178 086 53-2 2017-10–25

Installation and Maintenance instruction

B 30 / B 40 J/K

Bentone®
Enertech Group

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Important to remember!

This installation and maintenance manual is intended for the user and qualified professionals. It should be taken into account by all those who work with the burner and associated system components. Work with the boiler may only be carried out by individuals who have completed certified training.

- This manual is to be regarded as part of the burner and must always be kept near the installation site. Enertech AB reserves the right to make changes and correct any printing errors.
- All products are packed to prevent any damage occurring when they are handled. Handle the products with care. Two or more people are needed to move large packages. All products must be stored upright on a level, dry surface.
- The weight is on the label cardboard box.
- The burner may be installed by authorised personnel only.
- Check that the burner is compatible with the boiler's output range.
- The burner must be installed so that it complies with local regulations on fire safety, electrical safety and boiler and fuel distribution.
- Make sure when installing the equipment that enough room is left to service the burner.
- Permitted temperature during operation +3 to +30°C
- Temperature during transport/storage -10 to +60°C
- Max. relative air humidity 80%, no condensate
- The installer must ensure that the room has sufficient fresh air ventilation as per local norms.
- The room must comply with local regulations applicable to its intended use.
- If any electrical connection is used other than that recommended by Enertech, there may be a danger of damage to property and personal injury.
- The electrical installation must be carried out in accordance with applicable heavy current regulations and in a professional manner, avoiding the risk of gas leaks, fire or personal injury.
- Care should be taken by the installer to ensure that no electrical cables are crushed or damaged during installation or servicing.
- If the boiler has a door that opens, this should be locked with a door switch.
- Does this product need to be sorted as metal and plastic when being recycled? Used material must be handled appropriately and in an environmentally friendly manner. Observe local regulations.
- When in operation the burner's noise level can exceed 85 dBA. Wear ear defenders when in the same room.
- It is not permitted to use the burner outside the intended area of use.
- The burner may not be commissioned with safety or protective devices that are not fit for purpose. Nor are custom design modifications or the installation of accessories not tested together with the

Fire fighting equipment class BE are recommended.

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- burner permitted. Commissioning is to be carried out by qualified professionals only.
- Prior to commissioning, the following points should be checked:
- all fitting and installation work has been completed and approved
- the electrical installation has been carried out properly, the correct fuses added to circuits and measures to safeguard enclosures on electrical devices and all wiring have been checked
- flue gas ducts and combustion air ducts are not blocked
- all actuators and control and safety devices are in working order and set correctly

Service

- Service should be performed after 3,000 working hours, but no less than once a year.
- Only authorised personnel should perform the service.
- Before servicing, shut off the fuel supply, switch off the installation's main switch and ensure accidental reconnection cannot take place.
- Be careful: certain parts exposed after separation of the burner can be hotter than 60°C.
- Care should be taken by the installer to ensure that no electrical cables or gas pipelines are crushed or damaged during installation or servicing.
- Only spare parts recommended by Enertech should be used.
- All oil line components shall be assembled and mounted without bending, torque and other mechanical or thermal stress.

Component	"Useful life Recomended replacement"	"Useful life Operation cykles"
Control system	10 Years	250 000
Valve proving system	10 Years	250 000
Pressure switch	10 Years	250 000
Flame guard	10 Years	250 000
Uv flame detector	10 000 h	N/A
Stepper motor		500 000
Contaktor	10 Years	500 000

Service	Service	Service
Burner	1 Year	3000h
Filter	1 Year change	3000h 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	3000h
Cuppling chaft	1 year control/change	3000h control/change
Fan wheel	"1 Year Change when dirty /unbalance"	"3000h Change when dirty /unbalance"

Burner/Components must be recycled prior to local regulations.

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Safety instructions

- Read the manual before installation or commissioning.
- The burner may be installed by authorised personnel only.
- Check that the burner is compatible with the boiler's output range.
- The power data on the type sign refers to the burner's min. and max. power.
- Check that the burner's dimensions and capacity range are suitable for the boiler in question.
- The electrical installation must be carried out in accordance with applicable heavy current regulations and in a professional manner, avoiding the risk of oil leaks, fire or personal injury.
- If any electrical connection is used other than that recommended by Enertech, there may be a danger of damage to property and personal injury.
- Care should be taken by the installer to ensure that no electrical cables or gas pipelines are crushed or damaged during installation or servicing.
- The burner must be installed so that it complies with local regulations on electrical safety and boiler and fuel distribution.
- Check that the burner is approved for the intended grade of gas and connection pressure.
- No safety systems on the burner may be disconnected.
- The installer must ensure that the boiler room has sufficient fresh air ventilation as per local norms.
- Gas leak checks should be carried out on installation and servicing to avoid a gas leak and the associated hazards and risks.
- Before servicing, shut off the fuel supply and turn off the power to the burner.
- The surface temperature of the burner's components may exceed 60°C.
- Be careful when servicing: there may be a risk of pinching.
- Ensure that the burner is protected against direct spraying of water, since it is not designed to withstand this.
- Only spare parts recommended by Enertech should be used.
- If the boiler has a door that opens, this should be locked with a door switch installed to burner safety system.
- All oil line components shall be assembled and mounted without bending, torque and other mechanical or thermal stress.

! Fire fighting equipment class BE are recommended.

Delivery check

- 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.

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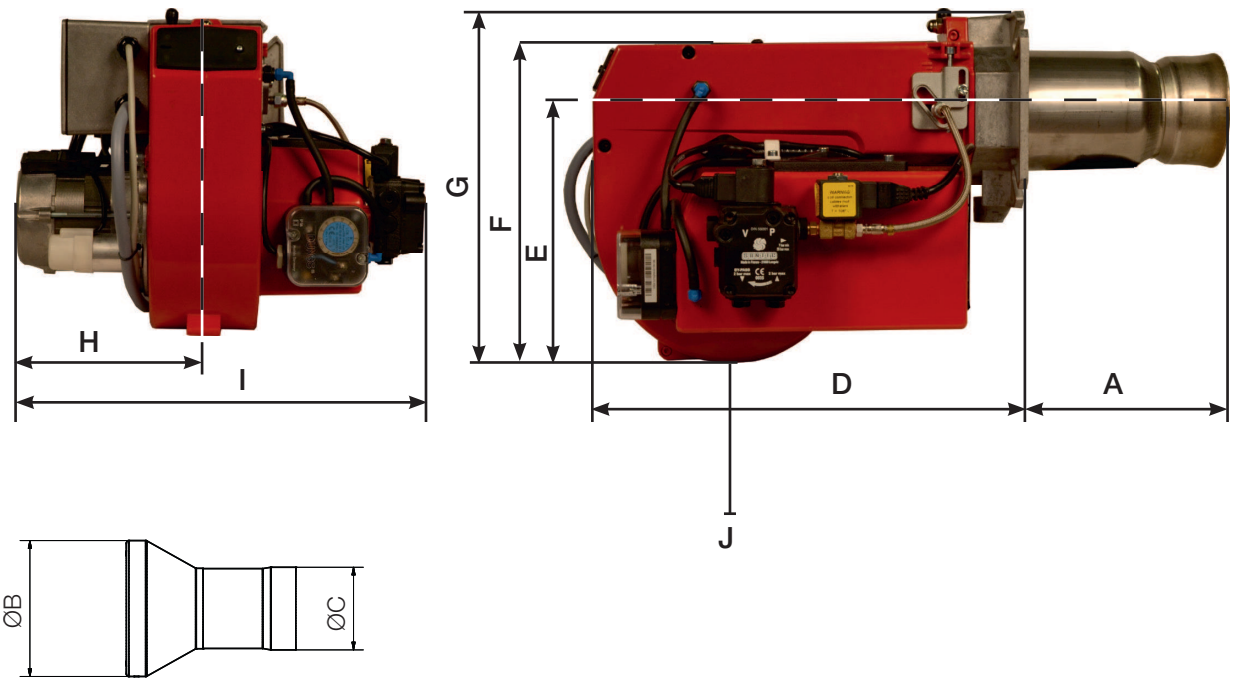
1. Thechnical data

1.1 Burner are intended for Eo1 use at:

- Water heating generators
- Steam generators
- Industrial applications
- Hot air generators

Contact Bentone/Enertech about operation RME

1.2 Dimensions B30/B40

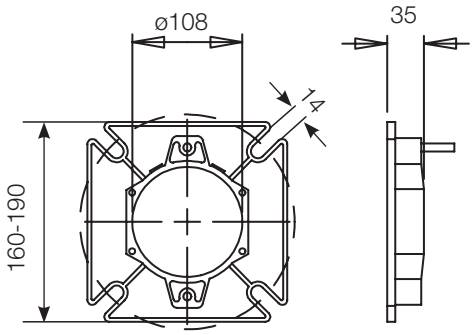


	A	Ø B	Ø C	D	E	F	G	H	I	* J
B30	187/315	108	108	372	220	281	303	175	382	200
B40	172/272	130	114	420	260	310	360	195	400	200

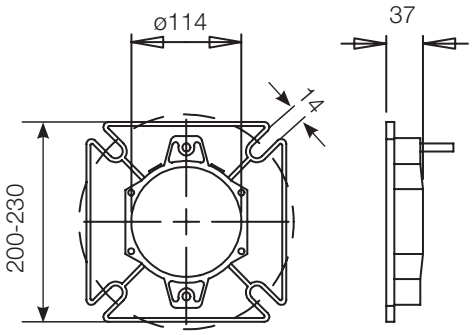
* Min. recommended distance to floor.

1.2.1 Dimension of flange

B 30

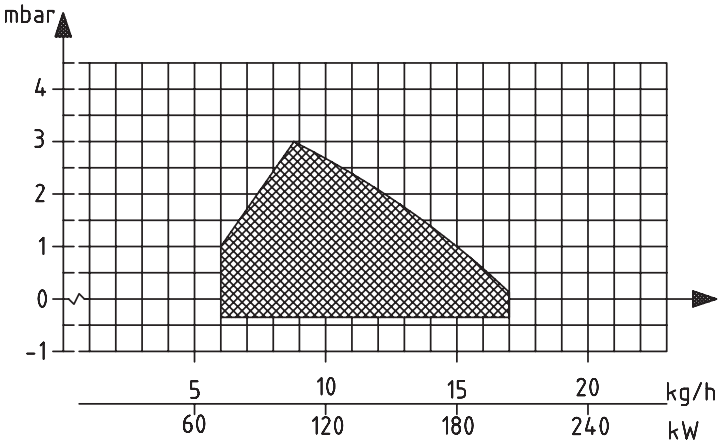


B 40



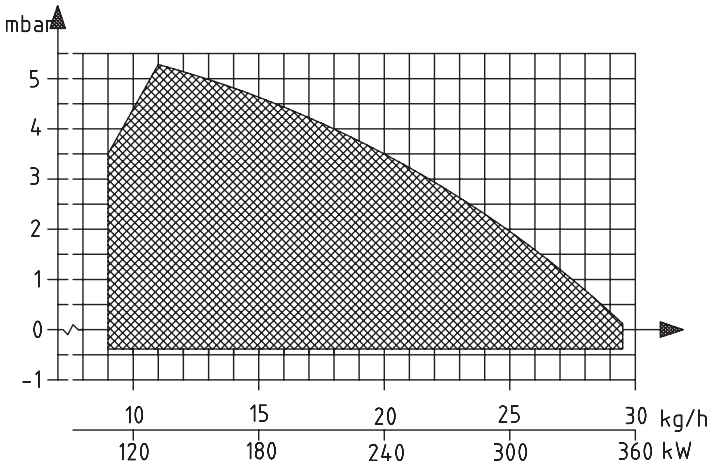
1.3 Working field B30

6,0-17,0 kg/h
71-202 kW

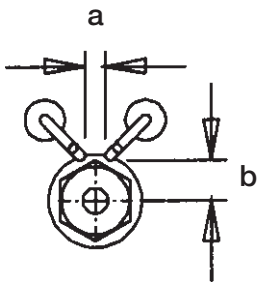


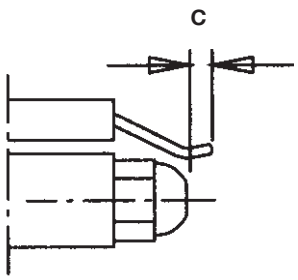
1.4 Working field B40

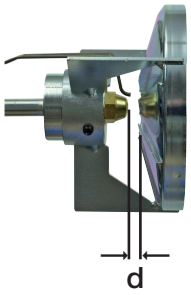
9,0-29,5 kg/h
107-350 kW



1.6 Setting of ignition electrodes and brake plate







	a	b	c	d
B30	2,5-3,5	7,0-9,0	1,0-2,0	4,5-5,0
B40	2,5-3,5	7,0-9,0	1,0-2,0	4,5-5,0

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

1.6.1 Electric Specification

Burner correspond to IP 40

Type	Motor	Complete burner	Sound
B 30	180 W 1,3 A 50 Hz	360 W 230 V 50 Hz 1,6 A	84 dBA ± 0,5 dBA
B 40	250 W 1,7 A 50 Hz	480 W 230 V 50 Hz 2,6 A	87 dBA ± 0,5 dBA

1.5 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	10 bar (8-15 bar)

1.7 Nozzle table

Pump pressure bar

Gph	8			9			10			11		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
0,40	1,33	16	13	1,41	17	14	1,49	18	15	1,56	18	16
0,50	1,66	20	17	1,76	21	18	1,86	22	19	1,95	23	20
0,60	2,00	24	20	2,12	25	22	2,23	26	23	2,34	28	24
0,65	2,16	26	22	2,29	27	23	2,42	29	25	2,54	30	26
0,75	2,49	29	25	2,65	31	27	2,79	33	28	2,93	35	30
0,85	2,83	33	29	3,00	36	31	3,16	37	32	3,32	39	34
1,00	3,33	39	34	3,53	42	36	3,72	44	38	3,90	46	40
1,10	3,66	43	37	3,88	46	39	4,09	48	42	4,29	51	44
1,20	3,99	47	41	4,24	50	43	4,47	53	46	4,68	55	48
1,25	4,16	49	42	4,40	52	45	4,65	55	47	4,88	58	50
1,35	4,49	53	46	4,76	56	48	5,02	59	51	5,27	62	54
1,50	4,98	59	51	5,29	63	54	5,58	66	57	5,85	69	60
1,65	5,49	65	56	5,82	69	59	6,14	73	63	6,44	76	66
1,75	5,82	69	59	6,18	73	63	6,51	77	66	6,83	81	70
2,00	6,65	79	68	7,06	84	72	7,45	88	76	7,81	93	80
2,25	7,49	89	76	7,94	94	81	8,38	99	85	8,78	104	89
2,50	8,32	99	85	8,82	105	90	9,31	110	95	9,76	116	99
2,75	9,15	108	93	9,71	115	99	10,24	121	104	10,73	127	109
3,00	9,98	118	102	10,59	126	108	11,16	132	114	11,71	139	119
3,50	11,65	138	119	12,35	146	126	13,03	154	133	13,66	162	139
4,00	13,31	158	136	14,12	167	144	14,89	176	152	15,62	185	159
4,50	14,97	177	153	15,88	188	162	16,75	198	171	17,57	208	179
5,00	16,64	197	170	17,65	209	180	18,62	221	190	19,52	231	199
5,50	18,30	217	187	19,42	230	198	20,48	243	209	21,47	255	219
6,00	19,97	237	204	21,18	251	216	22,34	265	228	23,42	278	239
6,50	21,63	256	220	22,94	272	234	24,20	287	247	25,37	301	259
7,00	23,29	276	237	24,71	293	252	26,06	309	266	27,33	324	279
7,50	24,96	296	254	26,47	314	270	27,92	331	285	29,28	347	298
8,00	26,62	316	271	28,24	335	288	29,79	353	304	31,23	370	318
8,50	28,28	335	288	30,00	356	306	31,65	375	323	33,18	393	338
9,00	29,95	355	305	31,77	377	324	33,59	398	342	35,14	417	358

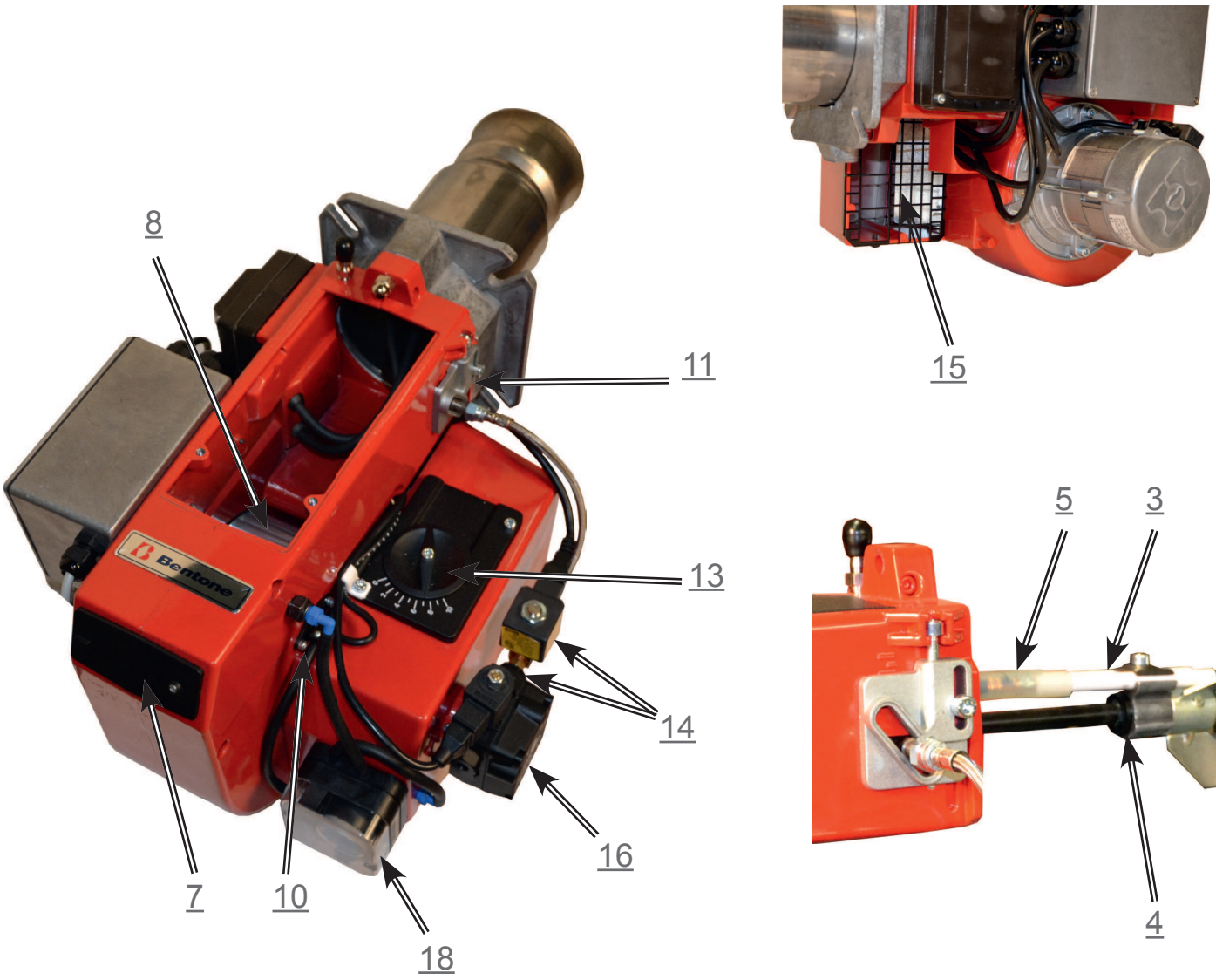
The table applies to oil with a viscosity of 4.4 mm ^{2}/s at a density of 830 kg/m ^{3}.

Pump pressure bar

Gph	12			13			14			15		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
0,40	1,63	19	17	1,70	20	17	1,76	21	18	1,82	21	18
0,50	2,04	24	21	2,12	25	22	2,20	26	22	2,28	27	23
0,60	2,45	29	25	2,55	30	26	2,64	31	27	2,73	32	28
0,65	2,65	31	27	2,75	33	28	2,86	34	29	2,96	35	30
0,75	3,08	36	31	3,18	38	32	3,30	39	34	3,42	40	35
0,85	3,47	41	35	3,61	43	37	3,74	44	38	3,87	46	39
1,00	4,08	48	42	4,24	50	43	4,40	52	45	4,56	54	46
1,10	4,48	53	46	4,67	55	48	4,84	57	49	5,01	59	51
1,20	4,89	58	50	5,09	60	52	5,29	63	54	5,47	65	56
1,25	5,10	60	52	5,30	63	54	5,51	65	56	5,70	68	58
1,35	5,50	65	56	5,73	68	58	5,95	70	61	6,15	73	63
1,50	6,11	72	62	6,36	75	65	6,60	78	67	6,83	81	70
1,65	6,73	80	69	7,00	83	71	7,27	86	74	7,52	89	77
1,75	7,14	85	73	7,42	88	76	7,71	91	79	7,97	94	81
2,00	8,18	97	83	8,49	101	86	8,81	104	90	9,12	108	93
2,25	9,18	109	94	9,55	113	97	9,91	117	101	10,26	122	105
2,50	10,19	121	104	10,61	126	108	11,01	130	112	11,39	135	116
2,75	11,21	133	114	11,67	138	119	12,11	144	123	12,53	148	128
3,00	12,23	145	125	12,73	151	130	13,21	157	135	13,67	162	139
3,50	14,27	169	145	14,85	176	151	15,42	183	157	15,95	189	163
4,00	16,31	193	166	16,97	201	173	17,62	209	180	18,23	216	186
4,50	18,35	217	187	19,10	226	195	19,82	235	202	20,51	243	209
5,00	20,39	242	208	21,22	251	216	22,03	261	225	22,79	270	232
5,50	22,43	266	229	23,34	277	238	24,23	287	247	25,07	297	256
6,00	24,47	290	249	25,46	302	260	26,43	313	269	27,49	326	280
6,50	26,51	314	270	27,58	327	281	28,63	339	292	29,63	351	302
7,00	28,55	338	291	29,70	352	303	30,84	366	314	31,91	378	325
7,50	30,59	363	312	31,83	377	324	33,04	392	337	34,19	405	349
8,00	32,63	387	333	33,95	403	346	35,25	418	359	36,47	432	372
8,50	34,66	411	353	36,07	428	368	37,45	444	382	38,74	459	395
9,00	36,71	435	374	38,19	453	389	39,65	470	404	41,02	486	418

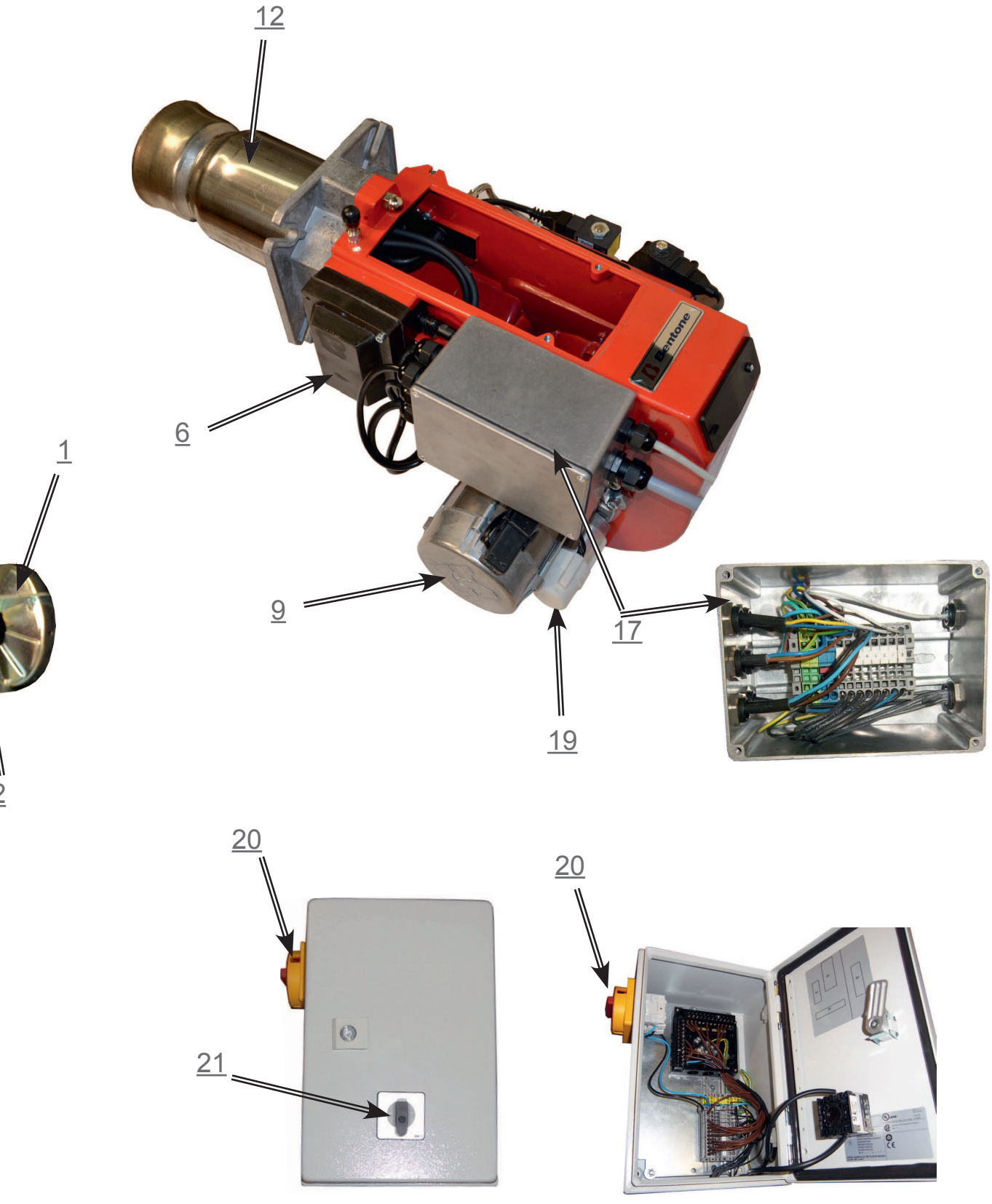
The table applies to oil with a viscosity of 4.4 mm ^{2}/s at a density of 830 kg/m ^{3}.

1.8 Description



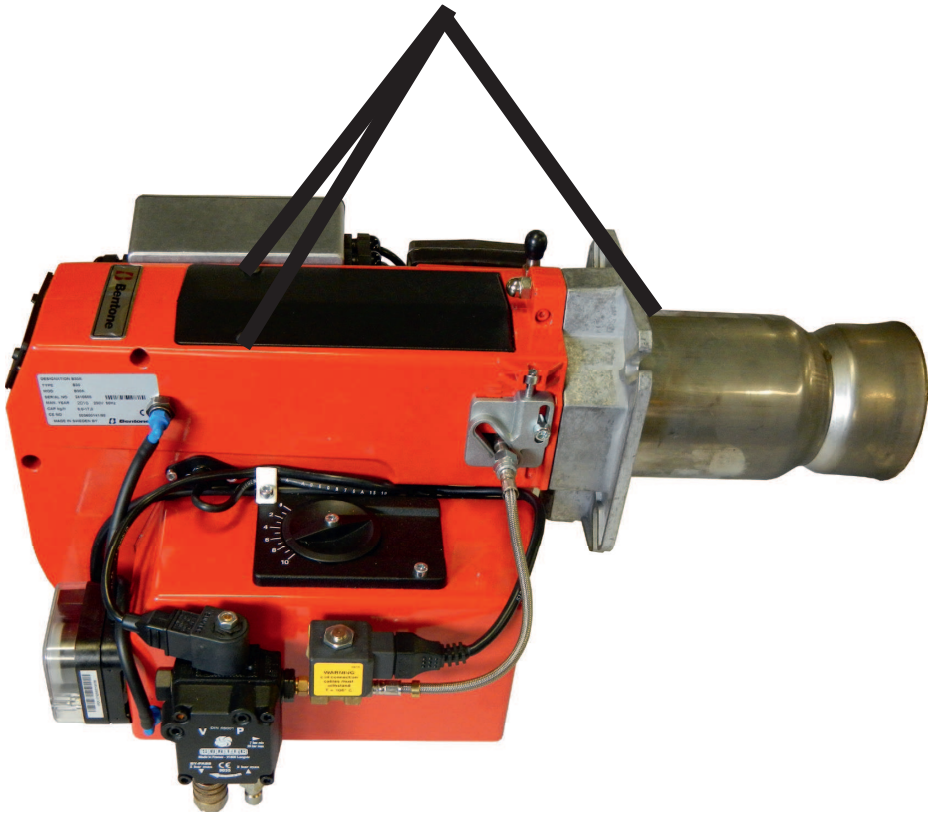
1.8.1 Components

1. Brake plate
2. Nozzle
3. Ignition electrodes
4. Nozzle assembly
5. Ignition Cable
6. Ignition transformer
7. Inspection glass
8. Fan wheel
9. Motor
10. Photocell
11. Nozzle assembly adjustment
12. Burner tube
13. Air setting
14. Solenoid valve
15. Air intake
16. Pump
17. Electric box
18. Air pressure switch
19. Capacitor
20. Disconnector
21. Switch 0-1


12
6
1
9
17
19
2
20
21
20

2. Installation

2.1 Handling and lifting instruktion



Option

The lifting aid we used here are available as spare parts, Figure 1.

figure 1

2.2 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.

2.3 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.

2.4 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:

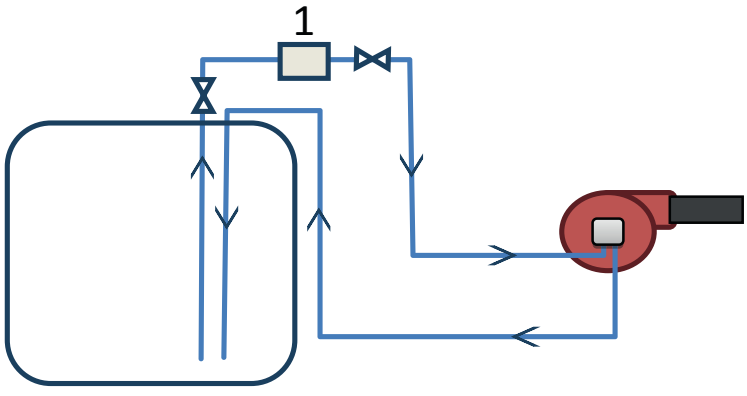
- Selection of pipe diameter, pipe length and height difference; see Pump instruction.
- Pipelines are to be laid with a minimal number of glands.
- The pipes are to be laid so that the oil supply hoses are not subjected to tensile stresses or are excessively bent when the burner is swung out or removed for service.
- The ½ " 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. To the suction line on the pump (see paragraph 7.2 pos. 3) should the supplied oil hose with 90° bend be connected.
- Bleed the oil system. The oil pump/oil preheater may be damaged if run dry. The vacuum should not fall below 0 bar in the suction line during start-up.

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

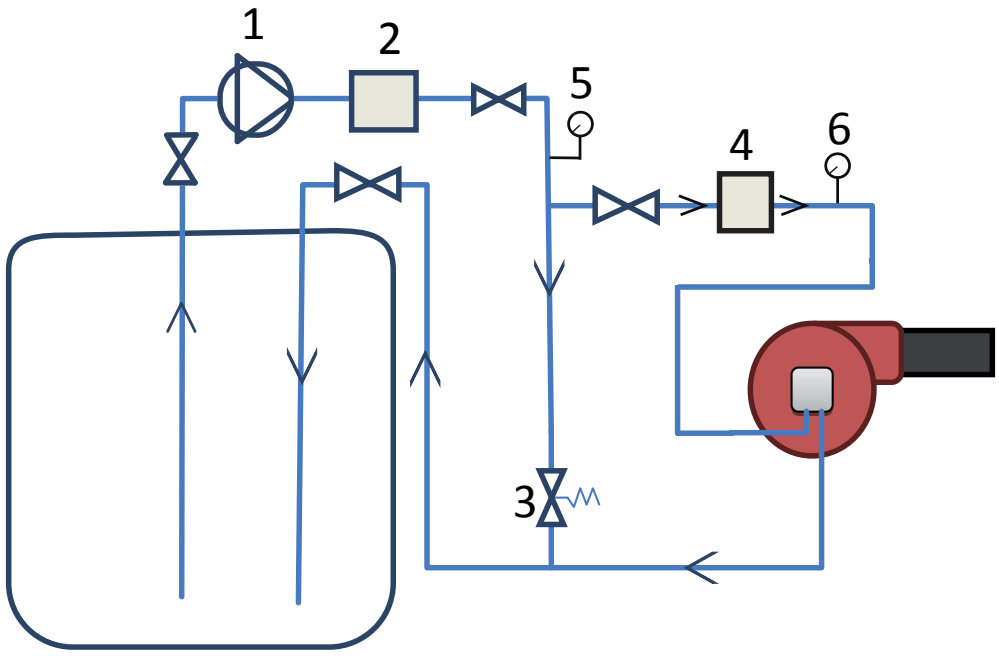
2.4.1 Proposed pipe routing for oil distribution systems without transport pump

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

1. Oil filter



2.5.1 Proposed pipe routing for oil distribution systems with transport pump



1. Transport oil pump
2. Heavy oil filter
3. Overflow valve 0.5 – 2.0 bar
4. Fine filter
5. Pressure gauge 1
6. Pressure gauge 2

2.5 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.

2.6 Nozzle selection

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

2.7 Setting of brake plate and air flow

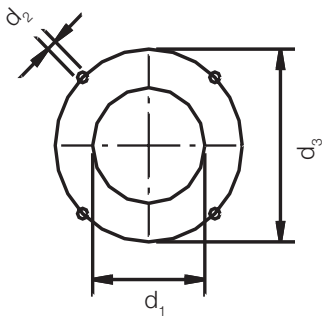
Prior to commissioning, the basic settings of the burner can be set in accordance with the diagram. See under Basic settings. Note that it is simply a matter of a basic setting that should be adjusted retrospectively once the burner has started. You should then conduct a flue gas analysis and soot quantity measurement.

2.8 Burner installation

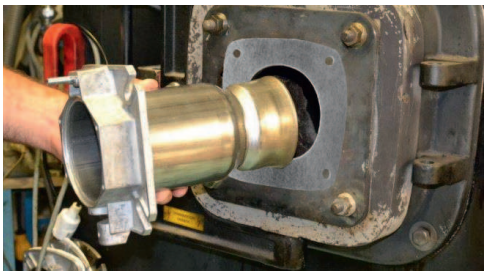
2.8.1 Hole patten

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

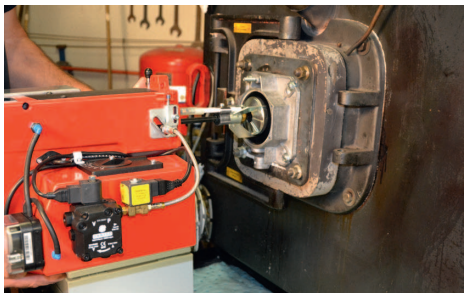
Combustion device	d_1	d_2	d_3
B 30	ø 115-150	M8-M12	ø 160-190
B 40	ø 115-175	M10-M12	ø 195-245



2.9 Burner installation



1. Separate the burner body and the flange.
2. Remove the brake disc from the oil pipe.
3. Install the selected nozzle. (See Technical data)
4. Install the brake disc on the oil pipe
5. Remove the burner pipe from the flange.
6. Install the flange with gasket on the boiler.
7. 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.

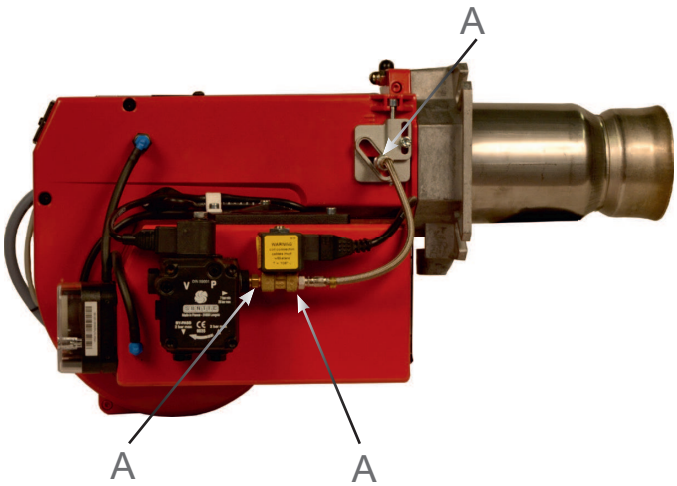


8. Insulate between the burner and boiler door to reduce radiated heat.
9. Install the burner body on the flange.
10. Lock the burner body using with the nut/nuts.
11. Connect the oil pipes to the pump, refer to the chapter - servicing of burners
12. Connect the burner electrically, refer to the chapter - servicing of burners

2.10 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.



3. Basic settings

3.1 Calculate prepurge time

V =	Fire box size	m^3	
Q =	Burner output at prepurge	[kW]	
X =	Prepurge time seconds	Water boilers	
		100% air rate	at least 20s prepurge time
		50 % air rate	at least 40s prepurge time
		33% air rate	at least 60s prepurge time
X =	Prepurge time seconds	Steam generators at last prepurge 5 times firebox volume	
X =	Prepurge time seconds	Industrial heating process at least prepurge at least 5 times firebox and adapted compartments volumes together	
		Local regulations must be followed	

Calculation example:

Example A: V=2m^3 Q=200

Example B: V=9,5m^3 Q=500

Example C: V=25m^3 Q=2200

Example A $X = \frac{V \cdot 5}{((Q \cdot 1{,}2) / 3600)} = \frac{2 \cdot 5}{((200 \cdot 1{,}2)/3600)} =$ 150 seconds

Example B $X = \frac{V \cdot 5}{((Q \cdot 1{,}2) / 3600)} = \frac{9{,}5 \cdot 5}{((500 \cdot 1{,}2)/3600)} =$ 285 seconds

Example C $X = \frac{V \cdot 5}{((Q \cdot 1{,}2) / 3600)} = \frac{25 \cdot 5}{((2200 \cdot 1{,}2)/3600)} =$ 170 seconds

3.2 Recomended exsess air

Grade of Oil	Excess air flue gases		Max. % CO_2
	% O_2	% CO_2 Lambda 1.2	
Light oil	3–5	≈12,5	15,4

3.3 Examples of basic setting B40

Burner output	200 kW
Estimated nozzle output	200 kW/11,86 kWh/kg*= 16,9 kg/h

Nozzle selection in accordance with the table. (See technical data) Nozzle selection is based on the selected pump pressure and the desired effect. According to the nozzle table, this provides the following nozzle.

Selected pump pressure	10 bar
Nozzle	4,50 gph
Power in	16,75 kg/h => 16,75 kg/h x 11,86 kWh/kg = 198 kW

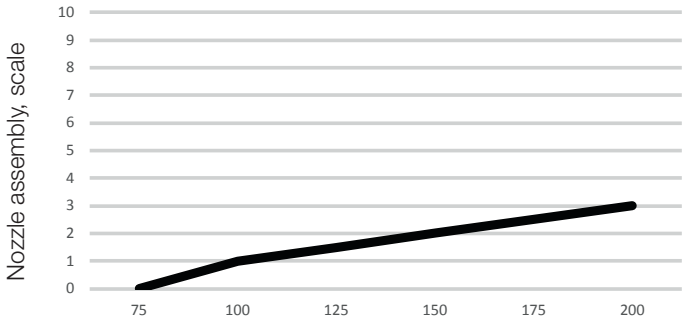
Basic settings

The setting value for 200 kW in accordance with basic setting tables. For the correct procedure when implementing settings, see 3.6 Nozzle assembly control, brake plate B40 and 3.7 Air setting B40 (See technical data)

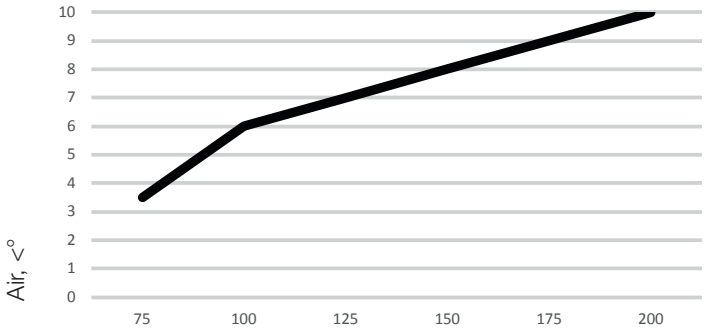
Effects and nozzle selection from example	
Nozzle assembly	1
Damper	6

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

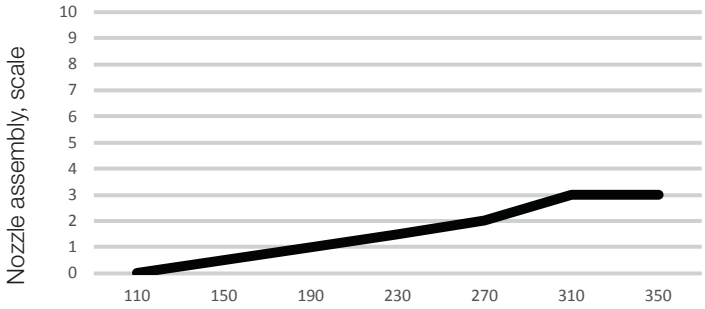
3.4 Setting values for nozzle assembly B 30



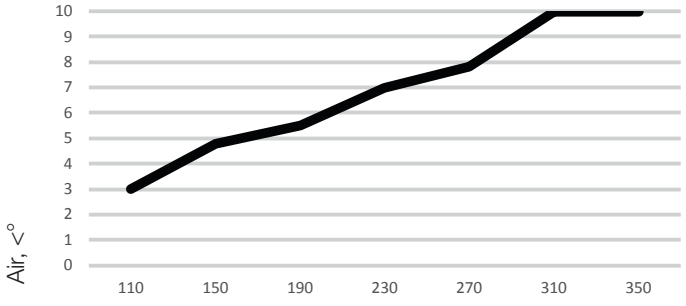
3.5 Setting values for air damper B 30



3.6 Setting values for nozzle assembly B 40

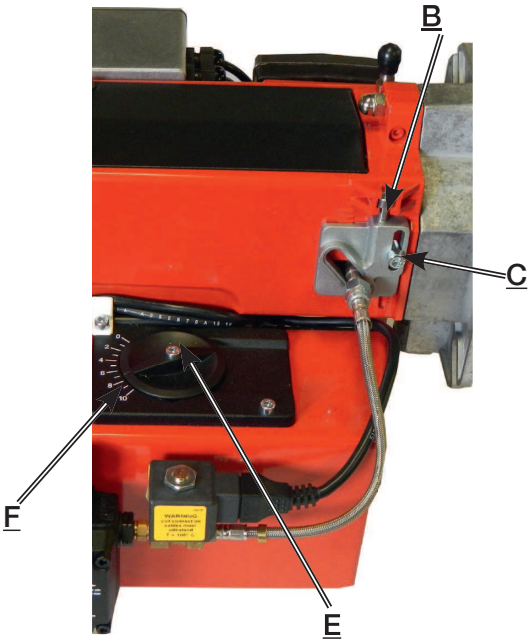


3.7 Setting values for air damper B 40



3.8 Nozzle assembly adjustment, brake plate

The nozzle assembly control is used to achieve the most favourable pressure drop across the brake plate as possible at the various effect stages. The nozzle assembly is adjusted manually (B) in order to obtain the optimum pressure drop for good combustion.



3.9 Air setting

Set the operations switch (S1) on the on position (I). Loosen the screw (E) that locks the air adjustment knob. Adjust the position of the air damper using the wheel until the desired air flow is achieved. Clockwise adjustment reduces the amount of air, whilst an anticlockwise adjustment increases the air flow. After adjustment, lock the damper position using the screw (E). Damper position can be read on the damper scale (F). Check the air settings by conducting a flue gas analysis..

3.10 Setting the air pressure switch

The air pressure switch should block the burner if the air quantity supplied for combustion is insufficient. The air pressure switch must be set so that, if there is a defective air supply at the burner's max. or min. capacity, it reacts before the monitored pressure falls so much that it results in poor combustion.

Setting for air pressure switch

1. Remove the protective cover, screw (Y).
2. Start the burner.
3. Carefully turn the scale on the air pressure switch clockwise until the air pressure switch stops the burner. **Is the tolerance on the scale for the min. air pressure switch approx. ±15%?**
4. Try to find the pressure at which the burner stops for both the minimum and maximum input power by turning the scale. Make a note of the values and then set the air pressure switch on the basis of the highest pressure noted at which the burner stopped.
5. The air pressure switch should be set to a pressure approx. 10–15% lower than the highest noted pressure at which the burner stopped.
6. After setting the air pressure switch, perform repeated starts and run through the burner's set output range several times. This is to ensure the reliable function of the burner. If breakdowns or interruptions occur, the air pressure switch is probably set to a too narrow position.
7. Fit the protective cover, screw (Y).

Setting area approx.:	Type	Max. pressure
1-10 mbar	LGW 10 A2	500 mbar
2,5-50 mbar	LGW 50	500 mbar

4. Burner servicing

4.1 Servicing the combustion assembly

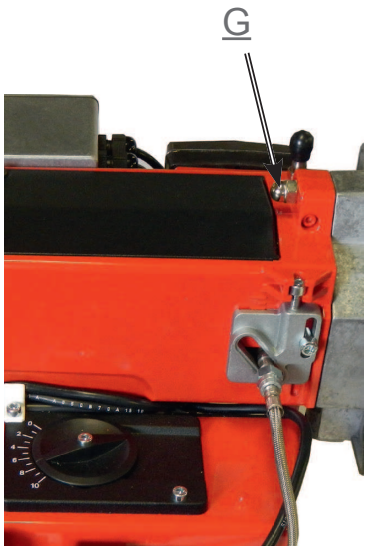
Removal and installation

1. Switch off the main power.

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

2. Loosen the nut (G) and remove the burner body from the burner flange.
3. Remove the brake plate from the oil pipe and clean the brake plate.
4. Unscrew the nozzle/nozzles.
5. Install new nozzle/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 (G).
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 main power.
15. Check combustion*.

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



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

Note:

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

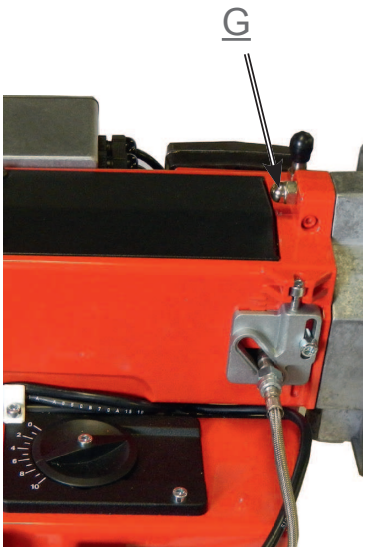
4.2 Servicing air dampers

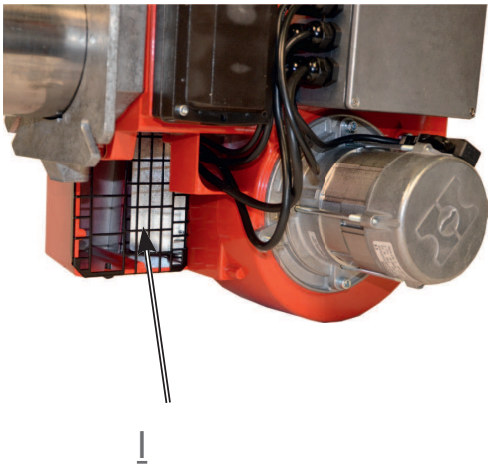
Removal and installation

1. Switch off the main power.

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

2. Loosen the nut (G) and remove the burner body from the burner flange.
3. Note the position of the air damper and loosen the air damper locking screw.
4. Clean the air damper (I) and the intake. Lubricate any damper shaft.
5. Adjust the air damper and its position.
6. Fit the burner body and the burner flange together and secure with the nut (G).
7. Fit the grille and turn on the mains power.
8. Check combustion*





Note:

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

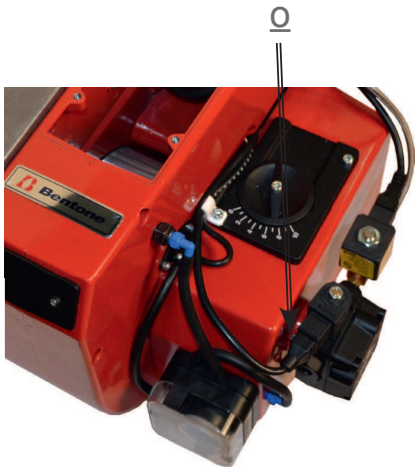
4.3 Replacement of oil pump

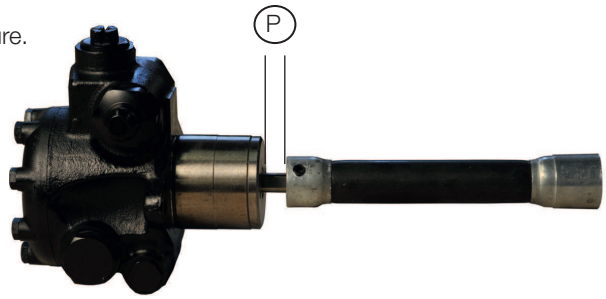
Removal and installation

1. Switch off the main power.

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

2. Undo the oil hoses from the pump.
3. Loosen the screws (O) and pull out the oil pump
4. Move the pump coupling to the new pump and set the same distance between (P) the pump and the pump coupling as before in order to avoid pressure on the pump seal.
5. 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).
6. Fit the immersion heater in the pump..
7. Turn on the main power.
8. Bleed the pump, start the burner and set the correct oil pressure.
9. Check combustion. *





> ! 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.

Note:

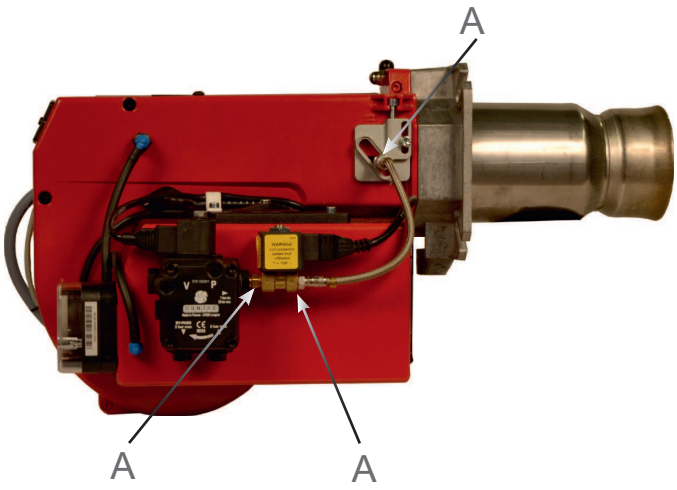
* When servicing/replacing components that affect combustion, an analysis and soot test shall be carried out on the installation.

4.4.1 Check oil line seals

Where there are temperature fluctuations in the burner oil system due to the preheater being on the burner, this may result, after a period of operation, in oil leaks occurring in the connection pipe's coupling element.

Therefore, check the tightness of the coupling element (A) after a period of operation after installation of the burner and at each service.

If leakage has occurred, it is usually sufficient to tighten the leaking coupling element.



! Seal threaded parts with Loctite 5188 or equivalent sealant.

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

4.4 Replacement of electrical components

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

1. Switch off the main power.
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. Turn on the main power.
6. Check the function of the new component.
7. Start the burner. Check combustion.*

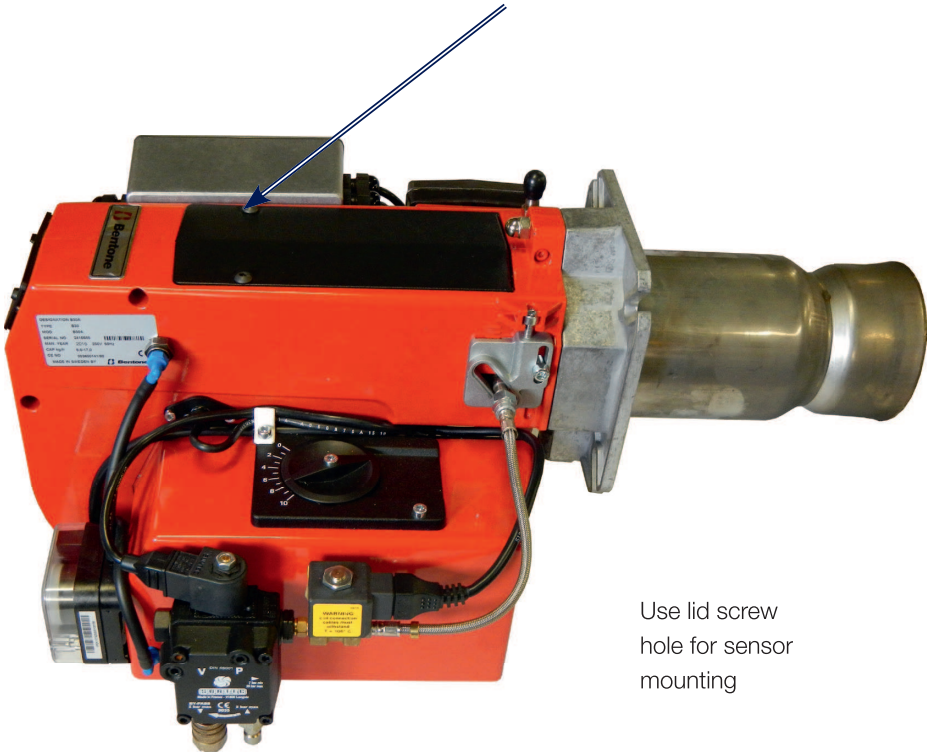
Note:

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

4.5 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

5. Pump instructions

5.1 Suntec AS47CK

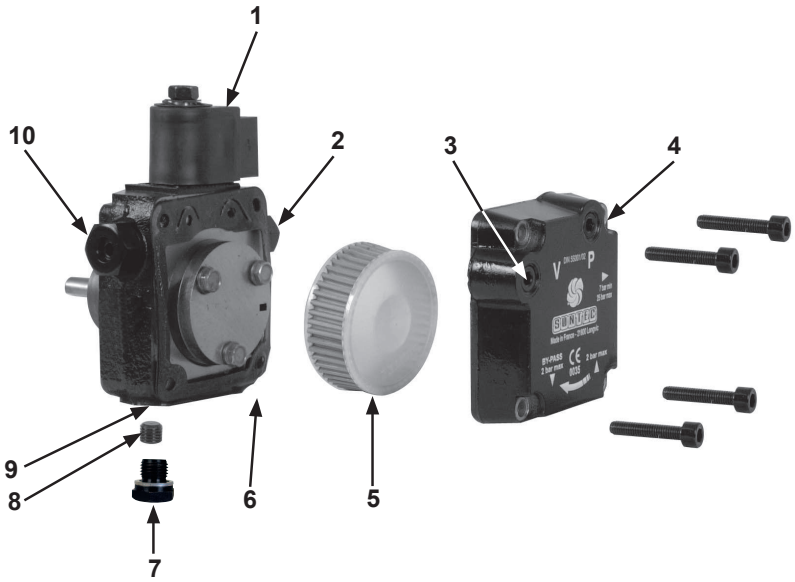
5.1.1 Technical data

Viscosity range:	1,0–12,0 mm²/s
Pressure range:	7–12 bar
Oil temperature:	max. 60°C

5.1.2 Components

1. Solenoid valve
2. Nozzle connection G 1/8”
3. Vacuum manometer connection G 1/8”
4. Manometer connection G 1/8”
5. Filter
6. Suction line G 1/4”
7. Metal plug G 1/4”
8. Return plug
9. Return line G 1/4”
10. Pressure regulation

5.1.3 Filter replacement



Cut off the power and shut off the oil. Remove the pump cover with the aid of a 4 mm Allen key. If necessary a screwdriver may be used between the cover and the housing to carefully pry the cover loose. Replace the old filter by a new one. Replace the cover, tighten lightly.
Do not forget to replace the gasket. Open the oil supply and switch on the power.

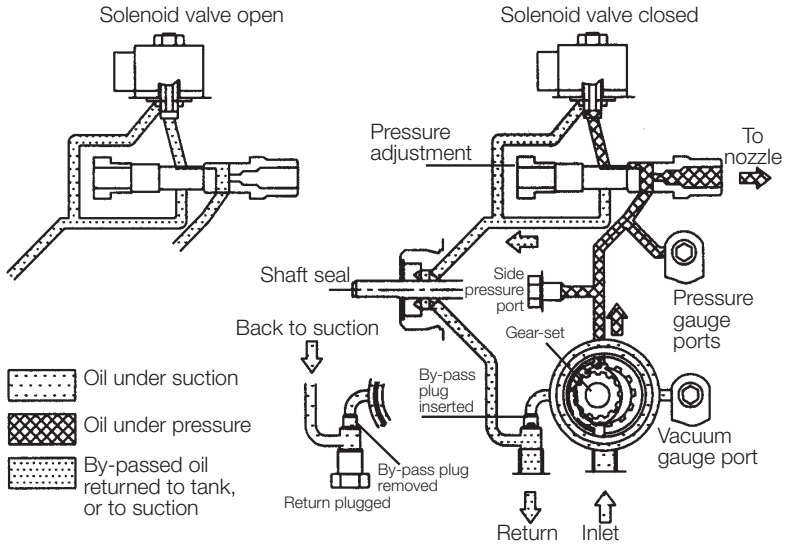
5.1.4 One-pipe system

Conversion to one-pipe system
Remove the return plug (8), plug the return line (9) with the metal plug (7) G 1/4”.

5.1.5 Two-pipe system

Conversion to two-pipe system
Remove the metal plug (7) G ¼”, fit the return plug (8) in the return line (9). Return plug are not included in products with one-pipe system, separately sold.

5.1.6 Function AS47CK



Pump working method

The oil pump has a solenoid valve which regulates the closing of the oil flow and provides a crisp function independent of pump rpm.

The pump's gear wheels draw oil from the tank through the integral filter and conveys the oil to the regulator valve which pressurizes the nozzle connection.

The quantity of oil that does not go to the nozzle connection is led through the valve back to the return line, or in the case of a one-pipe installation, back to the suction connection in the gear wheel pump.

- Two-pipe system

When the solenoid valve is not activated, the return plug channel between the pressure side and the return side of the pressure valve is open. No pressure will be built up to open the pressure valve, regardless of gear wheel pump rpm. When the solenoid valve is activated, the return plug channel is shut. The gear wheel pump's rotation at full rpm quickly builds up the pressure necessary for opening the valve and provides a sharp opening action.

- One-pipe system

Purging of the oil line system is not automatic in the one-pipe system; open the manometer connection for purging.

Shut-down

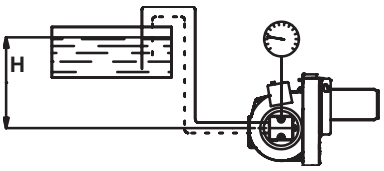
When the burner stops, the solenoid valve opens the return plug channel and drains oil to the return line. At that same moment the nozzle line is closed. This provides a sharp cut-off. The on and off functions can be controlled independent of motor rpm, and react very quickly. When the solenoid valve is not activated torque is low up to full motor rpm.

5.1.7 Suction pipe tables AS47CK

5.1.7.1 Overhead Tank

One-pipe system

Height m / Line diameters	4,0	3,0	2,0	1,0	0,5	0,0
ø 4 mm	100	100	100	91	82	74



Two-pipe system

Height m / Line diameters	4,0	3,0	2,0	1,0	0,5	0,0
ø 6 mm	29	25	22	18	16	14

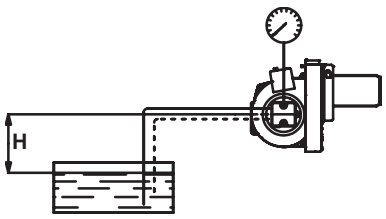
5.1.7.2 Underlying Tank

One-pipe system

For reliable operations, use of a Tigerloop is recommended in underlying tanks.

Two-pipe system

Height m / Line diameters	0,0	-0,5	-1,0	-2,0	-3,0	-4,0
ø 6 mm	14	12	10	7	3	0



The suction line tables comprise theoretically calculated values where pipe dimensions and oil flow are adapted to prevent turbulent flows from occurring.

Turbulent flows can result in pressure losses and noise in the pipework. A typical pipe system usually comprises pipe runs with 4 bends, a non return valve, a shut-off valve and a pre-filter.

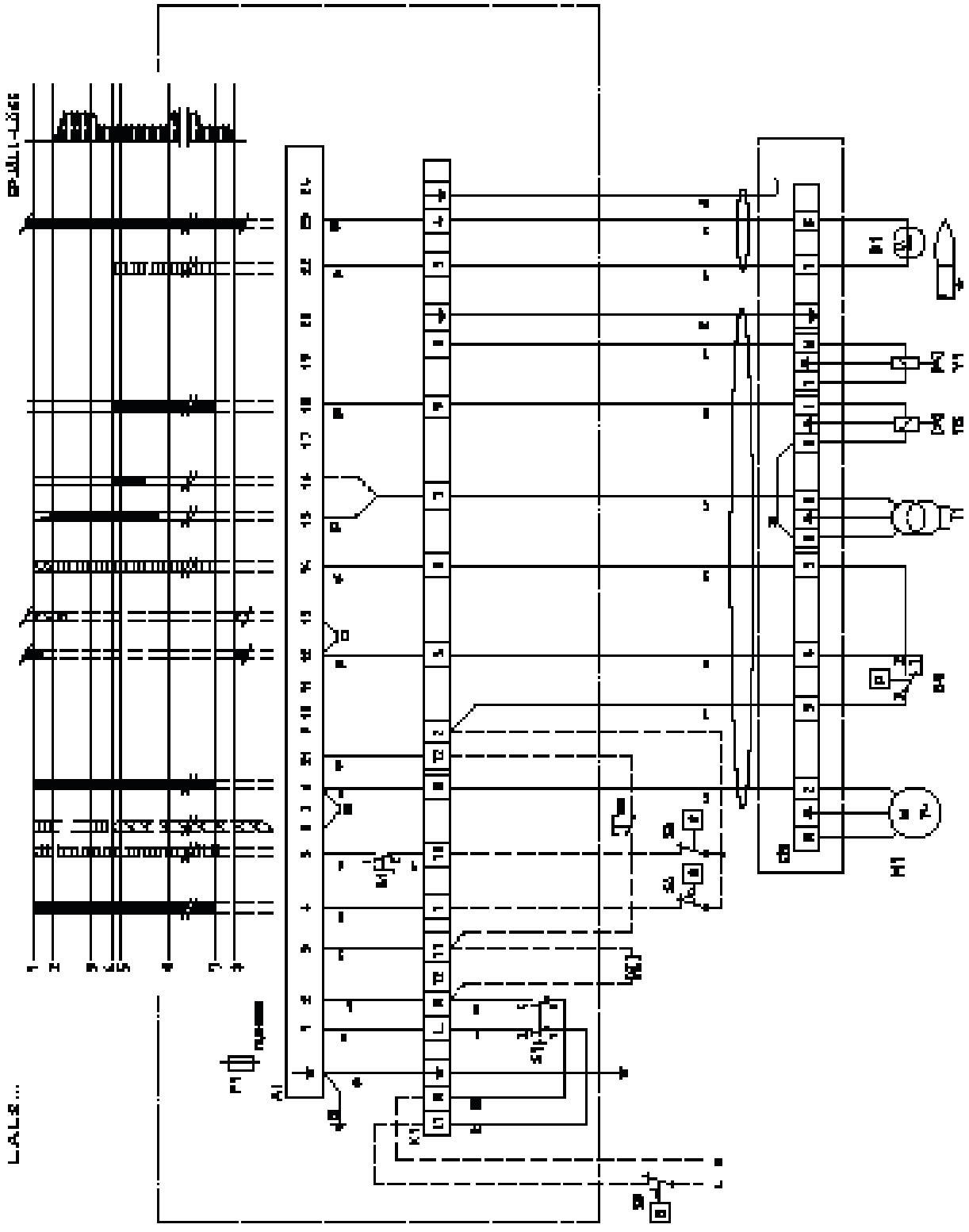
The total resistance of these items is such that it can be disregarded. In the tables no run longer than 100 m is listed, as experience shows this not to be required.

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

The tables give the total suction line length in meters with a nozzle capacity of 2.1 kg/h. Max. permissible pressure on the suction and return lines is 2.0 bar. For a two-pipe system the Q_{max} 46 l/h pump capacity at 0 bar applies.

6. Electrical equipment

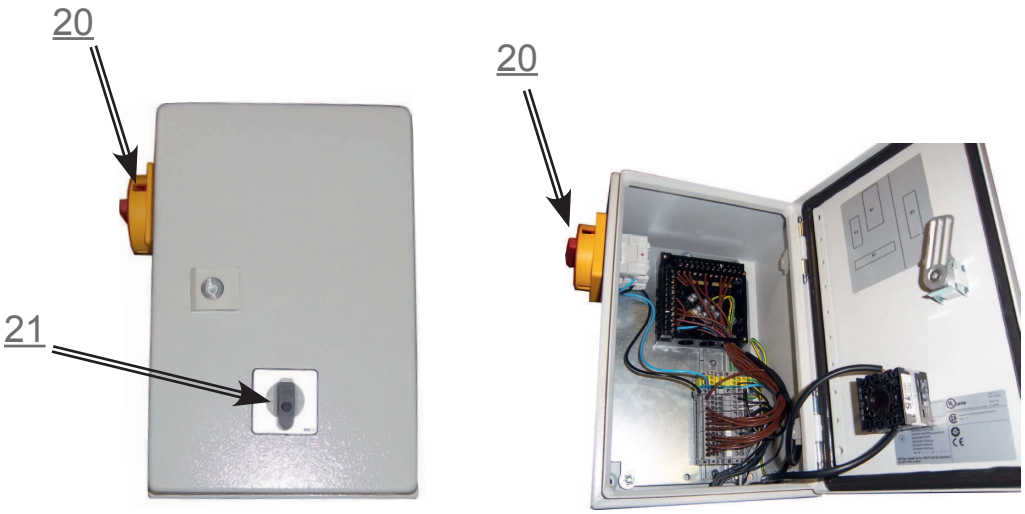
Wiring diagram LAL 2.25...



6.1 Component list LAL 2.25...

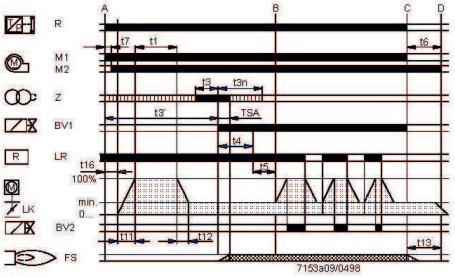
A1 Oil burner control
B1 Photoresistor
F1 Fuse
M1 Burner motor
S1 Operating switch
S3 Operations thermostat
S4 Temperature limiter
S7 Main switch
S8 Air pressure switch
S30 External reset
T1 Ignition transformer
X1 Connection terminal board
X20 Main switch
Y1 Solenoid valve
Y1S Safety solenoid valve

The installation must be connected to the mains and fused according to local regulations.

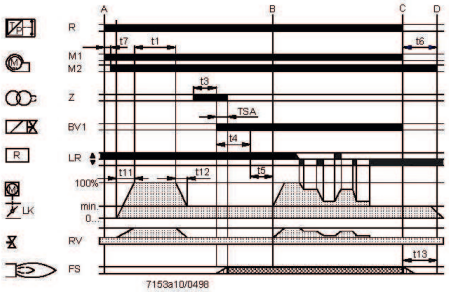


6.2 Function LAL

2-stage expanding flame burner



Modulating expanding flame burner



Legend	BV...	Fuel valve	M...	Fan or burner motor
	FS	Flame signal amplifier	R	Control thermostat or pressurestat
	LK	Air damper	RV	Modulating fuel valve
	LR	Load controller	Z	Ignition transformer

General

The following features of the LAL... afford a high level of safety:

- Detector and flame simulation test are restarted on completion of the afterburn time «t13». Open or not fully closed fuel valves immediately initiate lockout at the end of afterburn time «t13». The test ends on completion of the prepurge time «t1» of the next startup sequence
- The correct functioning of the flame supervision circuit is automatically checked during each burner startup sequence
- The control contacts for the release of fuel are checked to ensure they have not welded postpurge time «t6»
- A built-in unit fuse protects the control contacts against overloads

Control of the burner

- Burner operation with or without postpurge
- Fan motors with a current draw of up to 4 A can be connected directly → starting current max. 20 A (for max. 20 ms)
- Separate control outputs for

– preignition from start command

– postignition until shortly before the burner startup sequence is completed

– short preignition with postignition up to the end of «TSA»

- Separate control outputs for the actuator's positioning directions «OPEN», «CLOSE» and «MIN»
- Checked air damper operation to ensure prepurging with the nominal air volume
- Checked positions:
- «CLOSED» or «MIN» on startup → low-fire position

- «OPEN» at the beginning of prepurging

- «MIN» on completion of prepurging
  If the actuator does not drive the air damper to the required position, the burner startup sequence will be stopped

- 2 control outputs for the release of the second and third output stage or for load control

- When load control is enabled, the control outputs for the actuator will be galvanically separated from the burner control's control section

- Connection facilities for

– remote lockout warning device

– remote reset

– remote emergency shutdown

- In addition, with **LAL2... / LAL3...**:

– possibility of air pressure supervision with functional test of the air pressure monitor on startup

– possibility of semiautomatic burner startup

Flame supervision

- Flame detector and flame simulation test are made automatically during burner off times and the prepurge time «t1»

- If loss of flame occurs during operation, the burner control will initiate lockout

- If automatic repetition of the startup sequence is required, the clearly marked wire link on the plug-in section of the LAL... must be cut away → start repetition

Preconditions for burner startup

- Burner control is not in the lockout position

- Sequence switch is in its start position

→ with **LAL1...,** voltage is present at terminals 4 and 11

→ with **LAL2... / LAL3...**, voltage is present at terminals 11 and 12

- Air damper is closed

- End switch «z» for the «CLOSED» position must feed power from terminal 11 to terminal 8

- Contact of the limit thermostat or pressure switch «W» and the contacts of any other switching devices in the control loop between terminals 4 and 5 must be closed → e.g. a control contact for the oil preheaters temperature

With the exception of LAL1... Normally closed contact of the air pressure switch must be closed → «LP» test

Startup sequence

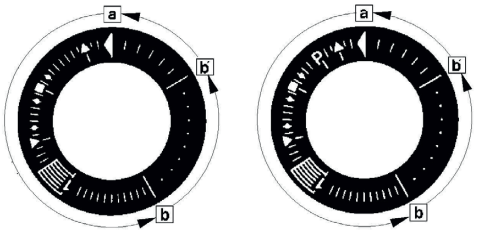
A	Start command by «R» →«R» closes the start control loop between terminals 4 and 5 - The sequence switch starts to run - Only prepurging, fan motor at terminal 6 receives power - Pre- and postpurging, fan motor or flue gas fan at terminal 7 receives power on completion of «t7» - On completion of «t16», the control command for opening the air damper is delivered via terminal 9 - Terminal 8 receives no power during the positioning time - The sequence switch continues to run only after the air damper has fully closed
t1	Prepurge time with air damper fully open - The correct functioning of the flame supervision circuit is checked during «t1» - The burner control will initiate lockout if correct functioning is not ensured
	With **LAL2... / LAL3...:** Shortly after the beginning of «t1», the air pressure switch must change over from terminal 13 to terminal 14 → otherwise, the burner control will initiate lockout → start of the air pressure check
t3	Short preignition time «Z» must be connected to terminal 16, release of fuel via terminal 18.
t3´	Long preignition time «Z» connected to terminal 15. With **LAL1...** «Z» is switched on when start command is given. With **LAL2... / LAL3**... «Z» is switched on when «LP» changes over. → no later than at the end of «t10»
	- On completion of «t1», the LAL... drives the air damper to the low-fire position via terminal 10 → the low-fire position is defined by the changeover point of auxiliary switch «m» in the actuator - During the positioning time, the sequence switch maintains its position → until terminal 8 receives power via «m» - The motor of the sequence switch is switched to the control section of the LAL... → positioning signals delivered to terminals 8 now have no impact on the further startup sequence and on subsequent burner operation
TSA	Ignition safety time On completion of «TSA», a flame signal must be present at terminal 22. It must be available until controlled shutdown occurs → otherwise, the burner control will initiate lockout and lock itself in the lockout position

t3n	Postignition time - «Z» must be connected to terminal 15 - With short preignition, «Z» remains on until «TSA» has elapsed → connection to terminal 16
t4	Interval «BV1 – BV2» or «BV1 - LR» - On completion of «t4», voltage is present at terminal 19 - The voltage is required to power «BV2» connected to auxiliary switch «v» in the actuator
t5	Interval - On completion of «t5», terminal 20 receives power. At the same time, control outputs 9 to 11 and input 8 are galvanically separated from the LAL...'s control section → LAL... is now protected against reverse voltages from the load control circuit - With the release of «LR» at terminal 20, the startup sequence of the LAL... ends - After a few idle steps (steps with no contact position changes), the sequence switch switches itself off
B	Operating position of the burner Burner operation
B-C	Burner operation - During burner operation, «LR» drives the air damper to the nominal load or low-fire position, depending on heat demand - Release of the nominal load takes place via auxiliary switch «v» in the actuator - In the event of loss of flame during operation, the LAL... will initiate lockout - For automatic start repetition, the clearly marked wire link «B» on the plug-in section of the LAL... must be cut away
C	Controlled shutdown In the case of controlled shutdown, «BV...» will immediately be closed. At the same time, the sequence switch is started to program «t6».
C-D	Sequence switch travels to start position «A»
t6	Postpurge time - Fan «M2» connected to terminal 7 - Shortly after the start of «t6», terminal 10 receives power → air damper is driven to the «MIN» position - Full closing of the air damper starts only shortly before «t6» has elapsed → initiated by the control signal at terminal 11 - During the following burner off time, terminal 11 is live
t13	Permissible afterburn time During «t13», the flame signal input may still receive a flame signal → no lockout
D-A	End of control program → start position As soon as the sequence switch has reached the start position – having thereby switched itself off – the flame detector and flame simulation test will start again. During burner off times, the flame supervision circuit is live.
When the start position is reached: With LAL1..., a voltage signals is fed to terminal 4 With LAL2... / LAL3..., a voltage signal is fed to terminal 12	

Control sequence under fault conditions and lockout indication
Whenever a fault occurs, the sequence switch stops and with it the lockout indicator. The symbol appearing above the reading mark indicates the type of fault:

◀	No start	• One of the contacts is not closed (also refer to «Preconditions for burner startup») • Extraneous light: Lockout during or after completion of the control program Examples: – Nonextinguished flame – Leaking fuel valves – Faulty flame supervision circuit
▲	Interruption of startup sequence	• No «OPEN» signal at terminal 8 from the changeover end switch «a» • Terminals 6, 7 and 15 are live until fault has been corrected
P	Lockout	Does not apply to LAL1...: • No air pressure indication at the beginning of the air pressure check • Air pressure failure after the air pressure check
∎	Lockout	• Defect in the flame supervision circuit
▼	Interruption of startup sequence	• No positioning signal at terminal 8 from the auxiliary switch «m» for the low-fire posi-tion • Terminals 6, 7 and 15 are live until fault has been corrected
1	Lockout	• No flame signal at the end of the safety time «TSA»
I	Lockout	• Flame signal has been lost during operation

Locout indicator



LAL1 LAL2..., LAL3...

a-b Startup sequence

b-b´ Idle steps
(with no contact confirmation)

b (b´)-a Postpurge program

Burner control can immediately be reset after lockout:

– Do not press the lockout reset button for more than 10 seconds

The sequence switch always travels to the start position first

– After resetting

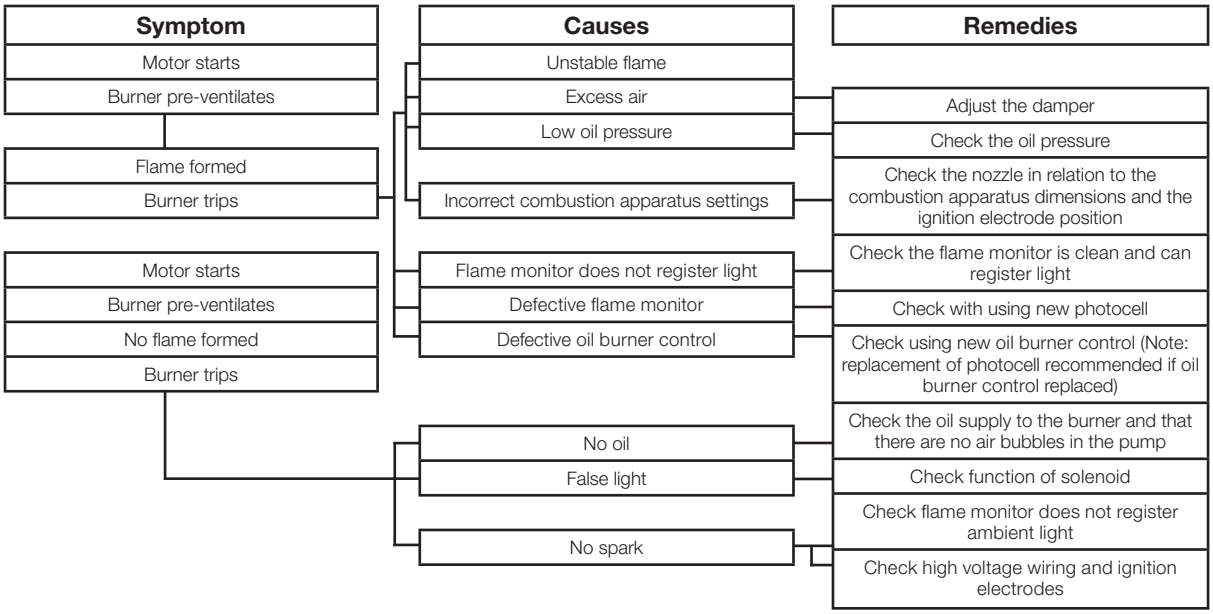
– After rectification of a fault that led to shutdown

– After each power failure
During this period of time, power is only fed to terminals 7 and 9...11.

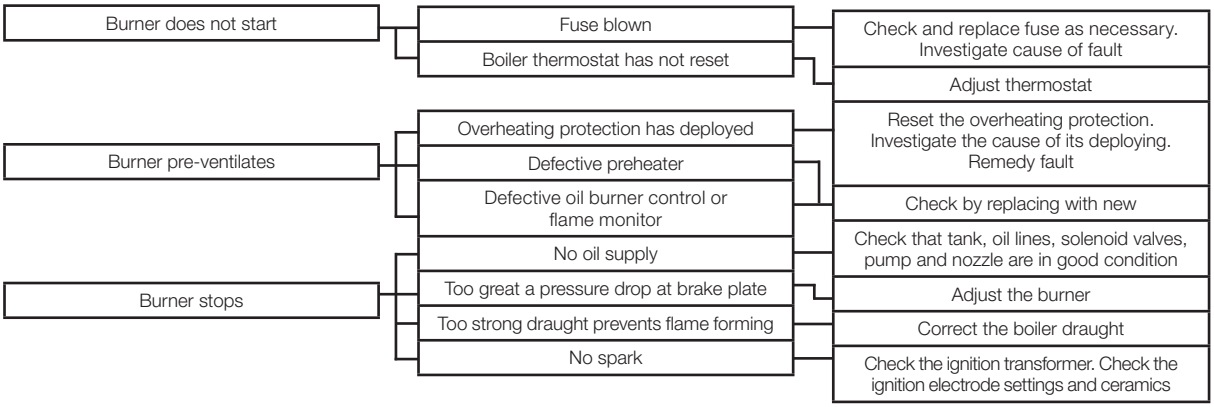
Then, the LAL.... will program a new burner startup sequence

7. Fault Location

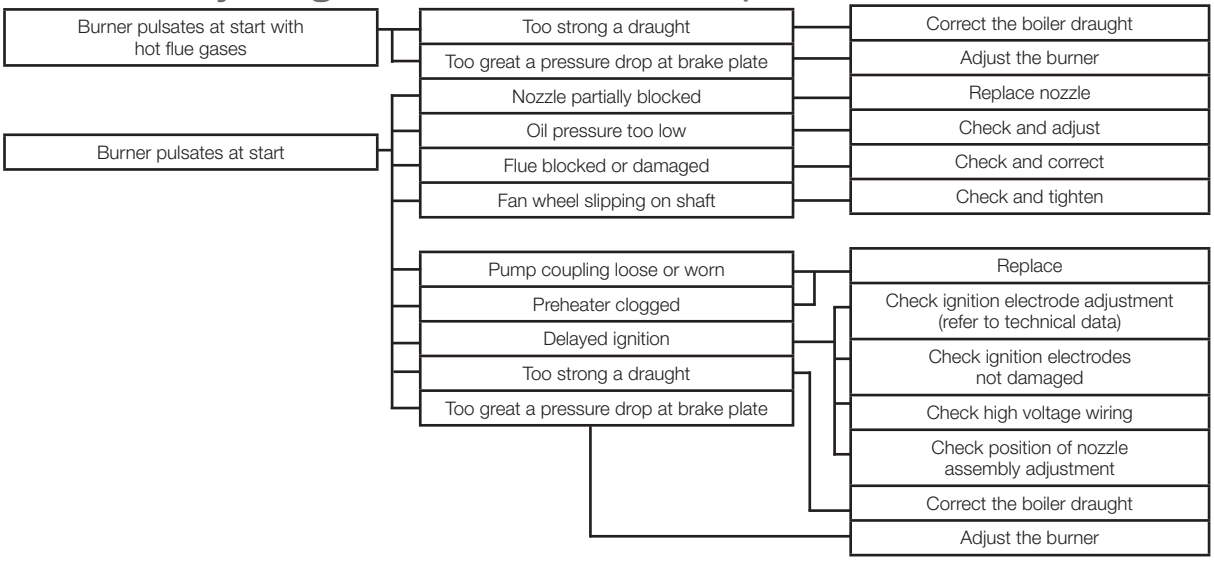
7.1 Burner will not start



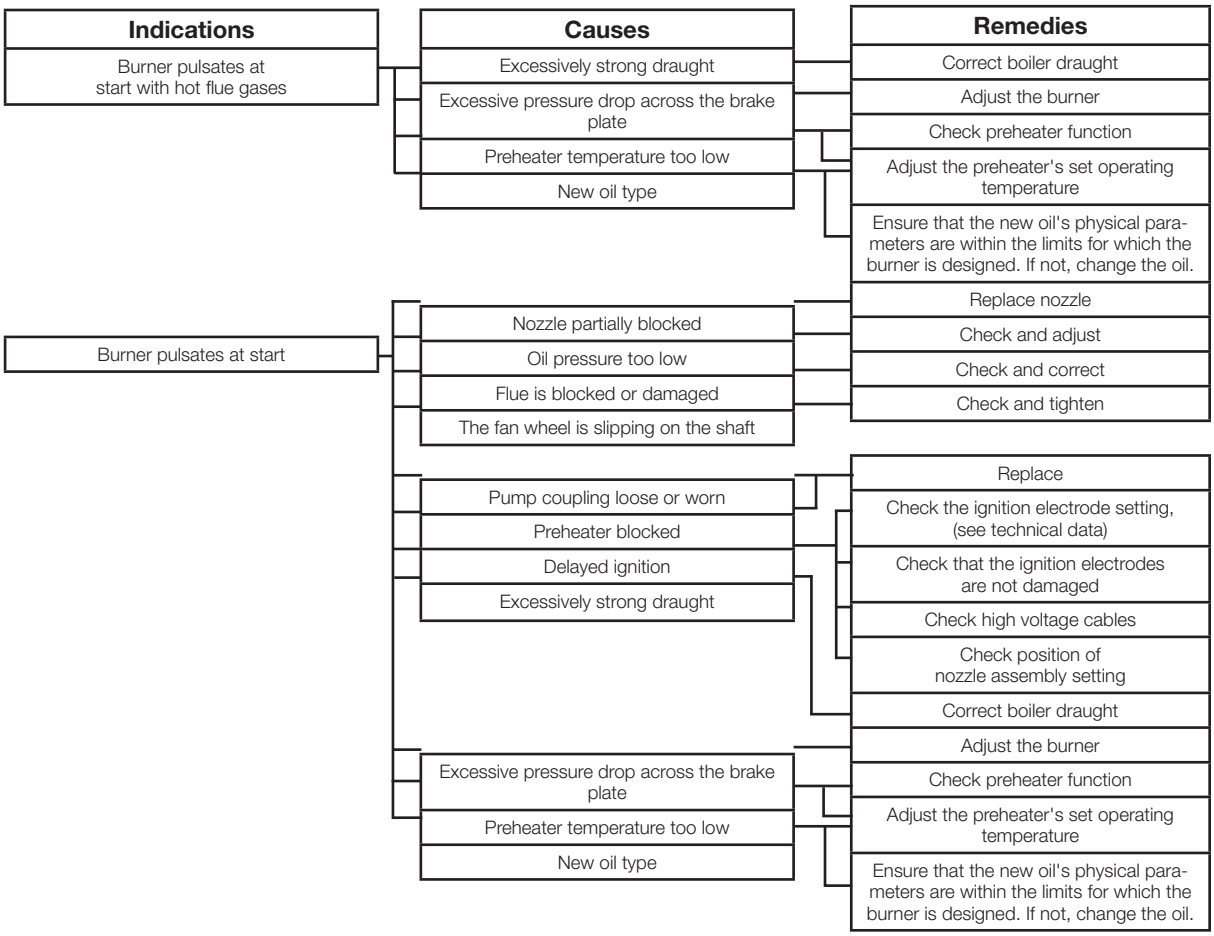
7.2 Burner will not start after normal use



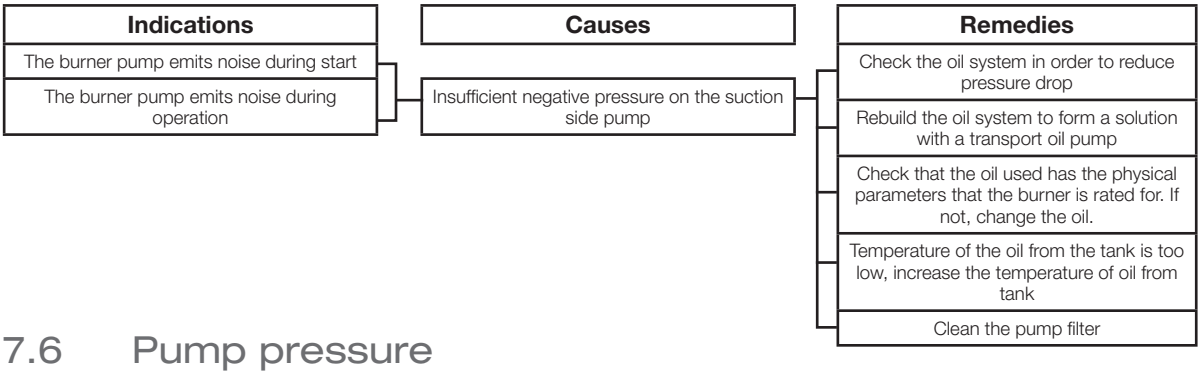
7.3 Delayed ignition, burner starts; pulsation



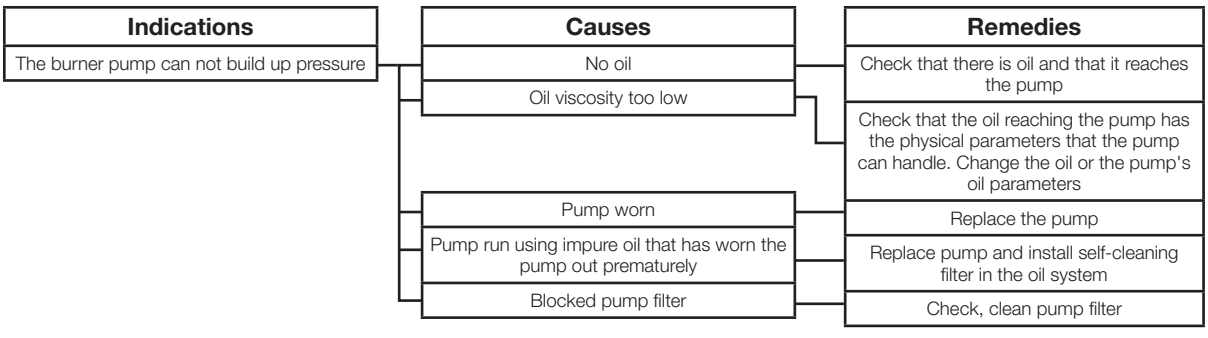
7.4 Delayed ignition



7.5 Noise in pump



7.6 Pump pressure



EU Declaration of conformity

CE

Bentone Oilburners

Type

BF 1	B 55
ST 146	B 65
B 30	B 70
B 40	B 80
B 45	

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 (Fulfiels the requirements of Annex J/K) Automatic forced draught burners for liquid fuels

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Additional information can be downloaded at:

www.bentone.com

Ljungby September 26rd, 2017

Håkan Lennartsson
Managing Director
Enertech AB

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:……..

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Enertech Group