Prior to operation, the following points must be checked:

- fitting and installation work has been completed and approved
- electrical installation has been correctly performed
- flue gas ducts and combustion air ducts are not blocked
- all actuators and control and safety devices are in working order and correctly set

- After commissioning, if a steady red light on the burner control is displayed, contact your installation technician.

Burner servicing schedule

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

Burner	1 year	3000 hrs
Filter	1 year	3000 h Change
Oilhose	1 year control/change	
Nozzle	1 year change	3000h Change
Electrods	1 Year Change /cleaning	3000h Change /cleaning
Brake plate	1 Year Change /cleaning	3000h Change /cleaning
Motor	1 year	3000 hrs
Cuppling chaft	1 year control/change	3000h control/change
Fan wheel	“1 Year Change when dirty / unbalance”	“3000h Change when dirty / unbalance”
Oil filter	1 year	3000 hrs Change
Oil valve	Tightness check 1 year	Replacement in case of leakage

Component replacement intervals

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

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

Delivery check

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

2. Technical data B 70-3

The burner is intended for:

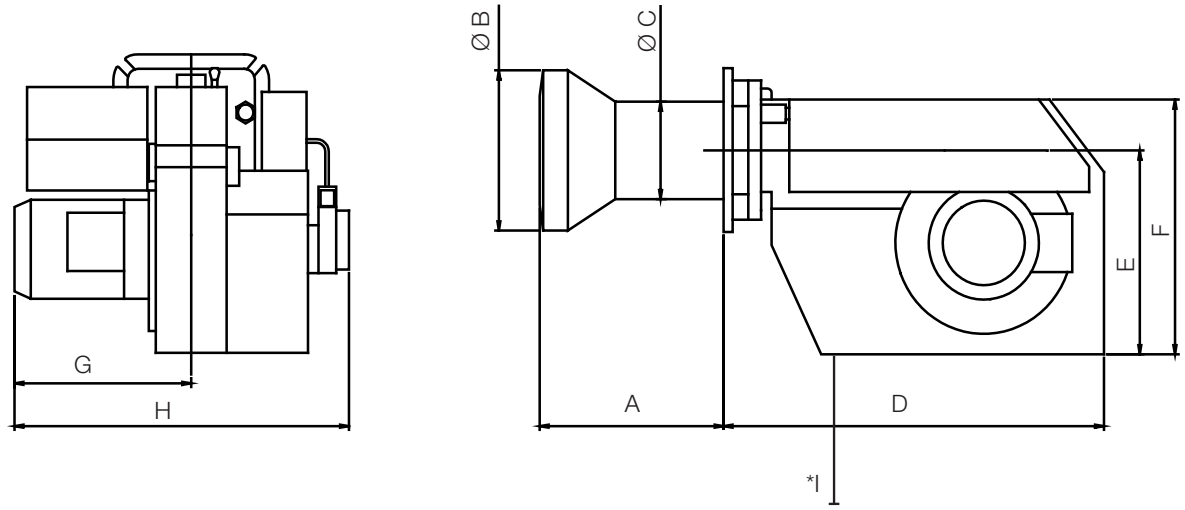
- Light oil, B10 heating oil/biofuel blend (as defined in DIN V51603-6)

and is used for:

- Water heating generators
- Hot air generators

2.1 Dimensions

Dimensions are in mm



	**A	Ø B	Ø C	D	E	F	G	H	*I
B 70-3	324	220	205	730	408	504	420	830	200
B 70-3	624	220	205	730	408	504	420	830	200

* Min. recommended distance to floor.

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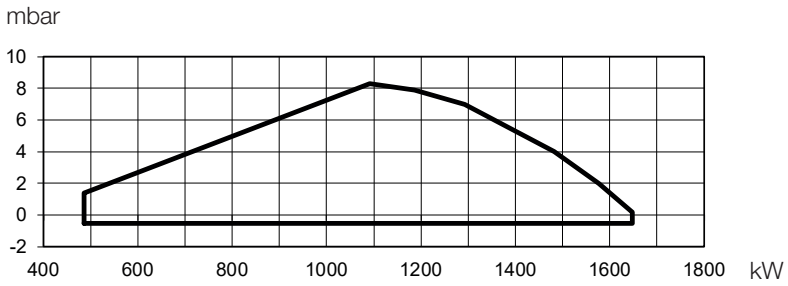
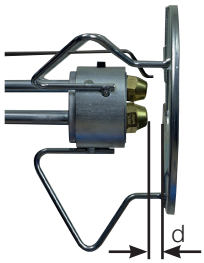
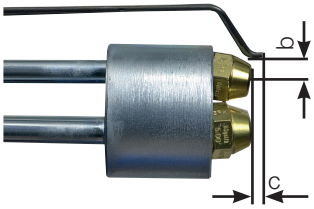
2.2 Working field B 70-3

41-139 kg/h
486-1649 kW



2.3 Setting of brake plate and air flow





Burner, Type	a	b	c	d
B70-3	3,5-4,0	8,0-10,0	2,0-3,0	10,0-13,0

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

2.3.1 Electric Specification

Burner correspond to IP 20

Type	Motor supply	Main supply	Sound
B 70-3	230/400V 10,4/6,0A	230V 0,7 A 50Hz	89 dBA ± 0,5 dBA
Max operating current, see data plate			

2.4 Nozzle selection

See under Technical data: Recommended nozzle and nozzle table in order to select the appropriate nozzle

2.5 Setting of brake disc and air flow

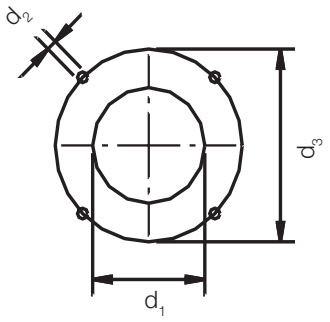
Once the different output modes have been selected prior to commissioning, basic settings for the burner can be made as shown in the air damper and brake disc diagrams. See under Default settings. Note that it is simply a matter of a default setting that should be adjusted retrospectively once the burner has started. You should then conduct a flue gas analysis and soot quantity measurement.

2.6 Burner installation

2.6.1 Hole pattern

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

Combustion device	d_1	d_2	d_3
B 70-3	(205) 225	M14	(310) 324-390



d1* If the burner tube is installed from inside the boiler

d_3* The hole pattern can be moved down if the burner tube is installed from the front and the tabs in the flange are removed.

2.7 Recommended nozzle and pressure

Because of the various boiler types with varying furnace geometries and furnace loads, it is impossible to commit to a certain scattering angle or a specific distribution pattern.
It should be noted that the scattering angle and distribution pattern changes with pump pressure.

Nozzle:	45° Solid/semisolid
	60° Solid/semisolid
	80° Solid/semisolid
Pump pressure	14 bar (12-16 bar) depending on pump model

2.8 Nozzle table.

Pump pressure bar

	10			11			12			13		
Gph	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
1,00	3,72	44	38	3,90	46	40	4,08	48	42	4,24	50	43
1,10	4,09	48	42	4,29	51	44	4,48	53	46	4,67	55	48
1,20	4,47	53	46	4,68	55	48	4,89	58	50	5,09	60	52
1,25	4,65	55	47	4,88	58	50	5,10	60	52	5,30	63	54
1,35	5,02	59	51	5,27	62	54	5,50	65	56	5,73	68	58
1,50	5,58	66	57	5,85	69	60	6,11	72	62	6,36	75	65
1,65	6,14	73	63	6,44	76	66	6,73	80	69	7,00	83	71
1,75	6,51	77	66	6,83	81	70	7,14	85	73	7,42	88	76
2,00	7,45	88	76	7,81	93	80	8,16	97	83	8,49	101	87
2,25	8,38	99	85	8,78	104	90	9,18	109	94	9,55	113	97
2,50	9,31	110	95	9,76	116	100	10,19	121	104	10,61	126	108
2,75	10,24	121	104	10,73	127	109	11,21	133	114	11,67	138	119
3,00	11,16	132	114	11,71	139	119	12,23	145	125	12,73	151	130
3,50	13,03	154	133	13,66	162	139	14,27	169	146	14,85	176	151
4,00	14,89	176	152	15,62	185	159	16,31	193	166	16,97	201	173
4,50	16,75	199	171	17,57	208	179	18,35	218	187	19,10	226	195
5,00	18,62	220	190	19,52	231	199	20,39	242	208	21,22	252	216
5,50	20,48	243	209	21,47	255	219	22,43	266	229	23,34	277	238
6,00	22,34	265	228	23,42	278	239	24,47	290	250	24,46	302	260
6,50	24,20	287	247	25,37	301	259	26,51	314	270	27,58	327	281
7,00	26,06	309	266	27,33	324	279	28,55	339	291	29,70	352	303
7,50	27,92	331	285	29,28	347	299	30,59	363	312	31,83	377	325
8,00	29,79	353	304	31,23	370	318	32,63	387	333	33,95	403	346
8,50	31,65	375	323	33,18	393	338	34,66	411	353	36,07	428	368
9,00	33,59	398	343	35,14	417	358	63,71	435	374	38,19	453	389
9,50	35,37	419	361	37,09	440	378	38,74	549	395	40,31	478	411
10,00	37,23	441	380	39,04	463	398	40,78	484	416	42,44	503	433
11,00	40,96	486	418	42,94	509	438	44,86	532	457	46,68	554	476
12,00	44,68	530	456	46,85	556	478	48,94	580	499	50,92	604	519
14,00	52,12	618	531	54,65	648	557	57,10	677	582	59,41	705	606
16,00	59,57	706	607	62,46	741	637	65,26	774	666	67,90	805	692
18,00	67,02	795	683	70,27	833	717	73,41	871	749	76,39	906	779
20,00	74,47	883	759	78,08	926	796	81,57	967	832	84,87	1007	865
22,00	81,91	971	835	85,89	1019	876	89,73	1064	915	93,36	1107	952
24,00	89,36	1060	911	93,70	1111	956	97,88	1161	998	101,85	1208	1039
26,00	96,81	1148	987	101,50	1204	1035	106,04	1258	1081	110,33	1308	1168

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

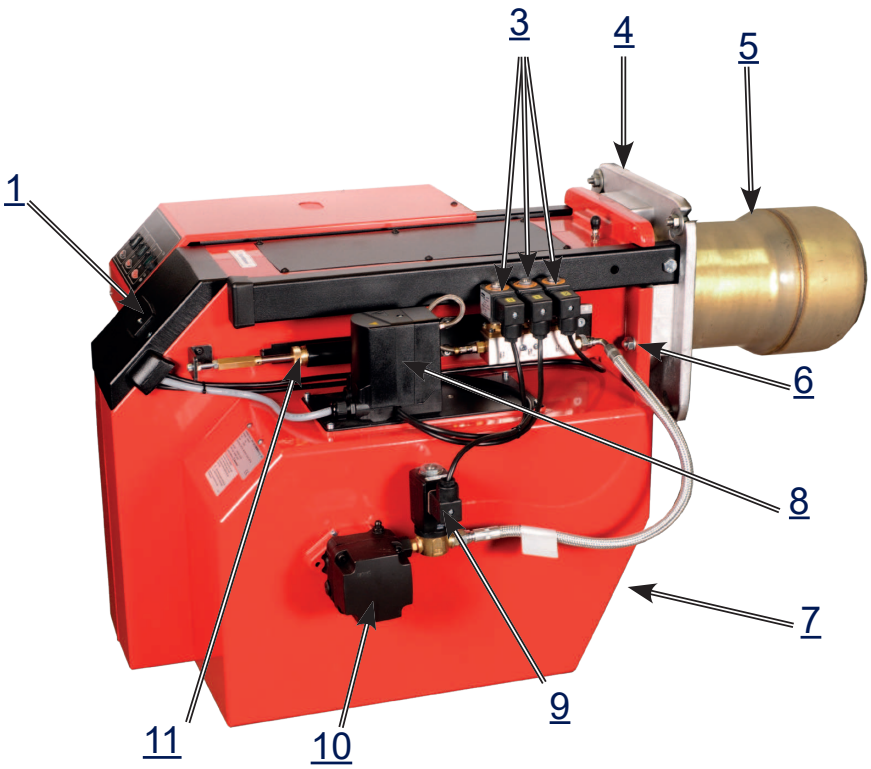
Nozzle table.

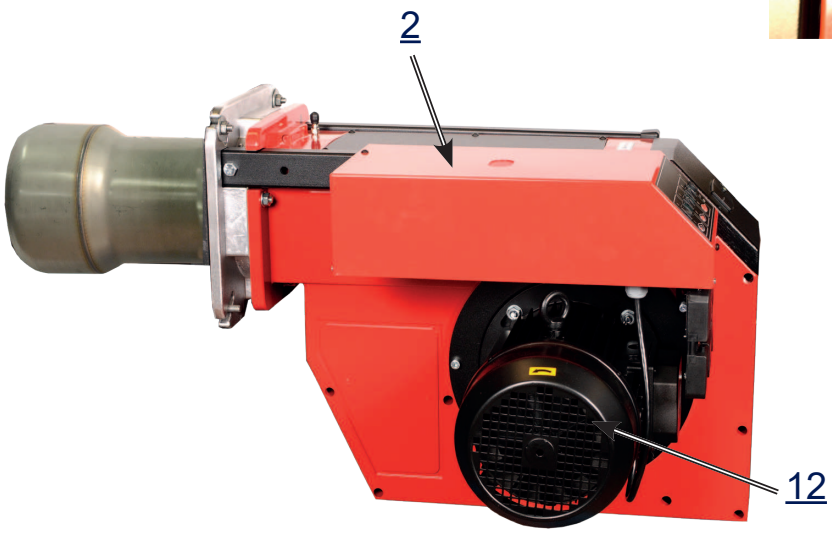
Pump pressure bar

	14			15			16			17		
Gph	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
1,00	4,40	52	45	4,56	54	46	4,71	56	48	4,85	57	49
1,10	4,84	57	49	5,01	59	51	5,18	61	53	5,34	63	54
1,20	5,29	63	54	5,47	65	56	5,65	67	58	5,82	69	59
1,25	5,51	65	56	5,70	68	58	5,89	70	60	6,07	72	62
1,35	5,95	70	61	6,15	73	63	6,36	75	65	6,55	78	67
1,50	6,60	78	67	6,83	81	70	7,06	84	72	7,27	86	74
1,65	7,27	86	74	7,52	89	77	7,77	92	79	8,01	95	82
1,75	7,71	91	79	7,97	95	81	8,24	98	84	8,49	101	87
2,00	8,81	104	90	9,12	108	93	9,42	112	96	9,71	115	99
2,25	9,91	118	101	10,26	122	105	10,60	126	108	10,92	130	111
2,50	11,01	131	112	11,39	135	116	11,77	140	120	12,13	144	124
2,75	12,11	144	123	12,53	149	128	12,95	154	132	13,35	158	136
3,00	13,21	157	135	13,67	162	139	14,13	168	144	14,56	173	148
3,50	15,42	183	157	15,95	189	163	16,49	196	168	16,99	201	173
4,00	17,62	209	180	18,23	216	186	18,84	223	192	19,42	230	198
4,50	19,82	235	202	20,51	243	209	21,20	251	216	21,84	259	223
5,00	22,03	261	225	22,79	270	232	23,55	279	240	24,27	288	247
5,50	24,23	287	247	25,07	297	256	25,91	307	264	26,70	317	272
6,00	26,43	313	270	27,49	326	280	28,27	335	288	29,13	345	297
6,50	28,63	340	292	29,63	351	302	30,62	363	312	31,55	374	322
7,00	30,84	366	314	31,91	378	325	32,98	391	336	33,98	403	374
7,50	33,04	392	337	34,19	405	349	35,33	419	360	36,41	432	371
8,00	35,25	418	359	36,47	433	372	37,69	447	384	38,80	460	396
8,50	37,45	444	382	38,74	459	395	40,04	475	408	41,26	489	421
9,00	39,65	470	404	41,02	486	418	42,40	503	432	43,69	518	446
9,50	41,85	496	427	43,30	514	442	44,75	531	456	46,11	547	470
10,00	44,06	523	449	45,58	541	465	47,11	559	480	47,11	559	480
11,00	48,46	575	494	50,14	595	511	51,82	615	528	53,40	633	545
12,00	52,87	627	539	54,70	648	558	56,53	670	576	58,25	691	594
14,00	62,68	732	629	63,81	757	651	65,95	778	669	67,96	806	693
16,00	70,49	836	719	72,93	865	744	75,38	894	769	77,67	921	792
18,00	79,30	940	809	82,05	973	837	84,80	1006	865	87,38	1036	891
20,00	88,11	1045	899	91,17	1081	930	94,22	1117	961	97,09	1151	990
22,00	96,92	1149	988	100	1189	1023	104	1229	1057	107	1267	1089
24,00	106	1254	1078	109	1297	1116	113	1341	1153	116	1382	1188
26,00	115	1359	1168	119	1406	1209	122	1453	1249	126	1497	1287

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

2.9 Description





1. Inspection window
2. Connection box
3. Solenoids with block
4. Flange
5. Burner pipe
6. Flange lock
7. Air intake
8. Damper motor
9. Solenoid valve
10. Pump
11. Insert control
12. Motor
13. Fan wheel

3. General instructions

3.1 General rules

The installation of an oil burner should be carried out in accordance with local regulations. The installer of the burner must therefore be aware of all regulations relating to oil and combustion.

Only oil suitable for the burner should be used and then in combination with a suitable oil filter before the oil pump of the burner.

If the burner is replacing an existing burner make sure that the oil filter is replaced or cleaned. The installation must only be undertaken by experienced personnel. 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.

3.1.1 Installation and maintenance instructions

The maintenance instructions supplied with the burner must be kept at an easily accessible location in the boiler room.

3.1.2 Instructions

The user must be receive detailed instructions concerning the functionality of the oil burner and entire system. It is the responsibility of the supplier to provide the user with instructions.

3.1.3 Inspection and maintenance

Refer to servicing schedule

3.1.4 Before commissioning

The 3-stage thermostat must be installed before operation. Contact Bentone for more information about the appropriate product.

3.1.5 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 precipitation in the chimney. The system must be fine-tuned at start-up. The temperature in the chimney must be at least 60 °C at 0.5 m down in the chimney to prevent condensation.

4. Installation

4.1 Handling and lifting instruktion

The lifting aid are available as spare parts. See figure 1

figure 1

4.2 Acceptance inspection

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

4.3 Preparations for installation

Check that the burner's dimensions and capacity range are suitable for the boiler in question. The power data on the type sign refers to the burner's min. and max. power.

4.4 Distribution of oil

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

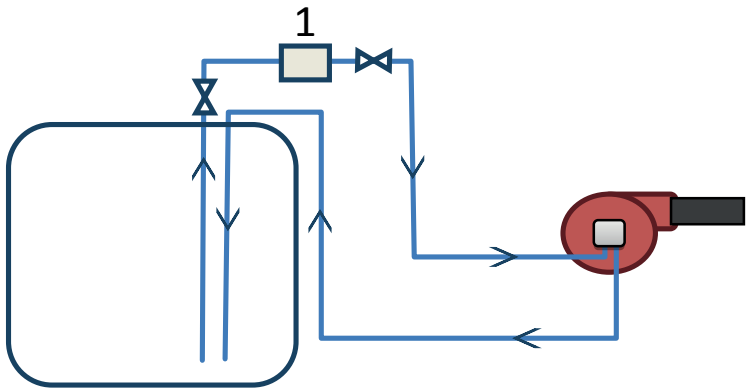
Take the following into account:

- Selection of pipe diameter, pipe length and height difference; see Pump instruction.
- Pipelines are to be laid with a minimal number of glands.
- The pipes are to be laid so that the oil supply hoses are not subjected to tensile stresses or are excessively bent when the burner is swung out or removed for service.
- The oil filter should be installed so that the filter cartridge can easily be replaced or cleaned. Self-cleaning filters are recommended for oils of a higher viscosity or oils that contain significant impurities.
- Oil-affected parts shall 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 shall 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 should not fall below -0.3 bar in the suction line during start-up.

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

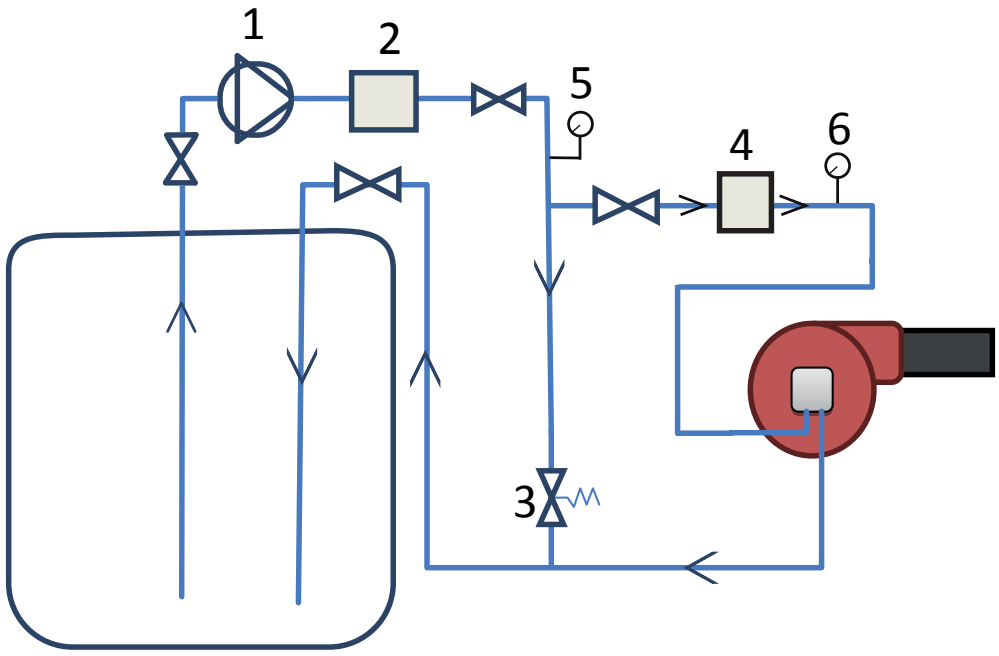
4.4.1 Proposed pipe routing for oil distribution systems without transport pump

This type of connection should be used only when the oil has a viscosity less than 6 mm²/s



1. Oil filter

4.4.2 Pipe routing suggestion for oil distribution systems with a transport pump, coarse filter and fine filter



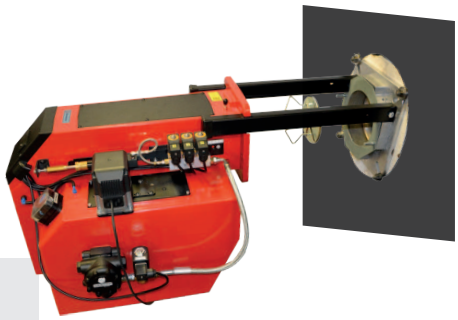
1. Transport pump
2. Coarse filter
3. Bypass valve 0,5 - 2,0 bar
4. Fine filter
5. Manometer 1
6. Manometer 2

4.5 Electrical connection

- Before work on the electrical connection, the current should be disconnected so that the installation is isolated.
- Electrical connection must be done in accordance with the applicable regulations.
- Burners should be connected to an isolator switch.
- The connection should be made in accordance with the wiring diagram.
- Fuse rating is as required

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

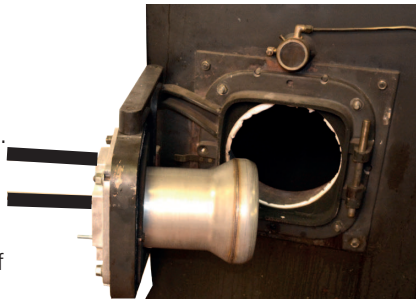
4.6 Mount the burner on the boiler



1. Separate the burner body and the flange.
2. Pull out the burner on the guides.
3. Remove the brake disc from the oil pipe.
4. Install the selected nozzle. (See Technical data)
5. Install the brake disc on the oil pipe

> **!** 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.

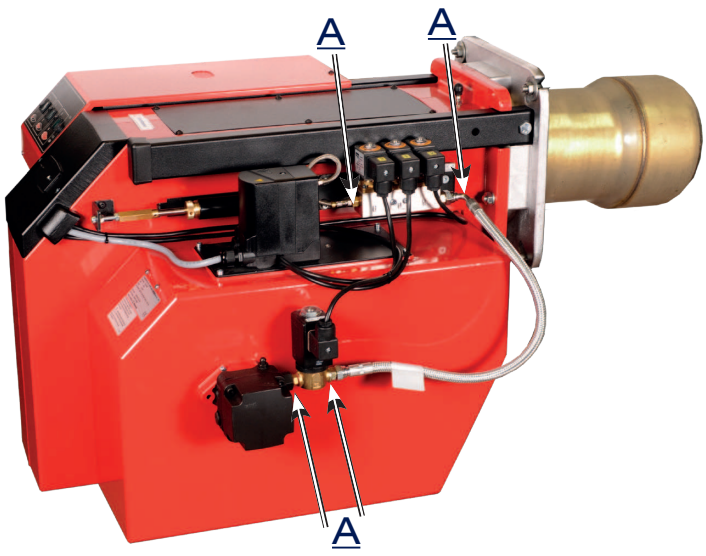
6. Remove the burner pipe from the flange.
7. Install the flange with gasket on the boiler.
8. Install the burner pipe on the flange. Make sure that the holes in the front edge of the burner pipe are pointing down (not on all burner pipes). This allows any drops of oil to run out.
9. Insulate between the burner and boiler door to reduce radiated heat.
10. Install the burner body on the flange.
11. Lock the burner body using with the nut/nuts.
12. Connect the oil pipes to the pump, refer to the chapter - servicing of burners
13. Connect the burner electrically, refer to the chapter - servicing of burners



4.7 Check oil line seals

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

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



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4.9 Example of basic settings

Choice of nozzle B 70-3

Burner output	1250 kW
Output stage 1	627 kW
Output stage 2	313 kW
Output stage 3	313 kW

According to the nozzle table, this provides the following nozzle.

Step 1	12,0 Gph
Step 2	6,0 Gph
Step 3	6,0 Gph

Basic settings B70-3

Effects and nozzle selection from the example above. The values are available in the tables for setting values of inserts or air dampers.

Insert	Step 1/2 = 17
	Step 3 = 37

Low load air damper	=22°
MV2 open	=35°
Air damper step 2	=52°
MV3 open	=60°
Air damper step 3	=75°

These are the default settings and controlling the combustion will take place during operation.

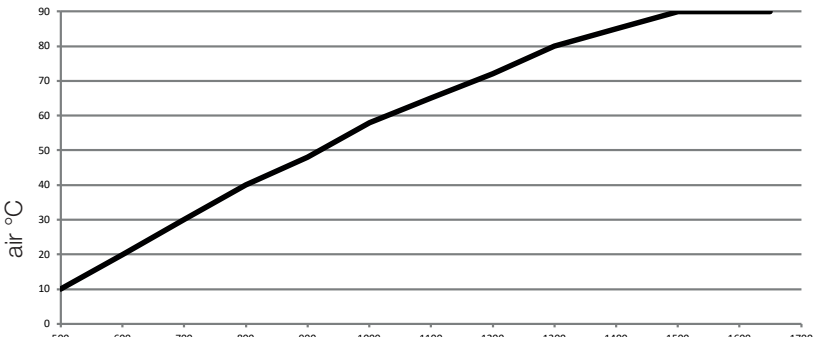
Selection of power and connection between the different power stages must be selected and adjusted so that the system achieves good functionality.

4.8 Recommended surplus air

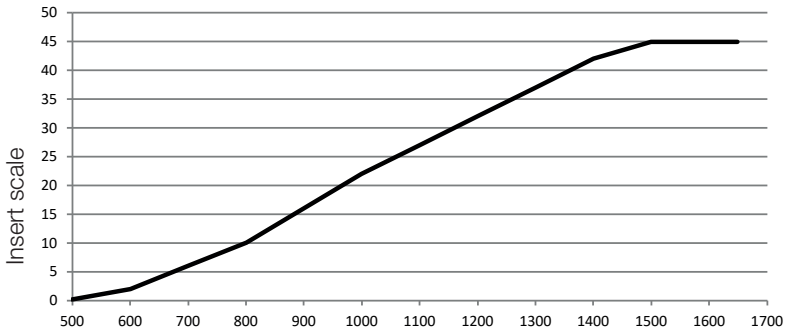
Oil type	Excess air flue gases		Max. % CO_2
	% O_2	% CO_2 Lambda 1.2	
Light oil, B10 heating oil/ biofuel mix (as per the definition in DIN V51603-6)	3–5	≈12,5	15,4

165 205 99

4.10 Setting values for air damper B70



4.11 Setting values for insert B70



4.12 Insert control movable brake disc

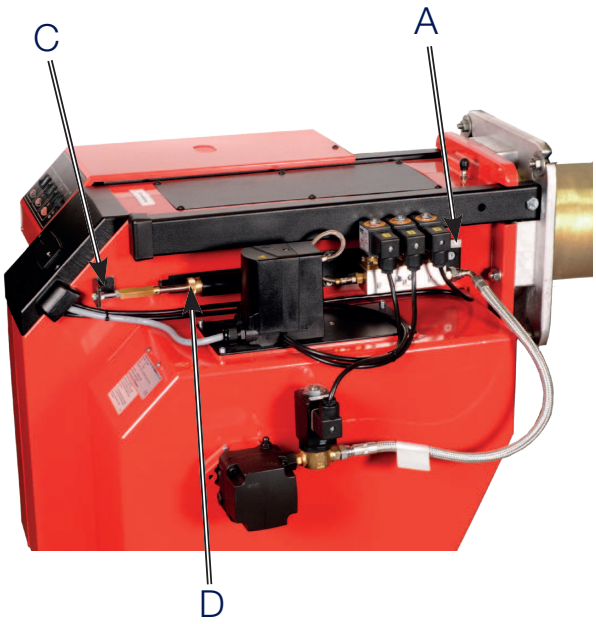
Insert control is used to achieve a pressure drop over the brake disc as favourable as possible in the various power stages.

3- nozzles

The insert control sets the brake disc mode between Step 2 and Step 3 using a hydraulic piston. There are two adjustments to be made on the insert a low load adjustment and a high load adjustment.

Low load

The low load adjustment takes place by changing the guide rail's mounting to the hydraulic piston. This takes place using a locking screw located through an oval hole. In the default setting, the value that is read in the table (XX) is used for the setting values for the chosen power for step 2. During operation, the insert is adjusted in order to achieve the best function.



Undo the locking screw (C).

Set the desired position on the scale (A) by pushing the disc in the desired position.

Tighten the screw (C).

High load

The high load setting takes place by adjusting the hydraulic piston's length of stroke using set screw (D). Loosening the set screw increases the length of stroke while tightening it reduces the length of stroke

Set the desired position on the scale (A) using the set screw (D) (left turn reduces pressure loss, the brake disc is moved outward).

If pulsation occurs, the changed pressure drop over the brake disc may result in the pulsation stopping

4.13 Air setting

When the burner's power stage has been selected, check the setting values for air dampers in table (XX). Read the damper angle for each of the power stages. This must then be used when the settings are made in the burner's control system 16520598(XX)

Check the air settings by conducting a flue gas analysis.

5. Burner servicing

5.1 Servicing the combustion device

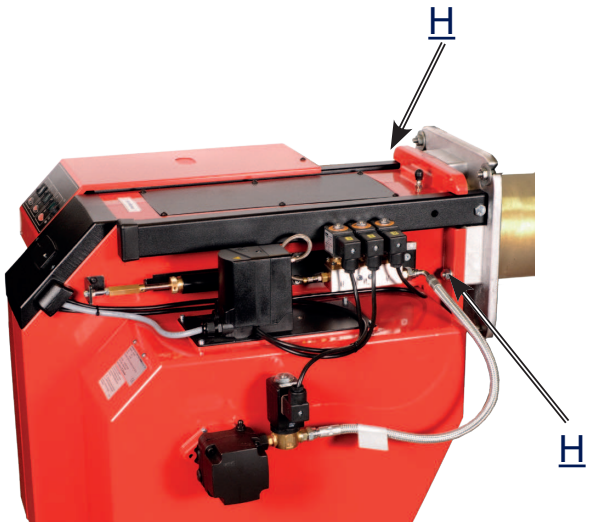
Removal and installation

1. Switch off the mains power..

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

2. Remove the nuts (H) and pull the burner body out of the guides from the burner flange.
3. Remove the brake plate from the oil pipe and clean the brake plate.
4. Unscrew the nozzle/nozzles.
5. Fit the nozzles
6. Install the brake plate. (See technical data)
7. Check the ignition electrodes. (See technical data)
8. If necessary, replace the ignition electrodes.
9. Fit the burner body and the burner flange together and secure with the nut (H).
10. Open the boiler/spectacle flange to access the burner pipe.
11. Remove and clean the burner pipe.
12. Install the burner pipe, make sure you install the drainage hole (not on all burner pipes) facing downwards so that any spilled oil can drain out.
13. Close the boiler / spectacle flange.
14. Turn on the mains power.
15. Check combustion*.

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



> ! When soiled, always replace nozzles with new nozzles.

Note:

* When servicing/replacing components that affect combustion, an analysis and soot test must be carried out on the installation

165 305 01

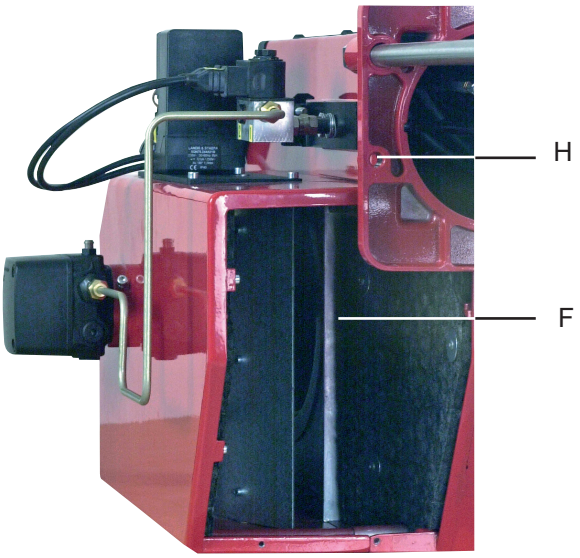
5.2 Servicing air dampers

Removal and installation

1. Break the main current and disconnect the Euro plugs from the burner.

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

2. Loosen the nuts (H) and pull the burner body out of the guides.
3. Remove the intake grille at the air intake.
4. Disconnect the damper motor.
5. Clean the air damper (F) and the intake.
6. Reconnect the damper motor.
7. Install the intake grille for the air intake.
8. Press the burner together and lock using the nuts (E).
9. Fit the Euro plugs and turn on the mains power.
10. Check combustion*.



Note:

* When servicing/replacing components that affect combustion, an analysis and soot test must be carried out on the installation

5.3 Replacement of damper motor, air

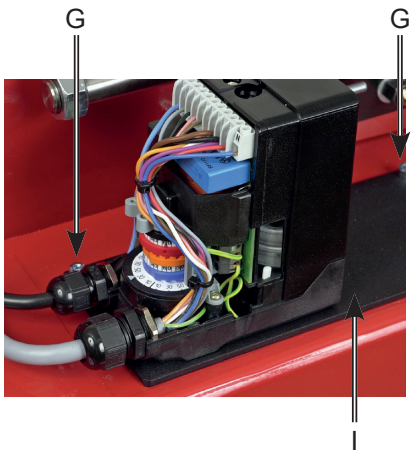
Removal and installation

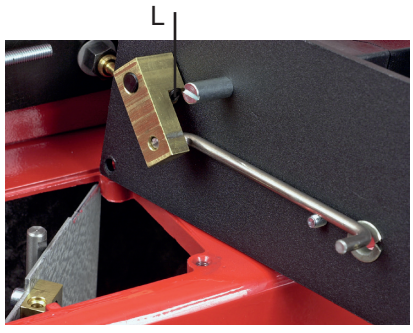
1. Break the main current and disconnect the Euro plugs from the burner.

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

2. Note the position of the cables and loosen the wires in the damper motor.
3. Disengage the damper motor and set it at 30°.
4. Loosen the screws (G) to the damper motor mounting plate.
5. Lift the damper motor carefully so that the air damper remains in the air intake.
6. Loosen (L) the control arm from the motor shaft.
7. Remove the damper motor from the mounting plate (I).
8. Reinstall the damper motor on the mounting plate.
9. Fit the control arm on the damper motor shaft. It is important that the screw is perpendicular to the plane of the shaft.
10. Disengage the damper motor and set it at 30°.
11. Install the mounting plate by guiding the control arm into the bracket on the air damper and the air damper shaft in the mounting plate (make sure the bushings between the mounting plate and the damper shaft are in place).
12. Disengage the damper motor, feel that the damper moves easily. Close the damper and reset the protractor on the damper motor.
13. Connect the damper motor electrically.
14. Set the damper motor notches.
15. Fit the Euro plugs and turn on the mains power.
16. Check combustion.*

> ! When resetting dampers, ensure that they do not engage in the close damper position. If dampers do engage, the automatic control unit will report an error message.



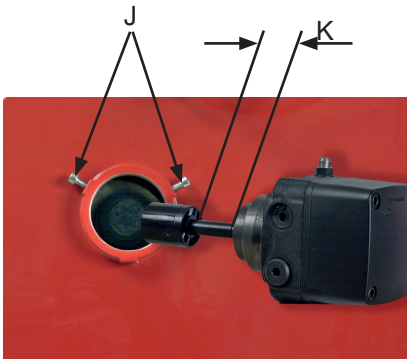


5.5 Replacing the oil pump

Removal and installation

1. Switch off the mains power.

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



2. Remove the oil hoses from the pump.
3. Loosen the screws (J) and pull out the oil pump
4. Measure the distance from the pump mount to the pump coupling (K).
5. Move the pump coupling to the new pump and set the same distance between the pump and the pump coupling as before (K) in order to avoid pressure on the pump seal.
6. Install the oil pump on the burner and tighten the screws (J). (It is important that the pump shaft splines align correctly in the pump coupling).
7. Fit the oil hoses
8. Turn on the mains power.
9. Bleed the pump, start the burner and set the correct oil pressure (refer to technical data for correct output).
10. Check combustion.*

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

> ! When servicing oil bearing components, check the oil leaks when the burner is commissioned after servicing.

Note:

* When servicing/replacing components that affect combustion, an analysis and soot test must be carried out on the installation

5.6 Replacement of electrical components

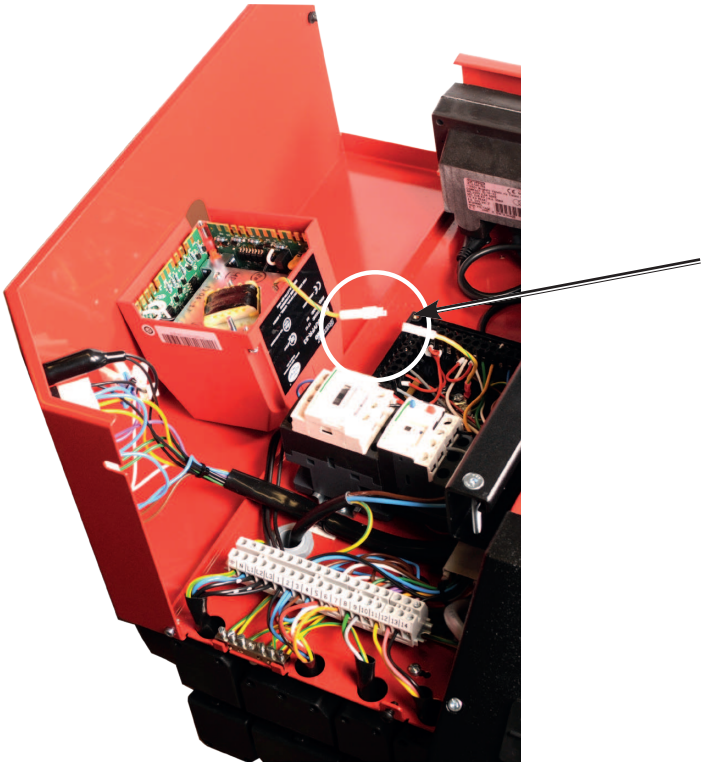
1. Switch off the mains power.

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

> ! Lift the relay carefully to avoid stretching the earth cable when dismantling

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

2. Note the connection of the existing component.
3. Remove the existing component.
4. Install the new component using the same wiring as the existing component or the specified alternative arrangement.
5. Make sure the relay's earth cable is in place.
6. Turn on the mains power.
7. Check the function of the new component.
8. Start the burner and check the combustion.



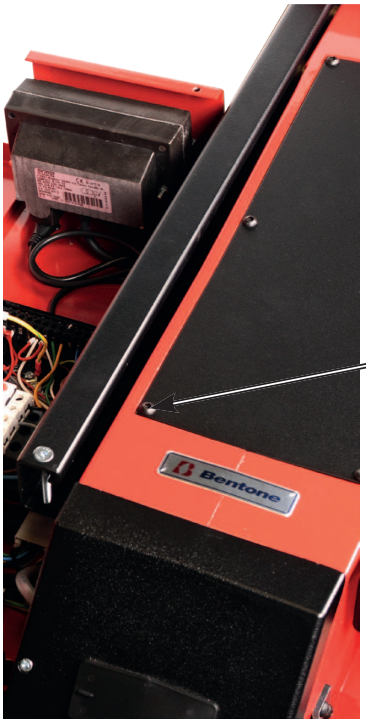
Note:

* When servicing/replacing components that affect combustion, an analysis and soot test must be carried out on the installation

5.7 Vibration

Maximum vibration level are 5,0 mm/s

- Check all bolts and nuts for correct torque
- Check fan wheel for damage and contamination. Change when dirty/ unbalanced
- Check motor bearings. If worn change motor/bearings



Use lid screw hole for sensor mounting

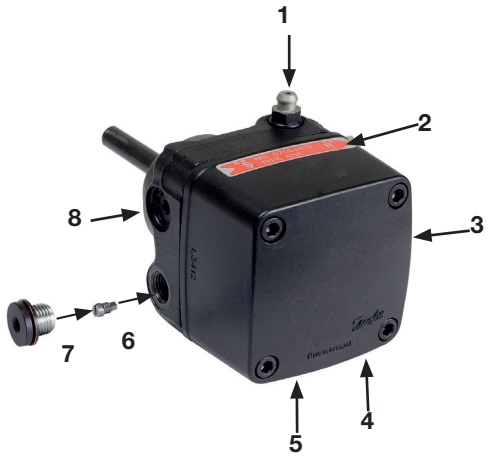
6. Instructions Pump RSA 95 & 125

6.1 Technical data

	RSA 95	RSA 125
Viscosity range::	1,3-18,0 mm^2/s	
Pressure range at viscosity 1,3-1,8:	5,5-12,0 bar	
Pressure range at viscosity 1,8-18,0:	2,5-21,0 bar	
Oil temperature:	-10 till+70°C	
Nozzle capacity at viscosity 4,3:	150-190 l/h	215-260 l/h
Gear capacity:	225 l/h	294 l/h
Max pressure on the suction and return side::	4 bar	

6.2 Components

1. Pressure gauge port G 1/8”
2. Nozzle outlet G 1/4”
3. Suction line G 1/4”
4. Suction line G 1/4”
5. Return line G 1/4”
6. Return line G 1/4”
7. Return plug
8. Pressure regulation 4 mm Allen key



6.3 Mounting/dismounting by-pass plug

In a 2-pipe-system excess oil is led back direct to the oil tank. In a 1-pipe-system the by-pass plug must be removed so that there is a free passage back to the suction side through the return line with the return port closed. (Pos.7).

6.4 Purging

On 1-pipe systems it is necessary to purge the pump. On 2-pipe systems purging is automatic through the return line.

6.5 Replacing the filter

Replace the oil fiter on the oil pump as follows..

- Close the oil valves.
- Unscrew the cover (4 x 5 mm Allen screws).
- Replace the oil filter.
- Replace the cover gasket.
- Refit the cover.
- Open the oil valves.

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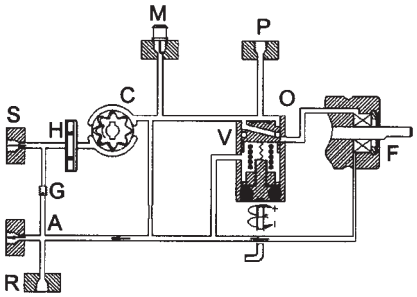
6.6 Function Danfoss RSA 95 - 125

When the pump is started oil is drawn through the suction port ”S” via filter ”H” to the suction side of the gearwheel set ”C”. From here the gearwheel set pumps the oil to the pressure side and at the same time the oil becomes pressurized. The oil is led to cut-off and regulating valve ”V” which opens when the set pressure is reached.

The pressure is controlled and kept constant by regulating valve ”V”. At the same time the gearwheel set ”C” distributes the oil through nozzle port ”P” and pump return side ”R” via the shaft seal ”F”.

The quantity of oil supplied to nozzle port ”P” is determined by the pressure set on regulating valve ”V” and the nozzle/resistance in the nozzle line.



In 2-pipe-systems excess oil is led back to the oil tank. In 1-pipe-systems the by-pass plug ”A” must be removed to give free flow back to the suction side via return line ”G” with return port ”R” closed.

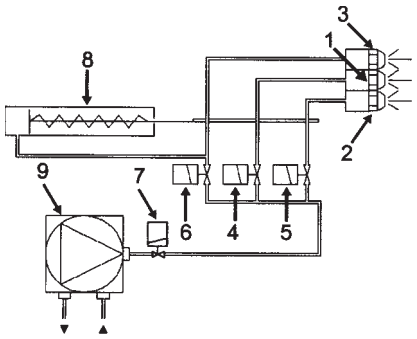
When the pump is stopped, the pump output drops and produces a drop in the oil pressure. The spring in the regulating valve presses the regulating piston forward until it seals in port ”P”. This cuts off the oil flow to the nozzle and ensures that the nozzle line is effectively shut off.

If the pump is overloaded, i.e. more oil is demanded than the gearwheel is able to pump under the given conditions, the oil pressure falls below the set value because the piston of the regulating valve moves towards its closed position and partially or wholly cuts off the return oil via port ”O”.

This can be remedied by

- reducing the pump pressure
- reducing the capacity, i.e. smaller nozzle or greater resistance
- changing to a pump with higher capacity

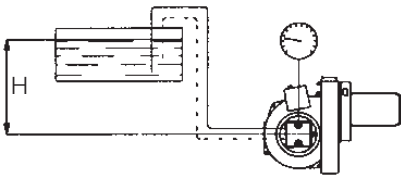
Schematic diagram



1. Nozzle Stage 1
2. Nozzle Stage 2
3. Nozzle Stage 3
4. Solenoid valve Stage 1 (Y1)
5. Solenoid valve Stage 2 (Y2)
6. Solenoid valve Stage 3 (Y3)
7. Safety valve for nozzle (Y1S)
   Only for capacities over 100 kg/h or on special request by customer
8. Hydraulic control device
   Only on burners with hydraulic air control or nozzle assembly optimisation.
9. Oil pump

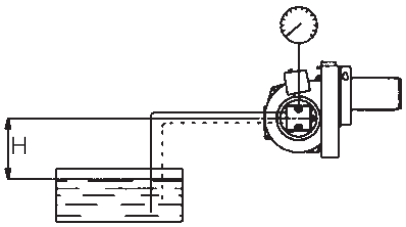
Items 3 and 6 are not fitted to two-stage burners. Item 8 is connected after solenoid valve nozzle 2 (Y2).

6.7 Suction line tables



1-pipe system

Höjd H m	ø12mm m	Pipe diameter ø15mm m	ø20mm m



1-pipe system

Height H m	ø12mm m	Pipe diameter ø15mm m	ø20mm m

Two-pipe system

Height H m	ø12mm m	Pipe diameter ø15mm m	ø20mm m
4,0	81	100	100
3,5	76	100	100
3,0	71	100	100
2,5	66	100	100
2,0	61	100	100
1,5	56	100	100
1,0	51	100	100
0,5	46	100	100

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

Two-pipe system

Height H m	ø12mm m	Pipe diameter ø15mm m	ø20mm m
0,0	41	100	100
-0,5	36	89	100
-1,0	31	77	100
-1,5	26	65	100
-2,0	22	53	100
-2,5	17	41	100
-3,0	12	29	91
-3,5	7	17	53
-4,0	2	5	15

The suction line tables consist of theoretically calculated values where the pipe dimensions and oil velocity have been matched so that turbulences will not occur. Such turbulences will result in increased pressure losses and in acoustic noise in the pipe system.

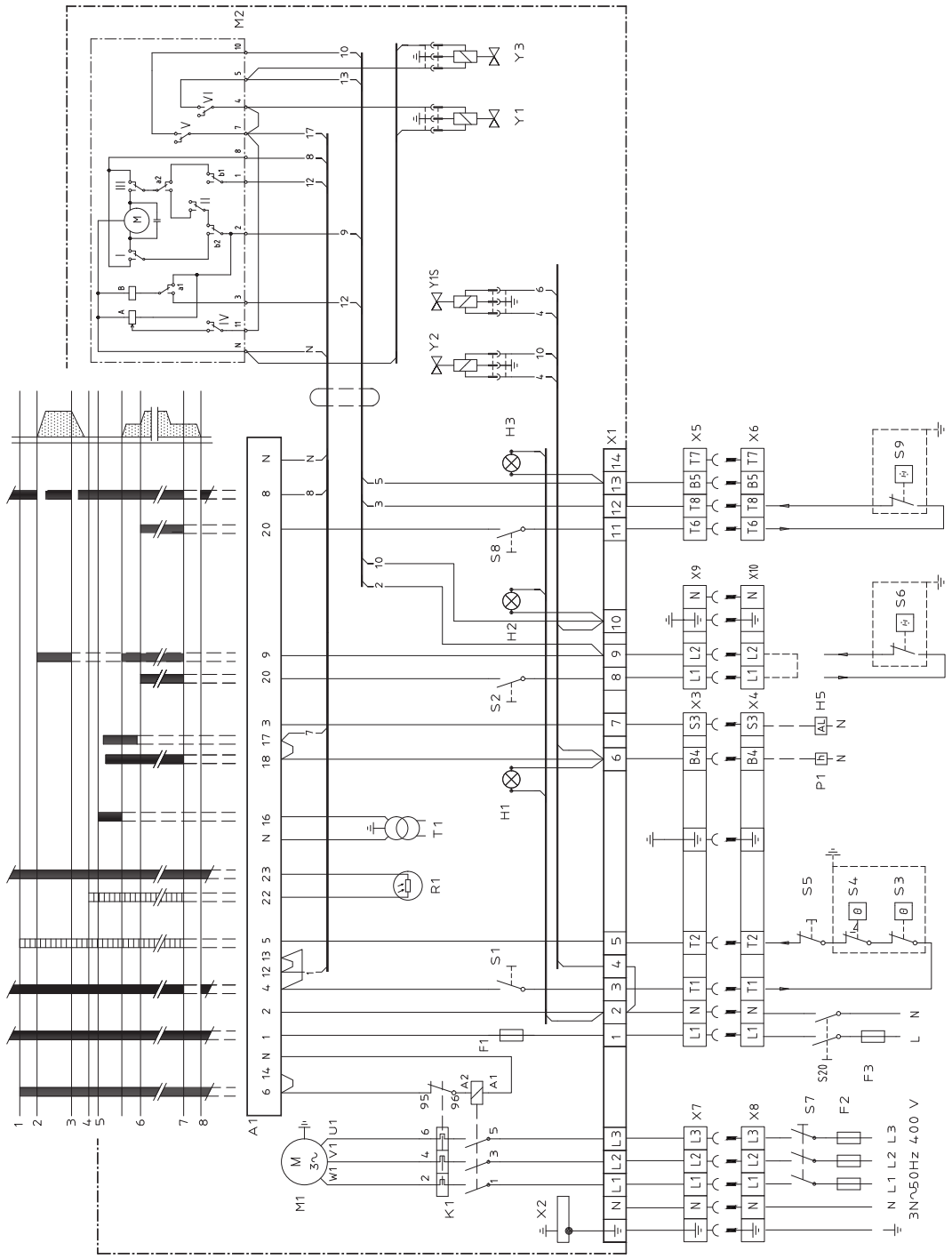
In addition to drawn copper piping a pipe system usually comprises 4 elbows, a non-return valve, a cut-off valve and an external oil filter. The sum of these individual resistances is so insignificant that they can be disregarded.

The tables do not include any lengths exceeding 100 m as experience shows that longer lengths are not needed. The tables apply to a standard fuel oil of normal commercial quality according to current standards. On commissioning 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 viscosity of 6,0 mm2/s.

7. Electrical equipment

7.1 Wiring diagram



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7.2 Component list

A1 Burner control
F1 Fuse
M1 Burner motor
R1 UV-detector
S1 Operating switch
S3 Rules/Operating thermostat
S4 Temperature/pressure limiter
S7 Main switch
S8 Air pressure switch
S30 External reset
T1 Ignition transformer
X1 Connection block
X20 Connection terminal board
Y1 Solenoid valve 1
Y1S Safety solenoid valve

8. Control

8.1 Technical data

	BP230UVFR-S2	BP230UVFR-S3
Pre-purge time (t1)	30.7 s	37.2 s
Pre-ignition time (t3)	6 s	2.5 s
Safety time (TSA)	3 s	5 s
Post-purge time (t6)	16.8 s	14.9 s
Reaction time for low interrupt	1 s	1 s
Ambient temperature BP	-40 to +60 °C	-40 to +60 °C
Ambient temperature UV5	-20 to +60 °C	-20 to +60 °C
Max. current, terminals 6-7	2 A	2 A
Max. current, other terminals	1 A	1 A
Ionisation current	3-10 µA	–

8.2 LED indicator lamps

BurnerPRO's burner control has seven LEDs which indicate the operating status of the control unit and the cause of the lockouts.

Each LED has an icon describing its function.

	FAN	Lights up when voltage is supplied to the fan motor (terminal 6)
	OPEN DAMPER 6	Flashes when the damper motor runs to maximum position. When the switch for the maximum damper motor position closes, this LED will light continuously.
	CLOSE DAMPER 5	Flashes when the damper motor runs to minimum position. When the switch for the minimum damper motor position closes, this LED will light continuously.
	AUTO 4	Lights up when the Burner control is in normal operating mode.
	IGNITION 3	Indicates ignition
	FLAME 2	Lights up when a flame is detected by the flame detector.
	ALARM/STATUS	In lockout mode, the Alarm lamp lights up and the other LEDs light up to indicate lockout. Refer to "Fault codes".

The LEDs can show the flame strength in Control mode by pressing the reset button for 3 seconds when the Flame LED flashes during start-up. In Control mode, the Status LED shines yellow, the Fan LED flashes, and LEDs 2-6 show the flame signal strength. Each LED corresponds to 20% of the total flame signal. 5 lit LEDs correspond to 100% and 2 LEDs correspond to 40%.

8.3 Explanation of the different sequence modes

1. **Operation**
   This is the control unit voltage supply.
2. **System test**
   In this status mode, the control unit undergoes an internal test to verify correct functionality of the hardware and software.
3. **Preconditions for burner start-up**
   The control unit verifies that the air pressure switch is in the depressurised position and a test of the fuel cut-off valve is carried out.
4. **Heating requirement**
   The operating thermostat closes and voltage is supplied to connection 5 so that the control unit can start the burner.
5. **Pre-purge begins**
   The control unit starts the fan. Connections 6 and 7.
6. **Damper motor opens**
   Control unit connection 9 sends a command to the damper motor to run at Max. mode. The control unit detects that the damper motor's end position switch indicates successful transition to the Max. load mode by supplying voltage to the connection 8 input. The control unit also performs a test to ensure that the air sensor detects airflow by monitoring connection 14.
7. **Pre-purge**
   The combustion chamber is ventilated.
8. **Damper motor closes**
   Following pre-purge, the control unit closes connection 10. The control unit detects that the damper motor is in the Low Load mode by supplying voltage to connection 8 on the control unit.
9. **Ignition on**
   The control unit supplies voltage to the ignition transformer by activating connection 16.
10. **Fuel on** The control unit activates the fuel valve by supplying voltage to connections 17 and 18 as well as to direct ignition systems.
11. **Flame indication**
    Ignition transformer turns off. The flame signal is tested during this stage. If no flame is detected, the burner enters Lockout mode.
12. **Operating mode**
    Once a flame is stable, the control unit transitions to Operating mode. There must be a flame signal. Voltage is supplied to connection 20.
13. **Shutdown**
    Shutdown occurs when the heating requirement is met and power is cut off to the operating thermostat connection 5 . The control unit closes the fuel valves by cutting off power to outputs 18 and 20. The fan post-purges the combustion chamber.
14. **Lockout**
    The control unit enters lockout mode when an internal or external fault is detected. The reset button and the remote-reset connection can be used to disable Lock mode. However, the control unit will revert to lockout mode if the fault is not rectified.

Burner Lockout

When lockout occurs, the LEDs indicate the cause. The control unit status is saved in the memory, even in the event of a power outage. By pressing the manual reset button on the control unit or remote reset.

8.4 BurnerPro LED fault/lock code table

NO.	FAULT	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	POSSIBLE SOLUTION
	OPERATION LED ● = ON	Fan	Open damper	Closed damper	Auto	Ignition	Flame	Status	
	ICON								
1	DIAGNOSTIC ERROR, MAIN MCU INLET	●						RED	Initial diagnostic error. Ensure correct status of inputs and outputs when the unit is turned on.
2	LOCAL RESET		●					RED	User-initiated manual reset/lockout or defective reset switch.
3	AIR SENSOR	●	●					RED	Air sensor signal [connection 14] could not be detected by the end of the safety time, or loss of the air sensor signal during burner operation
4	DIAGNOSTIC ERROR			●				RED	“The system detected voltage at terminal 16, 17, 18, or 19 at the incorrect time, or no voltage detected when necessary. Check cabling and makes sure the system is running on a single line phase (50/60Hz)”
5	IONISATION FLAME LOSS	●		●				RED	Flame loss. Inspect the system, check the gas pressure, flame detector, cabling, etc.
6	IONISATION CIRCUIT FAULT		●	●				RED	Replace the control unit. Contact reseller/distributor.
7	INTERNAL COMMUNICATION ERROR	●	●	●				RED	Reset the system to continue normal operation. Contact reseller/ distributor if the fault persists.
8	REMOTE RESET				●			RED	The user has pressed Remote Reset or the remote controller has short-circuited.
9	IONISATION FAULT	●			●			RED	Replace the control unit. Contact reseller/distributor.
10	MAIN PROGRAM SEQUENCE ERROR		●		●			RED	Replace the control unit. Contact reseller/distributor.
11	RAM TEST	●	●		●			RED	Replace the control unit. Contact reseller/distributor.
12	PROGRAM SEQUENCE ERROR			●	●			RED	Replace the control unit. Contact reseller/distributor.
13	READING ERROR INPUT	●		●	●			RED	Check cabling and makes sure the system is running on a single phase (50/60Hz)
14	TIMER2 ERROR		●	●	●			RED	Replace the control unit. Contact reseller/distributor.
15	CPU TEST FAILED	●	●	●	●			RED	Replace the control unit. Contact reseller/distributor.
16	FLAME LOSS	●				●		RED	Visually inspect the flame detector and confirm that the pilot light was lit during start-up. Check the fuel supply system.

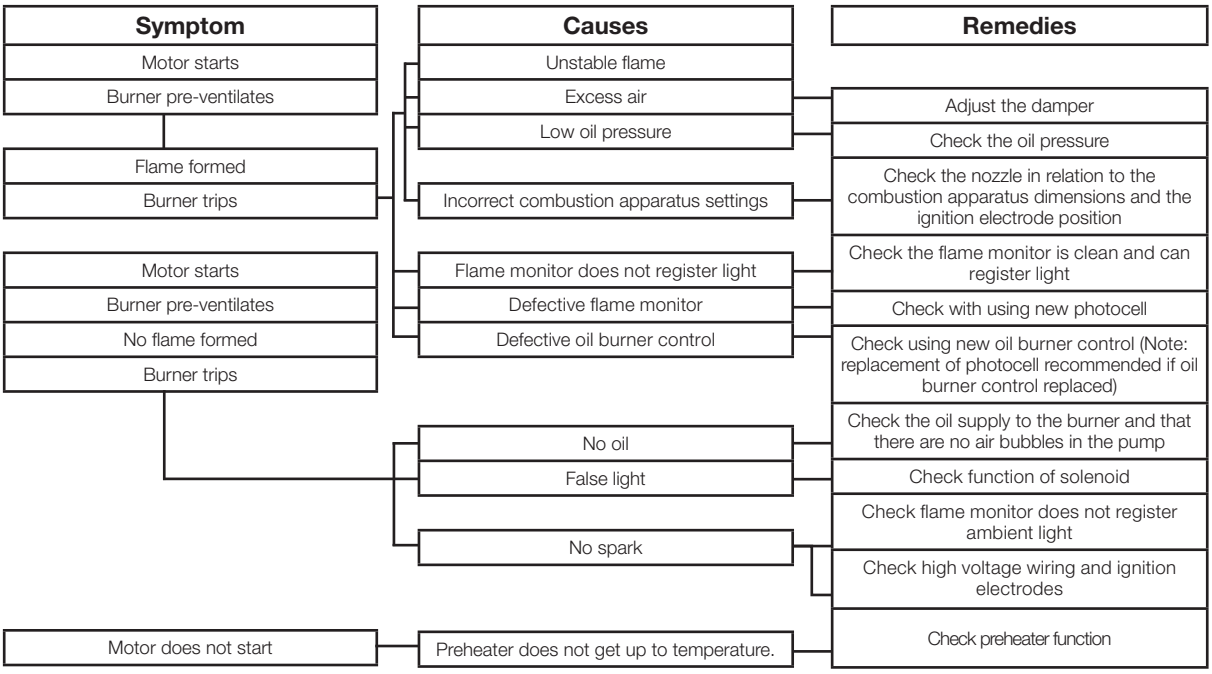
NO.	FAULT	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	POSSIBLE SOLUTION
17	CABLE FAULT		●			●		RED	The system detected voltage at terminal 16, 17, 18, or 19 at the incorrect time, or no voltage detected when necessary. Check cabling and makes sure the system is running on a single phase (50/60Hz)
18	SAFETY RELAY FAULT	●	●			●		RED	Replace the control unit. Contact reseller/distributor
19	FUEL VALVE OPEN			●		●		RED	Check fuel valve cabling. The valves may not be fully closed.
20	FLAME LOSS	●		●		●		RED	Visually inspect the flame detector and confirm that the main flame was lit during start-up. Check the fuel supply system.
21	WELDED SAFETY RELAY		●	●		●		RED	Replace the control unit. Contact reseller/distributor.
22	SELF TEST	●	●	●		●		RED	Replace the control unit. Contact reseller/distributor.
23	ROM ERROR				●	●		RED	Replace the control unit. Contact reseller/distributor.
24	FLAME LOSS DURING OPERATION	●			●	●		RED	Check the cabling. Check the flame detector. Check the fuel supply system.
25	RAM ERROR		●		●	●		RED	Replace the control unit. Contact reseller/distributor.
26	INTERNAL FAULT	●	●		●	●		RED	Replace the control unit. Contact reseller/distributor.
27	NOT USED								
28	NOT USED								
29	AMBIENT TEMPERATURE		●	●	●	●		RED	Ambient temperature below -40 °C or above 70 °C
30	ROM ERROR	●	●	●	●	●		RED	Replace the control unit. Contact reseller/distributor.
31	IONISATION SHORT-CIRCUIT						●	RED	Possible external short-circuit between terminals 23 and 24. Contact reseller/distributor if the fault persists.
32	TIME LIMIT EXCEEDED FOR CONTROL MODE	●					●	RED	30-minute activation time passed.
33	STANDBY FALSE FLAME		●					RED	False flame detected in Standby mode.
34	NOT USED							RED	
35	INTERNAL RESET			●			●	RED	Internal software reset of control unit. Contact reseller/distributor if the fault persists.
36	SOFTWARE RESET	●		●			●	RED	Internal software reset of control unit. Contact reseller/distributor if the fault persists.
37	WAITING TIME INPUTS		●	●			●	RED	The system was unable to perform airflow sensor test and/or valve closure test. Check the cabling. Check the air sensor and/or fuel valve switch.
38	INTERNAL RESET	●	●	●			●	RED	Internal software reset of control unit. Contact reseller/distributor if the fault persists.

NO.	FAULT	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	POSSIBLE SOLUTION
39	SOFTWARE RESET				●		●	RED	Internal software reset of control unit. Contact reseller/distributor if the fault persists.
40	HARDWARE RESET	●			●		●	RED	Replace the control unit. Contact reseller/distributor if the fault persists.
41	HARDWARE RESET		●		●		●	RED	Replace the control unit. Contact reseller/distributor if the fault persists.
42	CONTROL PROGRAM FROZEN	●	●		●		●	RED	Replace the control unit. Contact the distributor/factory.
43	CONTROL PROGRAM FROZEN			●	●		●	RED	Replace the control unit. Contact reseller/distributor.
44	TIMER2 ERROR	●		●	●		●	RED	Replace the control unit. Contact reseller/distributor.
45	LOW VOLTAGE ERROR		●	●	●		●	RED	Check mains power. Contact reseller/distributor if the fault persists.
46	LOW VOLTAGE ERROR	●	●	●	●		●	RED	Check mains power. Contact reseller/distributor if the fault persists.
47	UV DETECTION FAULTY					●	●	RED	Replace the control unit. Contact reseller/distributor.
48	INTERNAL FAULT	●				●	●	RED	Replace the control unit. Contact reseller/distributor.
49	INTERNAL FAULT		●			●	●	RED	Replace the control unit. Contact reseller/distributor.
50	IGNITION FEEDBACK	●	●			●	●	RED	The system detected voltage at terminal 16 at the incorrect time, or no voltage. Check cabling and ensure sufficient earthing.
51	PILOT FEEDBACK			●		●	●	RED	The system detected voltage at terminal 17 at the incorrect time, or no voltage. Check cabling and ensure sufficient earthing.
52	MAINP FEEDBACK	●		●		●	●	RED	The system detected voltage at terminal 19 at the incorrect time, or no voltage. Check cabling and ensure sufficient earthing.
53	WAITING TIME FEEDBACK LIMIT EXCEEDED		●	●		●	●	RED	Loss of feedback from the damper motor for more than 10 minutes. Check the cabling. Check the damper motor.
54	MAIND FEEDBACK	●	●	●		●	●	RED	The system detected voltage at terminal 18 at the incorrect time, or no voltage. Check cabling and ensure sufficient earthing.
55	DIAGNOSTICS INTERRUPTED				●	●	●	RED	Replace the control unit. Contact reseller/distributor.
56	UV FALSE FLAME			●	●	●	●	RED	False flame detected prior to ignition. Check the cabling. Check the flame detector. Ensure sufficient earthing.
57	IONISATION FALSE FLAME			●	●	●	●	RED	False flame detected prior to ignition. Check the cabling. Check the flame detector. Ensure sufficient earthing.
58	OPEN FEEDBACK READING		●	●	●	●	●	RED	The system detected voltage at terminal 8 at the incorrect time, or no voltage. Check cabling and ensure sufficient earthing.

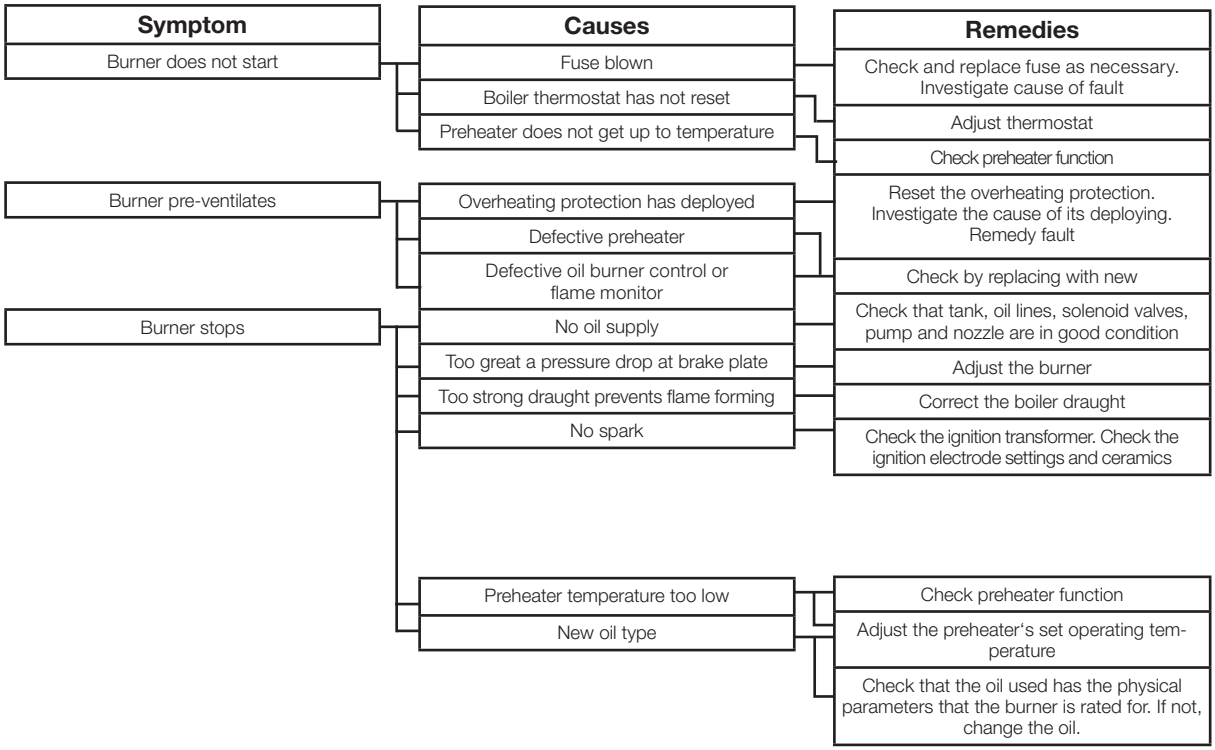
NO.	FAULT	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	POSSIBLE SOLUTION
59	ADJACENT POLE SHORT-CIRCUIT	●			●	●	●	RED	Replace the control unit. Contact reseller/distributor.
60	LOCAL RESET	●	●	●	●	●	●	RED	The local reset button has been pressed in for more than 10 seconds, or the reset button is stuck.
61	FUEL VALVE OPEN		●		●	●	●	RED	Fuel valve open at incorrect time.
62	STRONG UV FLAME	●	●		●	●	●	RED	Flame detector too close to the flame. Increase the distance between the flame detector and the flame.
63	INTERNAL FAULT					●		RED	Replace the control unit. Contact reseller/distributor.

9. Fault Location

9.1 Burner will not start

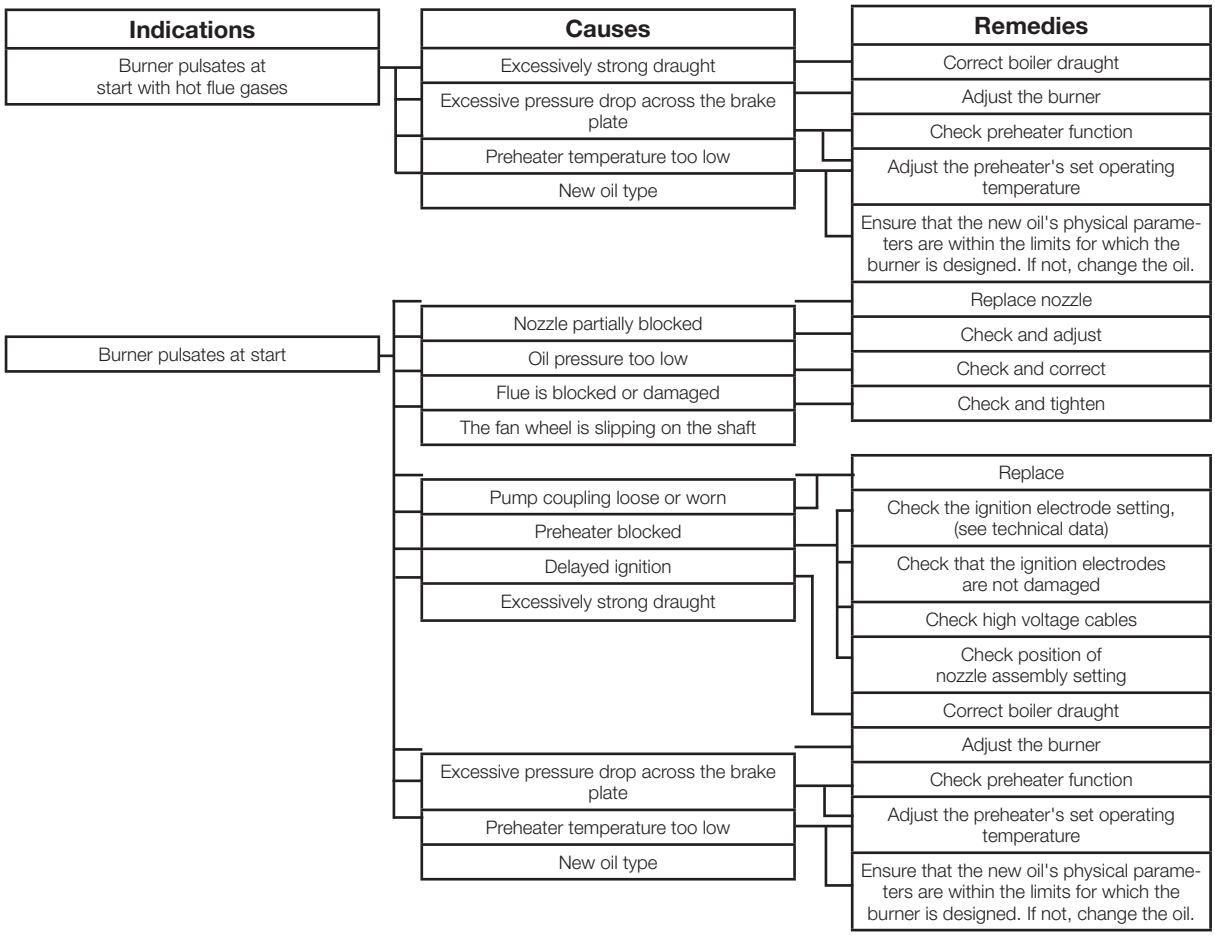


9.2 Burner will not start after normal use

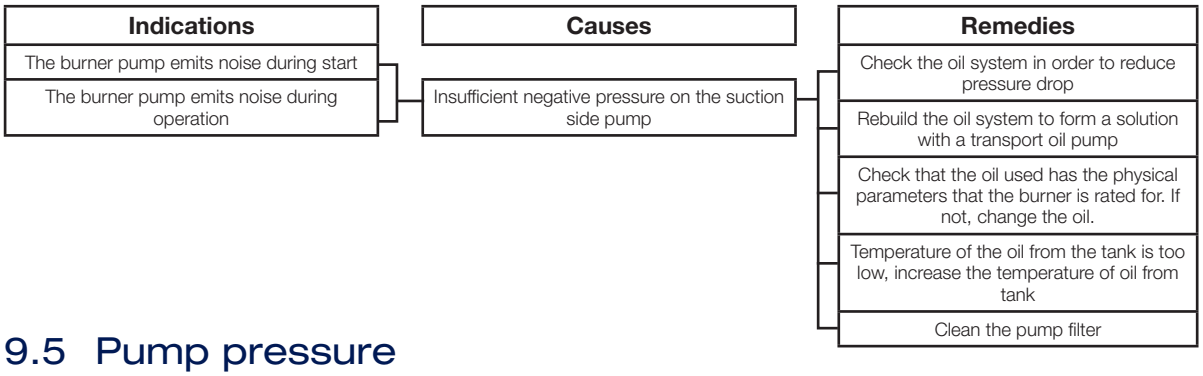


165 105 09

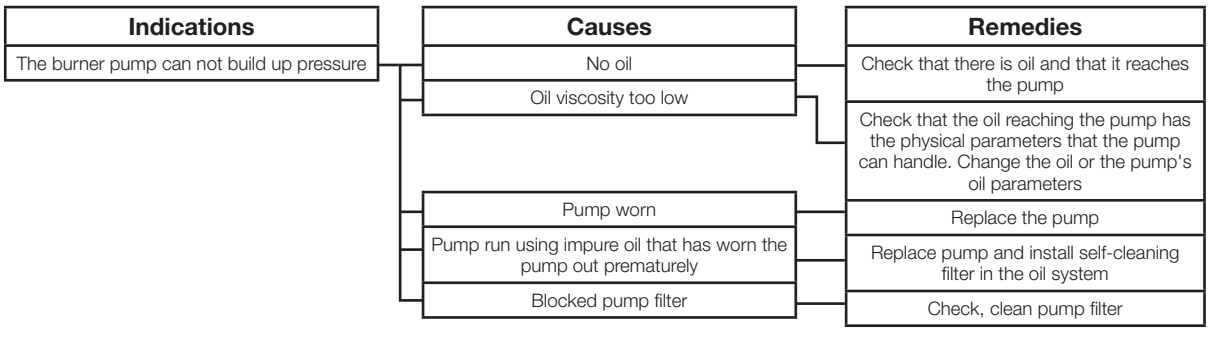
9.3 Delayed ignition



9.4 Noise in pump



9.5 Pump pressure



10. Log of flue gas analysis

Owner	Adresss	Tel. no:
Installation		Tel. no:

Boiler

Type	Make	Power kW

Bentone Burner

Type	Model	Serial no.	Fuel

	Step 1	Step 2	Step 3
Draught in fireplace			
Fan Press mbar			
Filter smoke number			
CO_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:

11. Oil burners maintenance instructions

General information

Keep the boiler room clean. Ensure that the boiler room has permanent fresh air intake. Switch off before dismantling the oil burner.
At hinged mounting, make sure that an automatic safety switch is fitted, so that the burner cannot start when theswing 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 tomake 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 areopen.
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 notstart until the oil in the preheater reaches the requiredtemperature.

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 fusesare intact and main switch is on.

If the burner starts but does not ignite

Make an attempt to start the burner.
Never make close repeated start attempts.
Don´t restart the burner until the boiler is free from oil gases.
If the burner still does not ignite send for the service engineer.

When switching off during summer

Always use the main switch to cut out the burner even when adjusting the burner or cutting off the heating for ashort time. For longer periods of shut down, close all valves and the oil supply stop-cock.
Clean the filter and nozzle by washing in petrol or paraffin.
Make sure the filter medium is not damaged or defective.
Protect electrical gear from damp.

Warning

Never stand too near or put your face to the inspection or fire door, when the burner is about to start.
Never use a naked flame to ignite oil if the electrical ignition fails.
Always wait for about 10 minutes for the unburnt gases to disperse before restarting the oil burner if it has failed to ignite previously.

Installed by:

……..

Tel: ……..

EU Declaration of conformity

CE

Bentone Oilburners

Type

BF 1	**ST 146**	**B 45**	**B 80**
ST 108	**B 2**	**B 55**	
ST 120	**B 30**	**B 65**	
ST 133	**B 40**	**B 70**	

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+A1:2011	Excluded Annex J/K. Automatic forced draught burners for liquid fuels.

Enertech AB
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Additional information can be downloaded at:

www.bentone.com

Ljungby June 22nd, 2020

Helen Richmond

Managing Director

Enertech AB

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www.bentone.se, www.bentone.com

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