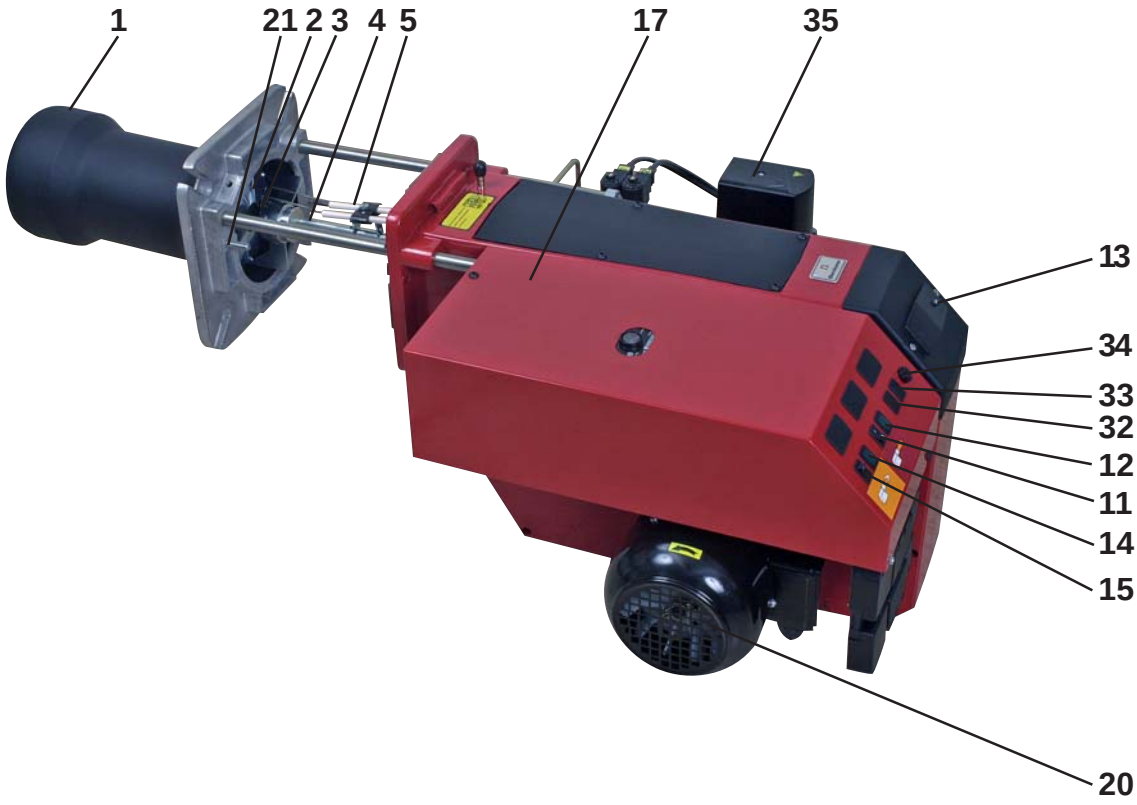
Installation- and maintenance instruction

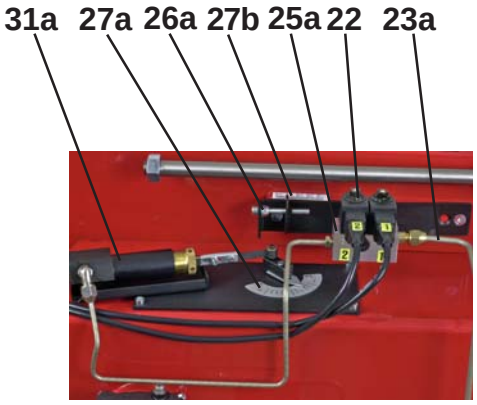
B55, B65

Model 2H, 2R, 3R

Contents

Description B55/B65

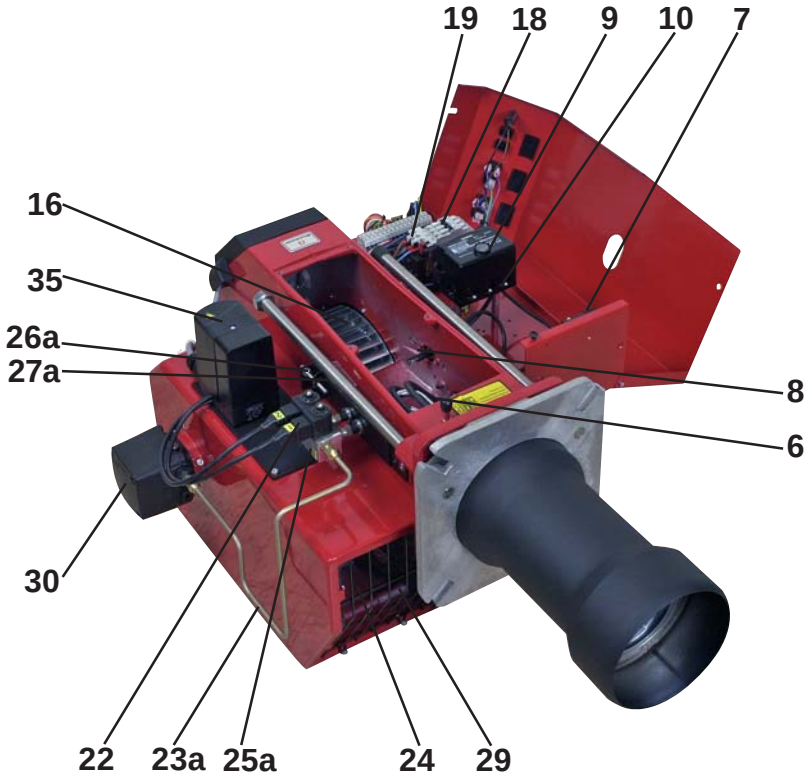


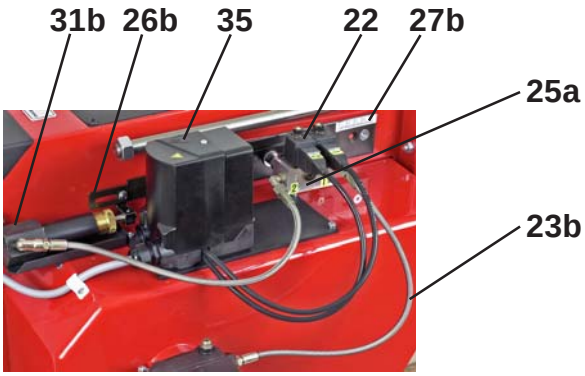


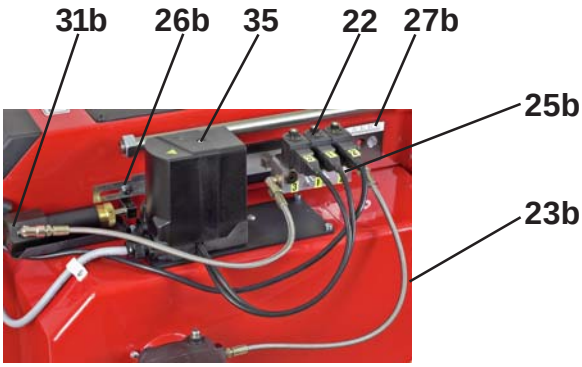
Components

1. Flame cone
2. Brake plate
3. Nozzle
4. Nozzle assembly
5. Ignition electrodes
11. Switch I-II
12. Indicating lamp Stage 2
13. Cover, inspection glass
14. Indicating lamp Stage 1
15. Switch 0-I
17. Electric panel
20. Motor
21. Locking device, flange
22. Solenoid valves
23a. Connecting pipe
25a. Solenoid valve bloc Stage 2
26a. Nozzle assembly adjustment fixed
27a. Scale, air regulation
27b. Scale, nozzle assembly
31a. Adjustment device, air damper
32. Switch II-III
33. Indicating lamp Stage 3
34. Fuse
35. Damper motor

Description B55/B65







Components

6. Ignition cables
7. Ignition transformer
8. Photocell
9. Control box
10. Front plate, relay base
16. Fan wheel
18. Contactor
19. Thermal overload protection
22. Solenoid valve
23a. Connecting pipe
23b. Hydraulic hose
24. Air intake
25a. Solenoid valve bloc Stage 2
25b. Solenoid valve bloc Stage 3
26a. Nozzle assembly adjustment fixed
26b. Nozzle assembly adjustment hydrauli
27a. Scale, air regulation
27b. Scale, Nozzle assembly
29. Air damper
30. Pump
31b. Adjustment device, Nozzle assembly
35. Damper motor

Declaration of conformity

Manufacturer:	Enertech AB, Bentone Division
Street address:	Näsvägen
	SE-341 34 Ljungby
Address:	P.O. Box 309
	SE-341 26 Ljungby
	Sweden
Product:	Oil burner
Type:	B 1, B 2, B 9, B 10, B 11, B 20, B 30, B 40, B 45, B 50, B 55, B 60, B 65, B 70, B 80, ST 97, ST 108, ST 120, ST133, ST 146

Certfikat TÜV Süddeutschland

Certifikat Nr	Burner
0111110535004	B1
0207110535005	B2
021198p15001	ST97, ST108, ST120, ST133, ST146
02119815002	B9, B10, B11
02119815003	B20, B30, B40, B45
02119815004	B50, B60, B70, B80
040588622001	B55
040588622002	B65

Enertech AB declares under sole responsibility that the above mentioned product is in conformity with the following standards or other normative documents.

Document: EN 267

and follows the provisions of applicable parts in the following EU Directives:

89/336/EEC	Electromagnetic compatibility
73/23/EEC	Low-voltage directive
89/392/EEC	Machinery directive
92/42/EEC	Efficiency directive

In that the burner conforms to the above mentioned standards it is awarded the CE mark.

Enertech AB, Bentone Division is quality certified according to SS-EN ISO 9001:2000

Ljungby 050810

Sven-Olov Lövgren

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01. GENERAL

Manual

- The contents of this manual are to be observed by all who work for any reason on the unit and its appertaining system parts.
- This manual is intended especially for authorised personnel.
- This manual is to be regarded as part of the burner and shall always be available near the place of installation.

Safety directions

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

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

Condensation in chimney

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

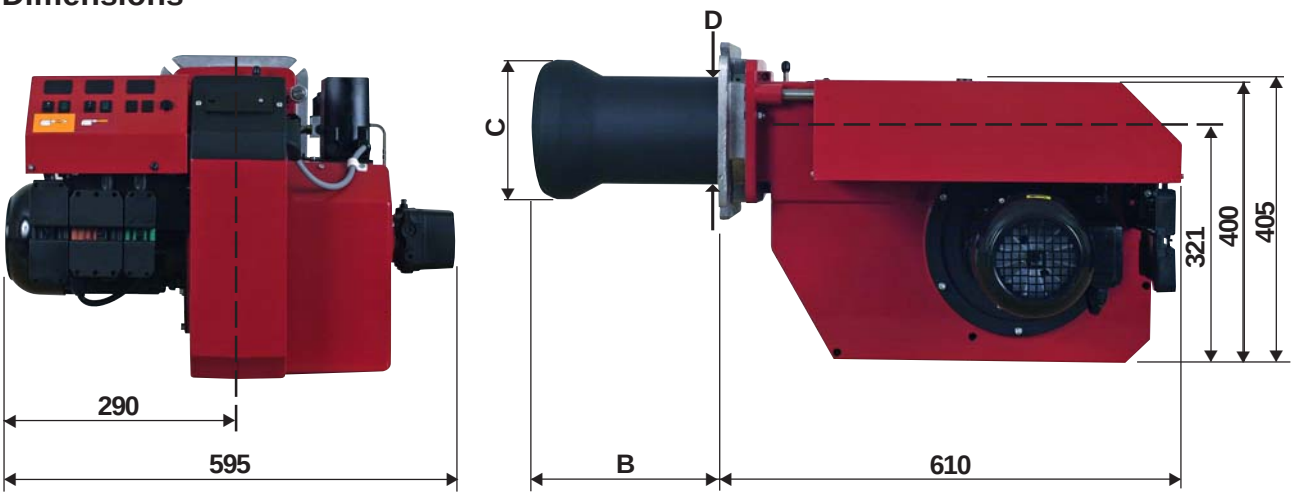
Setting the burner

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

02. TECHNICAL DATA

Type designation B55-2H/B55-2/B55-2R/B55-3R/B65-2H/B65-2/B65-2R/B65-3R

Dimensions



	Length of burner tube B55	Flange Measure B B55	Burner tube Measure C B55	Burner tube Measure D B55	Length of burner tube B65	Flange Measure B B65	Burner tube Measure C B65	Burner tube Measure D B65
Standard 1	303	273	160	155	288	258	200	155
Standard 2	403	373	160	155	388	358	200	155
Standard 3	503	473	160	155	488	458	200	155

Output range and nozzles recommended

	Oil capacity kg/h	Output kW	Output Mcal/h	Recommended nozzle Angle	Recommended nozzle Danfoss	Recommended Pump pressure
B55-2H, B55-2, B55-2R	14-67	166-795	143-685	45°-60°	S, B	14 bar
B55-3R	14-64	166-759	143-654	45°-60°	S, B	14 bar
B65-2H, B65-2, B65-2R	24-99	285-1174	246-1012	45°-60°	S, B	14 bar
B65-3R	24-99	285-1174	246-1012	45°-60°	S, B	14 bar

The net calorific value of 11,86 kWh/kg for light oil has been used.

Recommended nozzle and pressure

Because of the different boiler types, combustion chamber geometries and combustion chamber loads that exist, it is not possible to specify a given spray angle or spray pattern.It should be noted that the spray angle and spray pattern will vary depending on the pump pressure.

Nozzle

45°S Danfoss
45°B Danfoss
60°S Danfoss
60°B Danfoss

Pump pressure

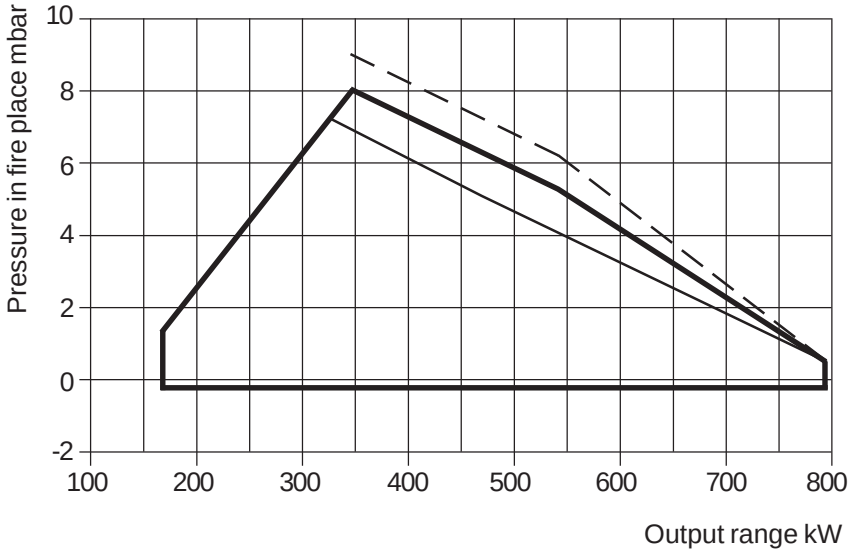
14 bar (12 - 16 bar)
On burners equipped with hydraulic air control or optimization the oil pressure should not be less than 14 bar.

02. TECHNICAL DATA

Working field

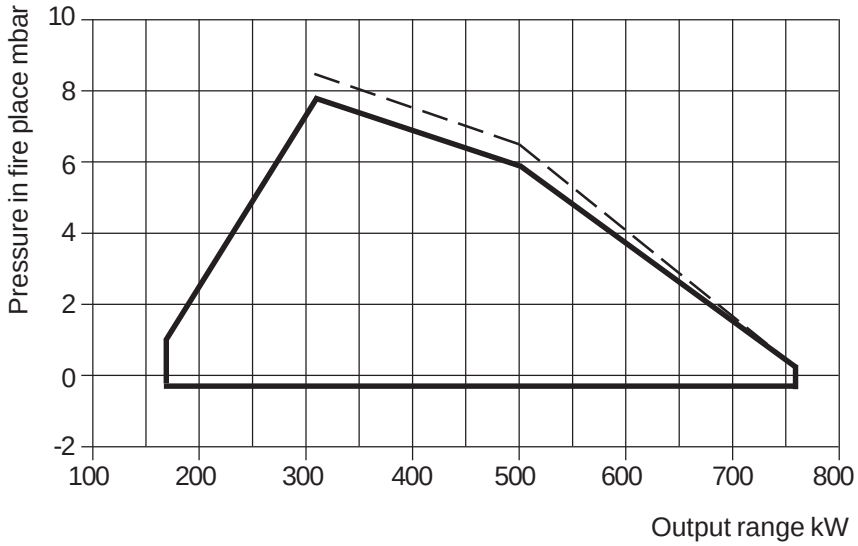
B55-2
14-67 kg/h
166-795 kW

B55-2R
B55-2H/B55-2
Measured (test)



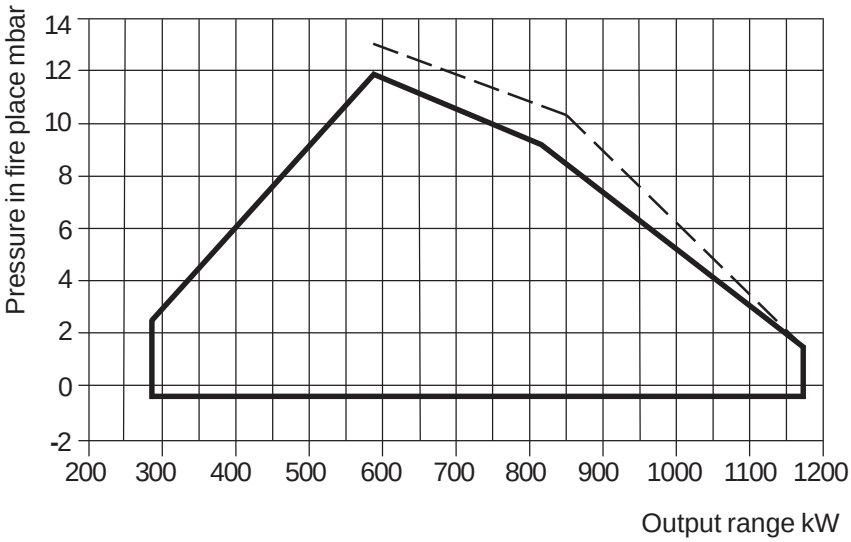
B55-3R
14-64 kg/h
166-759 kW

B55-3R
Measured (test)



B65
24-99 kg/h
285-1174 kW

B65
Measured (test)



Unbroken line is the approved working field as per EN267.

02. TECHNICAL DATA

Nozzle table

Pump pressure bar

Gph	10			11			12			13		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
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	25,46	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

Pump pressure bar

Gph	14			15			16			17		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
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	347
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

The table applies to oil with a viscosity of 4,4 mm^2/s (cSt) with density 830 kg/m^3.

03. INSTALLATION

Acceptance inspection

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

Preparations for installation

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

Distribution of oil

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

- See Pump instructions for choice of tube diameter, tube length and height difference.
- Fix the tubing with a minimum number of screw fittings.
- Fix the tubes so that the oil hoses are not subjected to tensile stress or sharp bending when swinging out the burner or removing it for service.
- Fit the oil filter 1½" so that the filter cartridge can easily be replaced.

Electrical connections

The main power switch must be turned off before beginning electrical installation. If the boiler has a 7-pin and a 4-pin Eurostecker connector these will often connect straight to the burner. If not, use the connectors supplied. A 5-pin connector supplies the burner motor with a separate 3-phase supply. See connection under the Electrical equipment heading.

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

Choice of nozzle

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

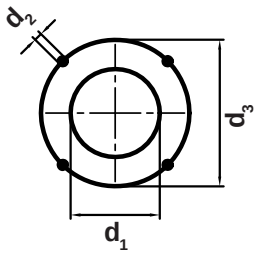
Setting of the brake plate and air flow

Basic burner settings can be made before commissioning as shown in the diagram. See Basic settings. Note that these are just basic settings and must be correctly adjusted when the burner has been started. Flue gas analysis and soot measurement should be carried out at this time.

03. INSTALLATION

Burner installation

Hole pattern

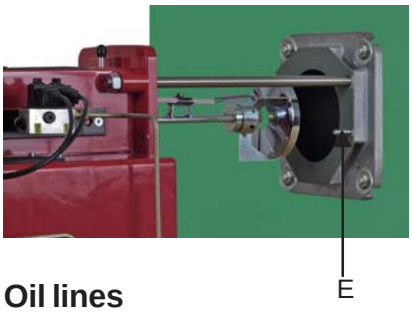


Check that the hole pattern on the boiler matches the pattern on the burner flange.

Flame head	d_1	d_2	d_3
B55	(160)* 165	M12	(226)* 254-295
B65	(160)* 210	M12	(226)* 254-295

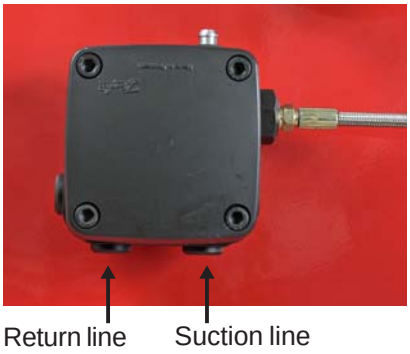
* The hole pattern can be reduced if the burner pipe is fitted from the front and the heels in the flange are ground off.

Installing the burner



1. Separate the burner body and the flange.
2. Fit the flange and gasket on the boiler.
3. Insulate between the burner pipe and boiler door to reduce heat radiation.
4. Slide the burner body on to the guides.
5. Pull the brake plate off the oil pipe.
6. Fit the chosen nozzles (see Technical data).
7. Fit the brake plate and check the ignition electrodes (see Servicing the burner).
8. Slide the burner together and secure it with the nuts (E).

Oil lines



1. Check the size of the oil line (see Pump instructions).
2. An oil filer (1/2") must be fitted to the oil line. If an air trap is fitted then the oil filter should be fitted to the oil line before the air trap.
3. With a single pipe system the return plug must be removed (see Pump instructions).
4. When fitting oil hoses, check that the supply and return hoses are connected to the right couplings on the oil pump. The hoses must be positioned so that they are not subjected to tensile stress or sharp bending.
5. Bleed the oil system. The oil pump will be damaged if it is run dry.
6. The vacuum in the suction line should not exceed 0.3 bar during commissioning.

Electrical connections

1. Turn off the main power switch.
2. Connect the Eurostecker connectors (see Electrical equipment).
3. Check that the burner control switch (S1) is off.
4. Fit the Eurostecker connectors on the burner.
5. Turn on the main power switch.
6. Check the direction of rotation of the burner motor.

04. BASIC SETTINGS

Typical basic settings for B65-2H/B65-2/B65-2R/B65-3R

Choice of nozzle
B65-2H/B65-2/B65-2R

Burner output= 770 kW
Nozzle Stage 1 : 770 x 0,6 = 460 kW 460 / 11,86 = 38,8 kg/h
Nozzle Stage 2 : 770 x 0,4 = 310 kW 310 / 11,86 = 26,1 kg/h

According to the table of nozzles this gives the following nozzles:
Stage 1 : 8,50 Gph
Stage 2 : 6,00 Gph
Pump pressure : 14 bar

Basic settings
B65-2H

Nozzle assembly	Stage 2	= 15
Air adjustment	Stage 1	= 25°
	Stage 2	= 65°

Each graduation on the scale corresponds to 10°.

Basic settings
B65-2

Power outputs and nozzle choice from example.

Nozzle assembly	Stage 2	=	15
Damper motor	Closed	= 0°	Blue cam
	Stage 1	= 25°	Orange cam
	MV 2	= 50°	Black cam
	Stage 2	= 65°	Red cam

The black cam for Stage 2 (MV 2) must be placed between the cams for Stage 1 and Stage 2. The positions of MV 2 are determined by the boiler characteristics when switching between stages, but for a basic setting the black cam should be placed in the middle.

Basic settings
B65-2R

Power outputs and nozzle choice from example.

Nozzle assembly	Stage 1	=	0
	Stage 2	= 15	
Damper motor	Closed	= 0°	Blue cam
	Stage 1	= 25°	Orange cam
	MV 2	= 50°	Black cam
	Stage 2	= 65°	Red cam

The black cam for Stage 2 (MV 2) must be placed between the cams for Stage 1 and Stage 2. The positions of MV 2 are determined by the boiler characteristics when switching between stages, but for a basic setting the black cam should be placed in the middle.

Choice of nozzle
B65-3R

Burner output = 880 kW
Nozzle 880 / 3 = 293 kW 293 / 11,86 = 24,7 kg/h
According to the table of nozzles this gives the following nozzles:
Stage 1 : 5,50 Gph
Stage 2 : 5,50 Gph
Stage 3 : 5,50 Gph
Pump pressure : 14 bar

Basic settings
B65-3R

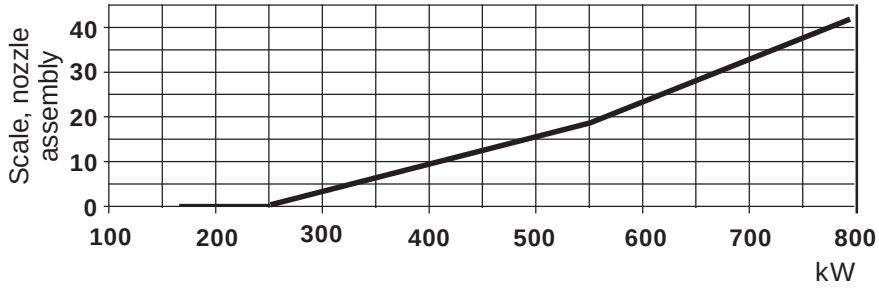
Power outputs and nozzle choice from example.

Nozzle assembly	Stage 1/2	= 5	
	Stage 3	= 20	
Damper motor	Stage 1	= 10°	Blue cam
	MV 2	= 30°	Black cam
	Stage 2	= 44°	Orange cam
	MV 3	= 60°	Green cam
	Stage 3	= 80°	Red cam

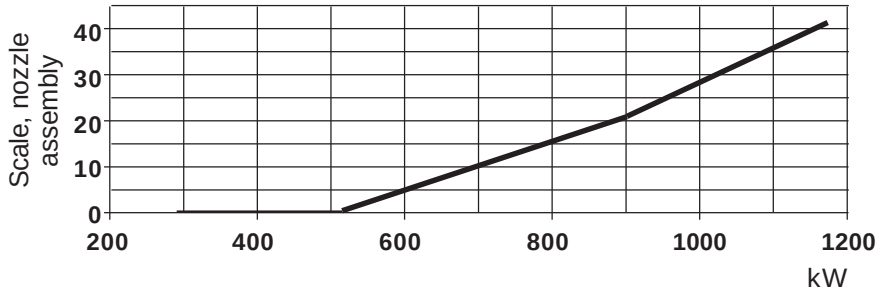
The cams for Stage 2 (MV 2) and Stage 3 (MV 3) must be placed between the cams for Stage 1 and Stage 2, and between Stage 2 and Stage 3, respectively. The positions of MV 2 and MV 3 are determined by the boiler characteristics when switching between stages, but for a basic setting the cams (MV2 and MV3) should be placed in the middle.

04. BASIC SETTINGS

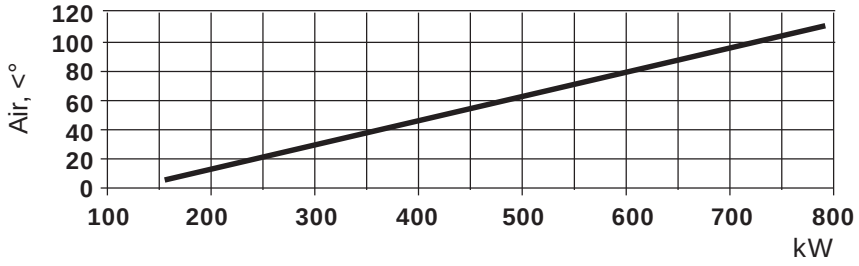
Set values for nozzle assembly B55



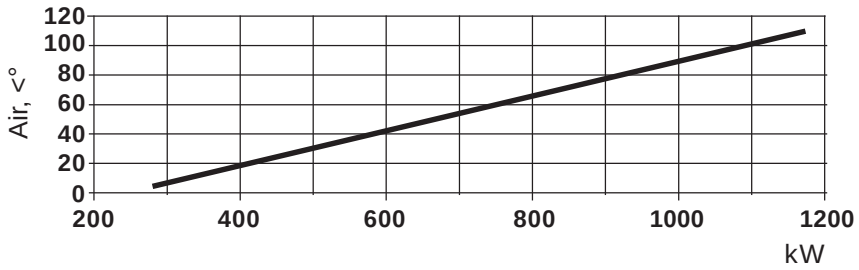
Set values for nozzle assembly B65



Set values for air damper B55

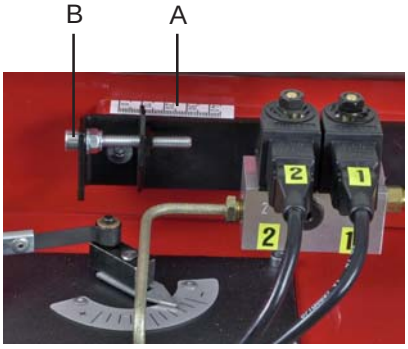


Set values for air damper B65



04. BASIC SETTINGS

Nozzle assembly regulation – fixed brake plate

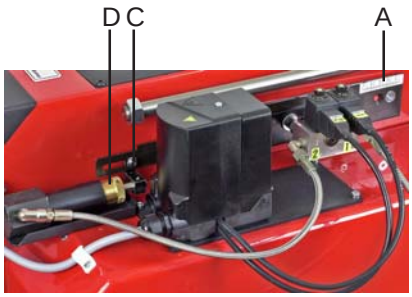


Nozzle assembly regulation is used to achieve the most favourable pressure drop possible across the brake plate.
Nozzle assembly regulation should be adjusted for Stage 2 output.

Adjustment
Adjust to the desired position on the scale (A) using the set screw (B) (turning anti-clockwise reduces the pressure drop and moves the brake plate outwards).

If pulsation occurs, the pressure drop across the brake plate can be altered until pulsation stops.

Nozzle assembly regulation – adjustable brake plate



Nozzle assembly regulation is used to achieve the most favourable pressure drop possible across the brake plate for each output stage.

Two nozzles
Nozzle assembly regulation adjusts the position of the brake plate between Stage 1 and Stage 2 by means of a hydraulic piston.

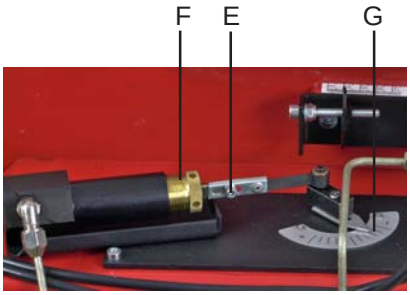
Three nozzles
Nozzle assembly regulation adjusts the position of the brake plate between Stage 2 and Stage 3 by means of a hydraulic piston.

Low load
Undo the locking nut.
Adjust to the desired position on the scale (A) by sliding the plate to the desired position. Tighten the locking nut (C).

High load
Adjust to the desired position on the scale (A) using the set screw (D) (turning anti-clockwise reduces the pressure drop and moves the brake plate outwards).

If pulsation occurs, the pressure drop across the brake plate can be altered until pulsation stops.

Hydraulic air adjustment



Stage 1
Set the control switch (S2) to low load (I). Undo the screw (E), turn the damper to the desired position and retighten the screw (E).

Stage 2
Set the control switch (S2) to high load (I). Use the adjuster pin to screw the sleeve (F) in (to reduce) or out (to increase). The position of the damper can be read from the damper scale (G). Carry out flue gas analysis to check the air settings.

04. BASIC SETTINGS

Damper motor 2-Stage

The damper motor rotates the damper between three preset positions. These positions are controlled at the motor by micro-switches, the switching positions of which are set using the coloured cams. There is also a black cam, which controls the activation of solenoid valve 2.
If the air flow requires adjustment:
Remove the cover from the damper motor and change the positions of the cams by turning them with the aid of the tool supplied. To deactivate a cam while you are turning it we recommend that you switch to a different stage and then switch back after adjustment is complete in order to check the result.

Stage 1

Adjust the operating switch to Stage 2 (II).
* Reduce the air volume:
  Turn orange cam towards 0°.
* Increase the air volume:
  Turn orange cam towards 90°.

Adjust the operating switch back to low capacity and check.

Stage 2

Adjust the operating switch to Stage 1 (I).
* Reduce the air volume:
  Turn red cam towards 0°.
* Increase the air volume:
  Turn red cam towards 90°.

If the red cam is moved, change the black cam as much. Adjust the operating switch back to Stage 2 and ensure that the correct air volume has been obtained.

Closed

The blue cam is the limit position for fully closed damper and it is normally not necessary to change it.

Releasing

The damper motor can be released using the white release button. This feature simplifies replacement of the damper motor.

To release. Press down the shaft and slide it outwards until it disengages from the milled slot.
To engage. Slide the shaft inwards and release. Adjust the position of the motor so that the cogs mesh with each other.

Solenoid valve Stage 2 (black)
Stage 2 (red)
Stage 1 (orange)
Closed damper (blue)

Releasing button
N.B. The upper position is the standard position

Damper motor 3-Stage

The damper motor rotates the damper between three preset positions. These positions are controlled at the motor by micro-switches, the switching positions of which are set using the coloured cams. There is also a black cam, which controls the activation of solenoid valve 2 and a green one which controls the activation of solenoid valve 3.
If the air flow requires adjustment:
Remove the cover from the damper motor and change the positions of the cams by turning them with the aid of the tool supplied. To deactivate a cam while you are turning it we recommend that you switch to a different stage and then switch back after adjustment is complete in order to check the result.

Stage 1

Adjust the operating switch to Stage 2 (II).
* Reduce the air volume:
  Turn blue cam towards 0°.
* Increase the air volume:
  Turn blue cam towards 90°.

Adjust the operating switch back to Stage 1 and check.

Stage 2

Adjust the operating switch to Stage 1 (I).
* Reduce the air volume:
  Turn orange cam towards 0°.
* Increase the air volume:
  Turn orange cam towards 90°.

If the orange cam is moved, change the black cam as much. Adjust the operating switch back to Stage 2 and ensure that the correct air volume has been obtained.

Stage 3

Adjust the operating switch to Stage 2 (II).
* Reduce the air volume:
  Turn red cam towards 0°.
* Increase the air volume:
  Turn red cam towards 90°.

If the red cam is moved, change the green cam as much. Adjust the operating switch to Stage 3 (III) and ensure that the correct air volume has been obtained.

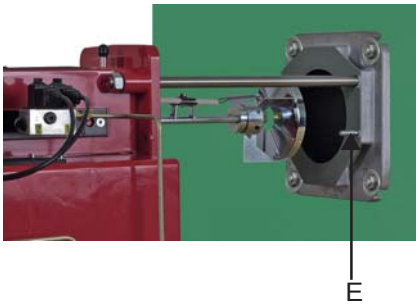
Releasing

The damper motor can be released using the white release button. This feature simplifies replacement of the damper motor.

To release. Press down the shaft and slide it outwards until it disengages from the milled slot.
To engage. Slide the shaft inwards and release. Adjust the position of the motor so that the cogs mesh with each other.

Servicing the burner device

Removal and fitting



1. Turn off the main power switch and disconnect the Eurostecker connectors from the burner.
2. Undo the nuts (E) and pull out the burner body on its guides.
3. Undo and remove the brake plate from the oil pipe.
4. Unscrew the nozzles.
5. Fit the nozzles.
6. Fit the brake plate (see Adjusting the brake plate).
7. Check the ignition electrodes (see Adjusting ignition electrodes). Replace if necessary.
8. Slide the burner together and secure it with the nuts (E).
9. Connect the Eurostecker connectors and turn on the main power switch.
10. Check combustion*.

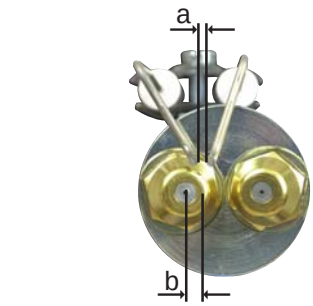
Note:

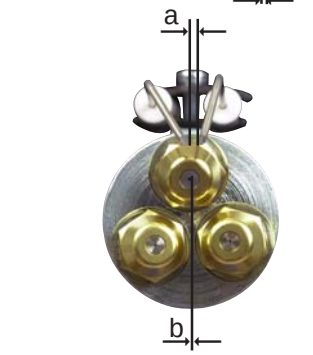
* After servicing/replacing components that affect combustion, a flue gas analysis and soot measurement must be carried out on the installation.

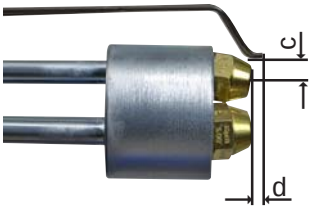
NOTE!
If nozzles are dirty always replace them with new ones. Do not clean them.
On boilers with a hinged door, the door can be opened and the burner pipe can be removed from the flange and pulled forwards.
With burners that have an extended burner tube, the burner body must be lifted off the guides, or the oil pipe must be disconnected from the solenoid valves to be removed for servicing.

Adjusting the ignition electrodes and brake plate

Adjustment dimensions for ignition electrodes.



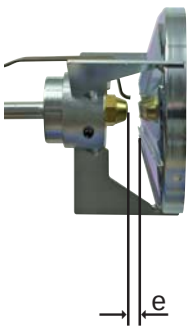




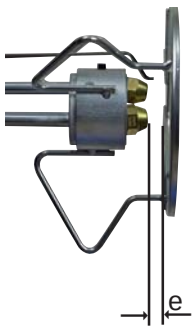
Burner, type	a	b	c	d	e
B55-2	2,5-3,0	2,0	6,5-7,0	2,0	6,0-7,0
B55-3	2,5-3,0	0,0	6,5-7,0	2,0	6,0-7,0
B65-2	2,5-3,0	2,0	6,5-7,0	2,0	10,0-12,0
B65-3	2,5-3,0	0,0	6,5-7,0	2,0	10,0-12,0

NOTE!
It is important that the spark does not strike the brake plate or nozzle.

B55

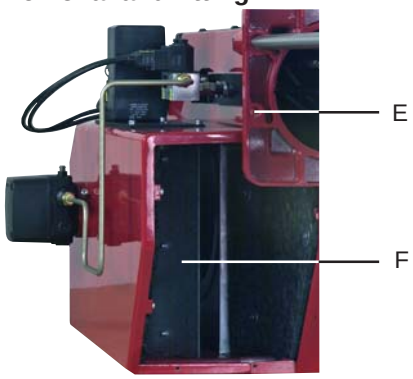


B65



Servicing the air damper

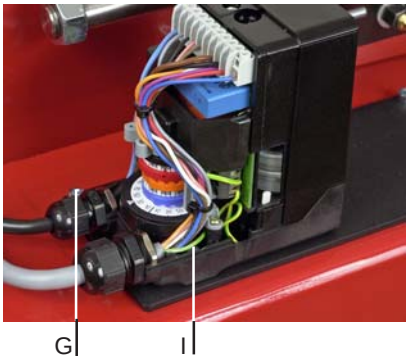
Removal and fitting

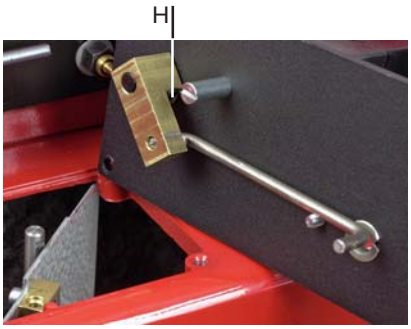


1. Turn off the main power switch and disconnect the Eurostecker connectors from the burner.
2. Undo the nuts (E) and pull out the burner body on its guides.
3. Remove the intake grille from the air intake.
4. Release the damper motor.
5. Clean the air damper (F) and the intake. Lubricate the damper shaft if applicable.
6. Re-engage the damper motor.
7. Fit the intake grille over the air intake.
8. Slide the burner together and secure it with the nuts (E).
9. Connect the Eurostecker connectors and turn on the main power switch.
10. Check combustion*.

Replacing the damper motor

Removal and fitting

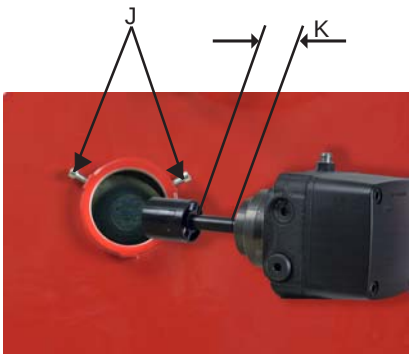




1. Turn off the main power switch and disconnect the Eurostecker connectors from the burner.
2. Note the positions of the cables and then disconnect the cables from the damper motor
3. Release the damper motor and lock it at 30°.
4. Undo the screws (G) that secure the mounting plate for the damper motor.
5. Raise it carefully so that the air damper stays in the air intake.
6. Disconnect the (H) link arm from the motor shaft.
7. Separate the damper motor from the mounting plate (I).
8. Refit the damper motor on the mounting plate.
9. Connect the link arm to the damper motor shaft. It is important that the screw is at right angles to the plane of the shaft.
10. Release the damper motor and lock it at 30°.
11. Fit the mounting plate by guiding the link arm into the attachment point on the air damper and the air damper shaft into the mounting plate (make sure that the bushings are fitted between the mounting plate and damper shaft).
12. Release the damper motor and check that the damper moves freely. Close the damper and zero the graduated scale on the damper motor.
13. Make the electrical connections to the damper motor.
14. Reset the damper motor cams.
15. Connect the Eurostecker connectors and turn on the main power switch.
16. Check combustion.*

Replacing the oil pump B55/B65

Removal and fitting



1. Turn off the main power switch and disconnect the Eurostecker connectors from the burner.
2. Disconnect the oil hoses from the pump.
3. Undo the screws (J) and pull out the oil pump.
4. Measure the distance between the pump mounting and the pump coupling (K).
5. Transfer the pump coupling to the new pump and adjust to give the same spacing between the pump and pump coupling as before (K)
6. Fit the oil pump on the burner and tighten the screws (J). (It is important that splines on the pump shaft align correctly with the pump coupling.)
7. Fit the oil hoses.
8. Connect the Eurostecker connectors and turn on the main power switch.
9. Bleed the pump, start the burner and adjust to the correct oil pressure.
10. Check combustion.*

Note:

* After servicing/replacing components that affect combustion, a flue gas analysis and soot measurement must be carried out on the installation.

06. INSTRUCTIONS PUMP TYPE RSA 95 & 125

Technical data

	RSA 95	RSA 125
Viscosity range:	1,3-18,0 mm²/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 to+70°C	
Nozzle capacity at viscosity 4,3:	150-190 l/h	215-260 l/h
Gearwheel capacity:	225 l/h	294 l/h
Max pressure on suction- and return side:	4 bar	

Components

1. Pressure gauge port G 1/8"
2. Nozzle port 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. By-pass plug
8. Pressure adjustment, 4 mm Allen key

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).

Purging

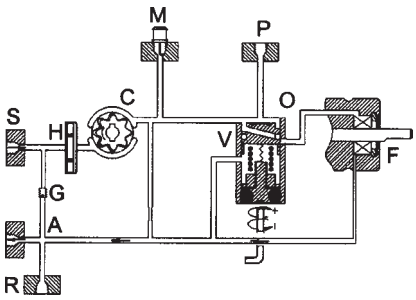
On 1-pipe systems it is necessary to purge the pump. On 2-pipe systems purging is automatic through the return line.

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.

06. INSTRUCTIONS PUMP TYPE RSA 95 & 125

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.

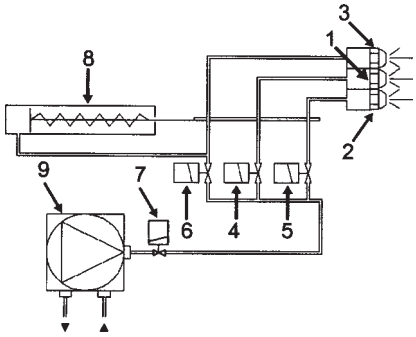
In 2-pipe-systems excess oil is led back to the oil tank. In 1-pipe-systems the by-pass plug "A" must be removed to give free flow back to the suction side via return line "G" with return port "R" closed.

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

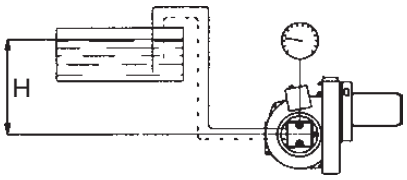
Schematic diagram



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).

Suction line tables



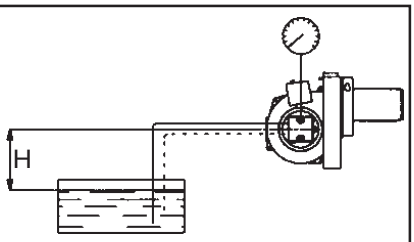
1-pipe system

Height	Pipe diameter		
H	ø12mm	ø15mm	ø20mm
m	m	m	m

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

Two-pipe system

Height	Pipe diameter		
H	ø12mm	ø15mm	ø20mm
m	m	m	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



1-pipe system

Height	Pipe diameter		
H	ø12mm	ø15mm	ø20mm
m	m	m	m

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

Two-pipe system

Height	Pipe diameter		
H	ø12mm	ø15mm	ø20mm
m	m	m	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.

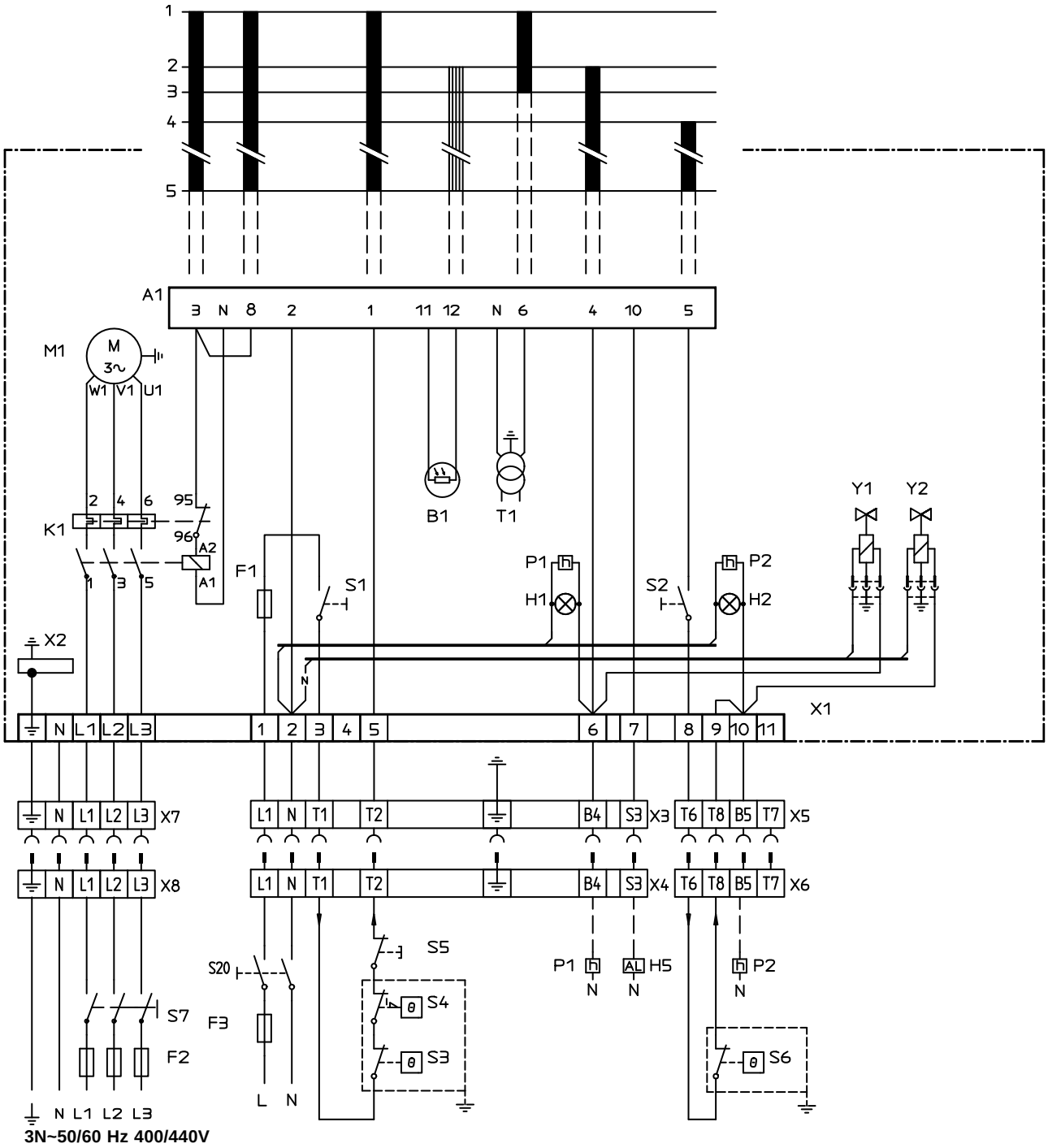
In addition to drawn copper piping a pipe system usually comprises 4 elbows, a non-return valve, a cut-off valve and an external oil filter.
The sum of these individual resistances is so insignificant that they can be disregarded.

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 mm^2/s.

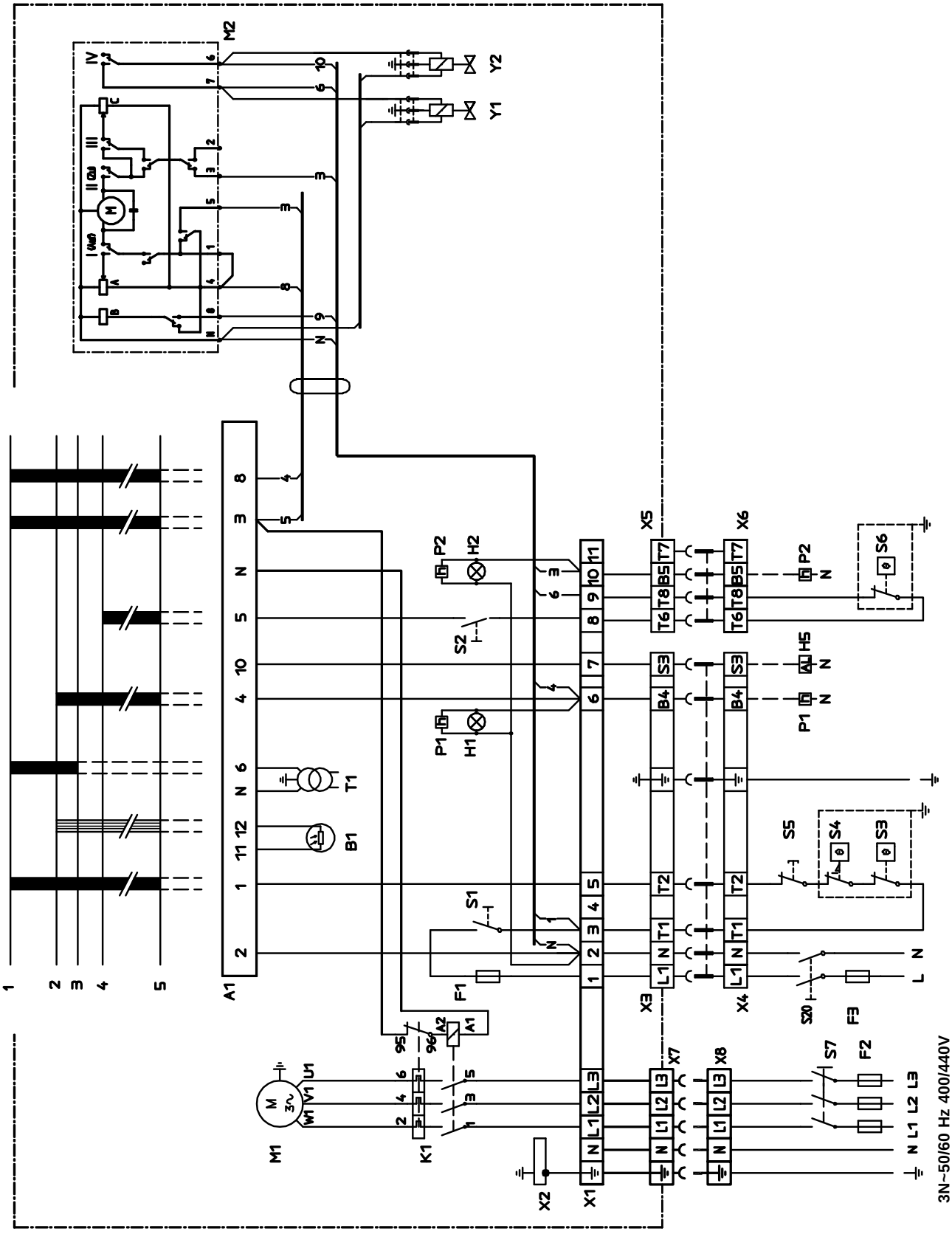
09. ELECTRIC EQUIPMENT

Wiring diagram LOA44.../LMO24.255... (B55-2H/B65-2H)



09. ELECTRIC EQUIPMENT

Wiring diagram LOA44.../LMO24.255... (B55-2/B65-2/B55-2R/B65-2R)



09. ELECTRIC EQUIPMENT

List of components LOA44.../LMO24.255... (B55-2H/B65-2H/B55-2R/B65-2R)

A1	Oil burner control
B1	Photoresistor
F1	Operating fuse
F2	Fuse
F3	Fuse
H1	Lamp, low capacity
H2	Lamp, high capacity
H5	Alarm signal 230V
K1	Thermal overload protection
M1	Burner motor
M2	Damper motor SQN75.244A21B
P1	Time meter, low capacity (optional)
P2	Time meter, high capacity (optional)
S1	Operating switch
S2	Operating switch, high/low capacity
S3	Operation thermostat
S4	Temperature limiter
S5	Micro switch for hinged door
S6	Control thermostat, high/low
S7	Main switch 3-fas
S20	Main switch 1-fas
T1	Ignition transformer
X1	Connection terminal board
X2	Earth terminal
X3	Plug-in contact "Euro", burner
X4	Plug-in contact "Euro", boiler
X5	Plug-in contact "Euro", high/low burner
X6	Plug-in contact "Euro", high/low boiler
X7	Plug-in contact "Euro" 3-phase, burner
X8	Plug-in contact "Euro", 3-phase, boiler
Y1	Solenoid valve 1
Y2	Solenoid valve 2

If S6 is missing connection between T6 and T8.
Mains connection and fuse in accordance with local regulations.

Function LOA44.../LMO24.255...

1. Switch on operating switch and twin thermostat
The burner motor starts, an ignition spark is formed, the prepurge goes on till the prepurge period expires and the solenoid valve 1 opens (2).

2. Solenoid valve 1 opens
Oil mist is formed and ignited. The photocell indicates a flame.

3. The safety time expires
a. If no flame is established before this time limit the control cuts out.
b. If for some reasons the flame disappears after this time limit, the burner will make an attempt to re-start.

4. Full load thermostat ON
The burner is in operating position and can now change between high and low capacity.

4-5. Operating position
If the burner operation is interrupted by means of the main switch or the thermostat, a new start takes place when the conditions in accordance with point 1 are fulfilled.

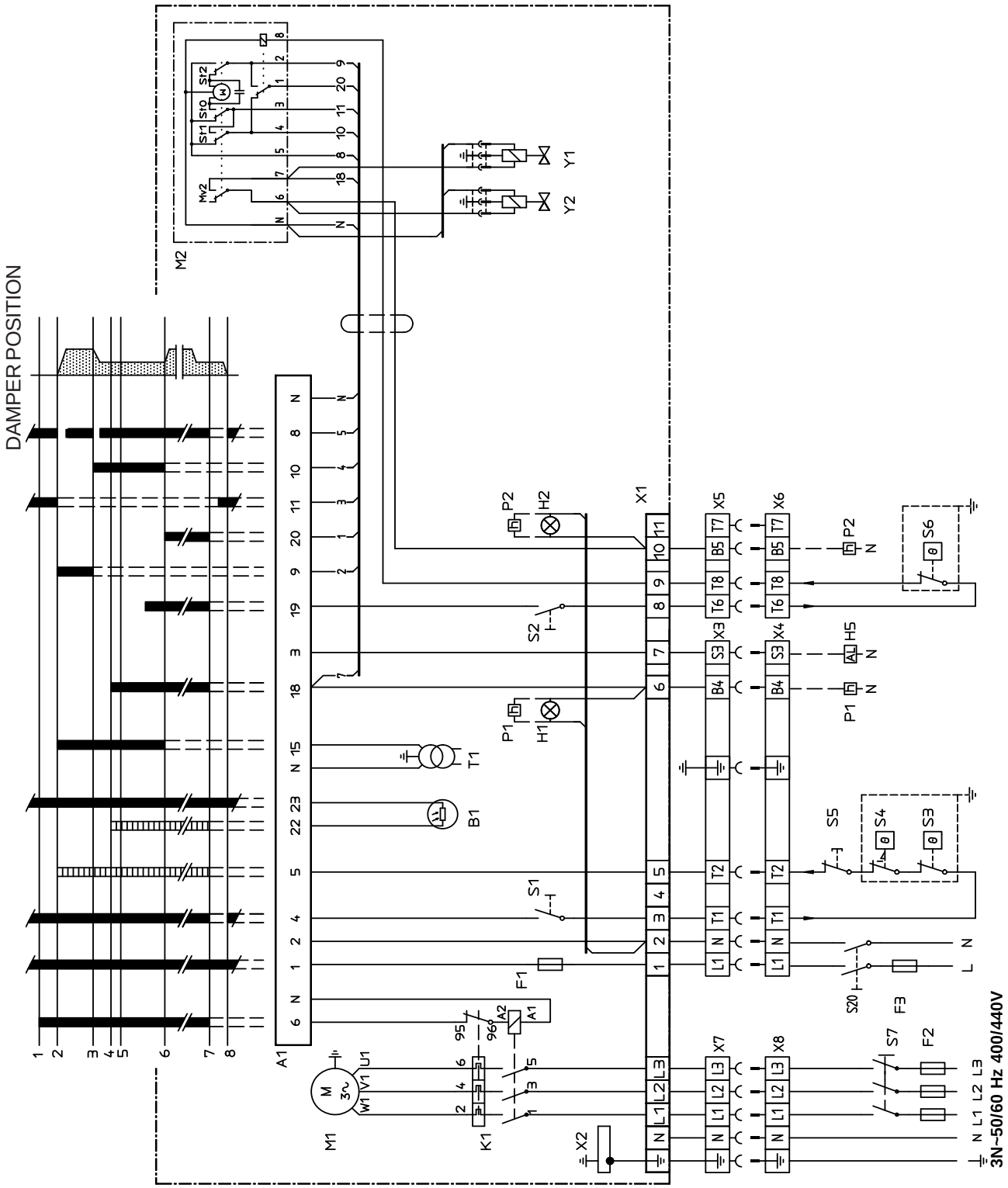
The oil burner control cuts out
A red lamp in the control is lit. Press the reset button and the burner re-starts.

Technical data LOA44.../LMO24.255...

	LOA44	LMO24
Pre-ignition time:	25 s	25 s
Pre-purge time	25 s	26 s
Post-ignition time:	2 s	5 s
Safety lock-out time:	< 5 s	< 5 s
Reset time after lockout:	2 s	< 1 s
Reaction time on flame failure:	< 1 s	< 1 s
Ambient temperature:	from - 20 to + 60°C	from - 5 to + 60°C
Min. current with flame established:	58 µ A	45 µ A
Max. photo current at start:	5,5 µ A	5,5 µ A
Enclosure:	IP 40	IP 40

Control of photo current
Current through photo unit is measured with a d.c. ammeter (a movingc oil instrument connected in series with the photo unit).

Wiring diagram LAL 1... (B55-2/B55-2R/B65-2/B65-2R)



09. ELECTRIC EQUIPMENT

List of components LAL 1... (B55-2/B55-2R/B65-2/B65-2R)

A1 Oil burner control
B1 Photoresistor
F1 Operating fuse
F2 Fuse
F3 Fuse
H1 Lamp, low capacity
H2 Lamp, high capacity
H5 Alarm signal 230V
K1 Thermal overload protection
M1 Burner motor
M2 Damper motor L&S SQN75.294A21B
P1 Time meter, low capacity (optional)
P2 Time meter, high capacity (optional)
S1 Operating switch
S2 Operating switch, high/low capacity
S3 Operation thermostat
S4 Temperature limiter
S5 Micro switch for hinged door
S6 Control thermostat, high/low capacity
S7 Main switch 3-fas
S20 Main switch 1-fas
T1 Ignition transformer
X1 Connection terminal board
X2 Earth terminal
X3 Plug-in contact "Euro", burner
X4 Plug-in contact "Euro", boiler
X5 Plug-in contact "Euro", high/low burner
X6 Plug-in contact "Euro", high/low boiler
X7 Plug-in contact "Euro", 3-phase, burner
X8 Plug-in contact "Euro" 3-phase, boiler
Y1 Solenoid valve 1 ",
Y2 Solenoid valve 2

If S6 is missing connection between T6 and T8.
Mains connection and fuse in accordance with local regulations.

Function LAL 1...

1. Operating switch ON, twin thermostat ON Air damper closed
The burner motor starts.

2. Ignition spark is formed
Ignition spark is formed. Air damper motor opens the damper to full load position.

3. Air damper motor closes
The air damper motor closes to low load position.

4. Solenoid valve opens
The oil mist is ignited. The photoresistor indicates a flame.

5. The safety time expires
a. If there is no flame established **before** this time limit the burner control locks out.
b. If the flame for some reason disappears **after** this time limit the burner control also locks out. If a repetition of the start-up sequence is desired, the wire link marked "Repetition" on the side of the base plate of the control must be removed.

6. Full load theromstat ON
The burner is in operating position. It can now change over to full load and then it alternates between full load and low load.

7. Stop
The burner operation is interrupted by means of the operating switch or if the thermostat switches off. The air damper closes completely and the oil burner control continues to position 8 for a new start.

8. State of rest
The burner is waiting for a new start.

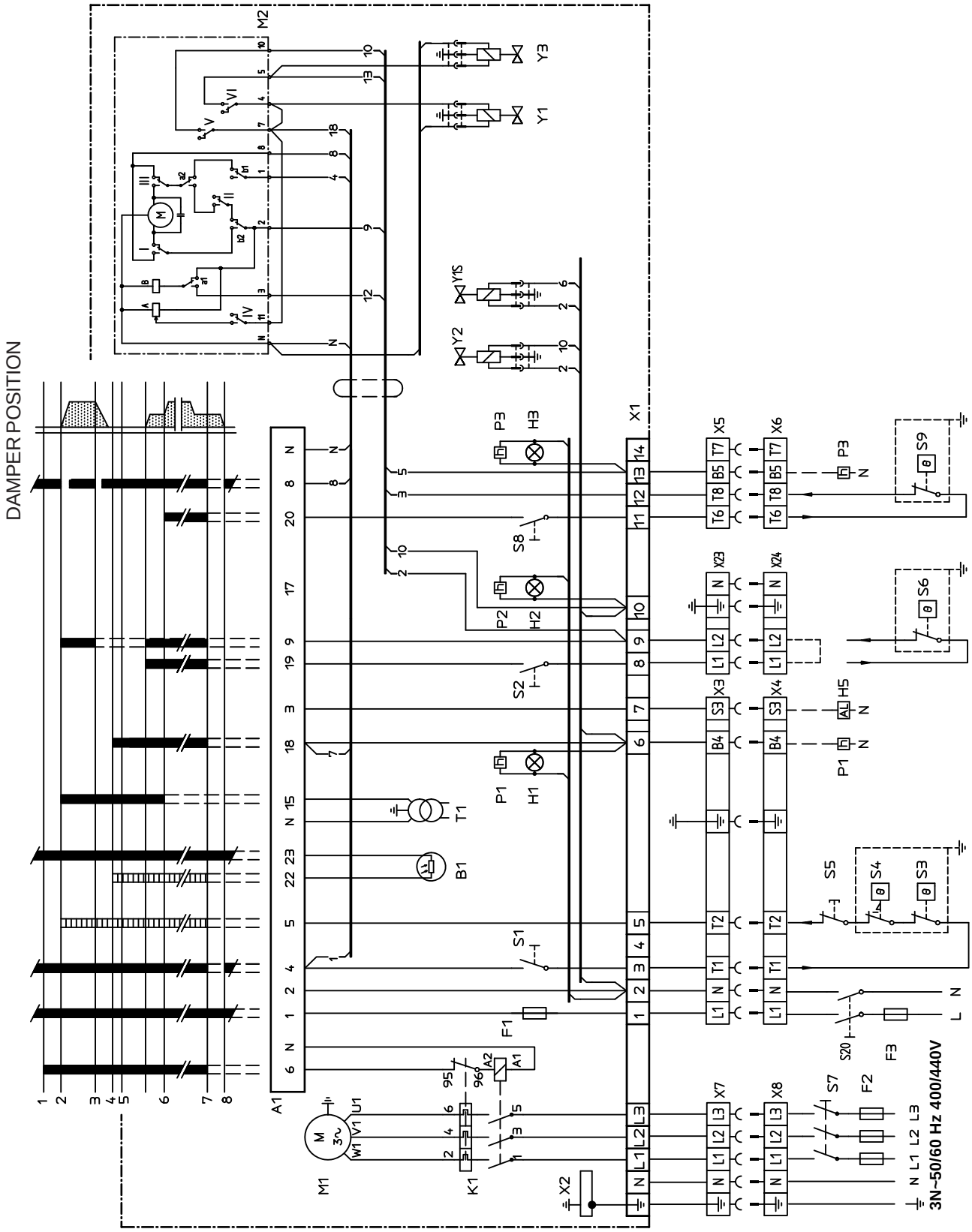
The control locks out

A red lamp in the control is lit. Move the transparent cover aside and restart the burner by pressing the reset button.

Note!

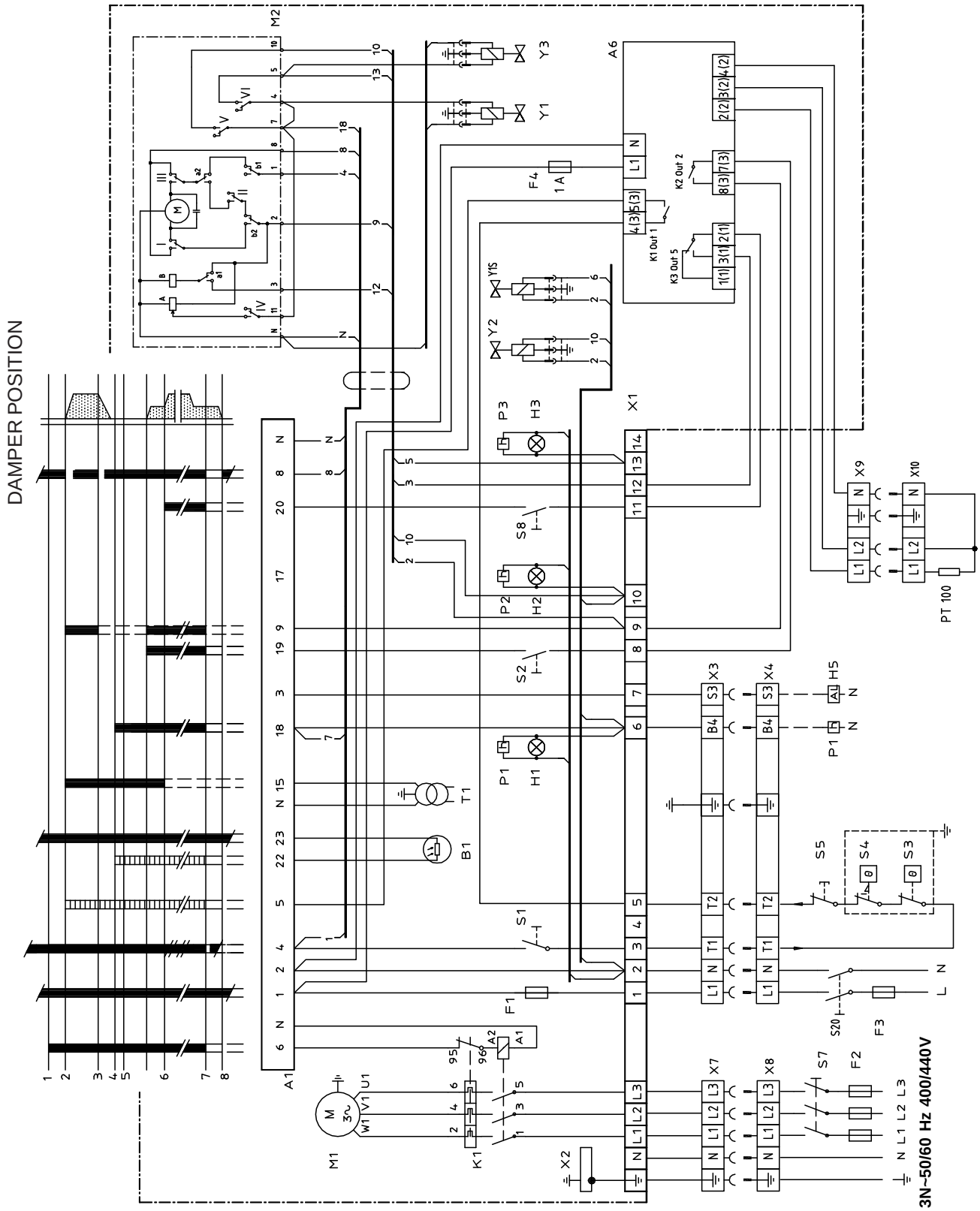
In the window of the control symbols appear showing in which position the control locks out , see the adjoining explanation.

Wiring diagram LAL 1... (B55-3/B65-3)



09. ELECTRIC EQUIPMENT

Wiring diagram LAL 1... (B55-3/B65-3 with regulator R316T)



09. ELECTRIC EQUIPMENT

List of components LAL 1... (B55-3/B65-3 och B55-3/B65-3)

A1	Oil burner control
A6	Regulator R316T
B1	Photoresistor
F1	Operating fuse
F2	Fuse
F3	Fuse
F4	Fuse 1A
H1	Lamp, Stage 1
H2	Lamp, Stage 2
H3	Lamp, Stage 3
H5	Alarm signal 230V
K1	Thermal overload protection
M1	Burner motor
M2	Damper motor L&S SQN75.436A21B
P1	Time meter, Stage 1
P2	Time meter, Stage 2
P3	Time meter, Stage 3
S1	Operating switch
S2	Operating switch, Stage 2
S3	Operation thermostat
S4	Temperature limiter
S5	Micro switch for hinged door
S6	Control thermostat, Stage 2
S7	Main switch 3-phase
S8	Operating switch, Stage 3
S9	Control thermostat, Stage 3
S20	Main switch 1-phase
T1	Ignition transformeR
X1	Connection terminal board
X2	Earth terminal
X3	Plug-in contact "Euro", burner
X4	Plug-in contact "Euro", boiler
X5	Plug-in contact "Euro", Stage 3 burner
X6	Plug-in contact "Euro", Stage 3 boiler
X7	Plug-in contact "Euro" 3-phase, burner
X8	Plug-in contact "Euro", 3-phase, boiler
X9	Plug-in contact regulator, burner
X10	Plug-in contact regulator, PT 100-resistance thermometer
X23	Plug-in contact "Euro", Stage 2 burner
X24	Plug-in contact "Euro", Stage 2 boiler
Y1	Solenoid valve 1
Y2	Solenoid valve 2
Y3	Solenoid valve 3
Y1S	Safety solenoid valve (Only burners with a capacity over 100 kg/h)

If S6 is missing connection between L1 and L2.
If S9 is missing connection between T6 and T8.
Mains connection and fuse in accordance with local regulations.

Function LAL 1...

1. Operating switch ON, twin thermostat ON Air damper closed
The burner motor starts.

2. Ignition spark is formed
Ignition spark is formed. Air damper motor opens the damper to stage 3.

3. Air damper motor closes
The air damper motor closes to stage 1.

4. Solenoid valve 1 opens
The oil mist is ignited. The photoresistor indicates a flame.

5. The safety time expires

a. If there is no flame established **before** this time limit the burner control locks out.
b. If the flame for some reason disappears **after** this time limit the burner control also locks out. If a repetition of the start-up sequence is desired, the wire link marked "Repetition" on the side of the base plate of the control must be removed.

6. Thermostat and switch Stage 2 ON
The burner can now change over to stage 2.

7. Thermostat and switch Stage 3 ON
The burner can now change over to stage 3.

8-9. Operating position
The burner can now change between stage 1, 2 and 3. The burner operation is interrupted by means of the operating switch or the thermostat.

The control locks out

A red lamp in the control is lit. Move the transparent cover aside and restart the burner by pressing the reset button.

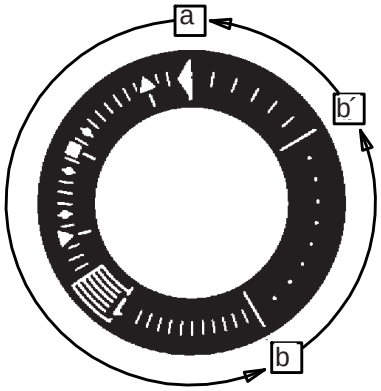
Note!

In the window of the control symbols appear showing in which position the control locks out , see the adjoining explanation.

09. ELECTRIC EQUIPMENT

Control programme under fault conditions and lock-out indication LAL 1...

In the event of fault conditions the sequence switch stops and simultaneosly the lock-out indicator. The symbol appearing above the reading mark indicates kind of fault:



◀ **No start,**
because e.g., the CLOSE signal has not been supplied to terminal 8 by the limit switch, or a contact has not been closed between terminals 4 and 5.

▲ **Shut-down of start-up sequence,**
because the OPEN signal has not been supplied to terminal 8 by the limit switch. Terminals 6, 7 and 15 remain under voltage until the fault is corrected.

■ **Lock-out**
due to a fault in the super-vision circuit.

▼ **Shut-down of start-up sequence,**
because the position signal for the low-flame position has not been supplied to terminal 8 by the auxiliary switch. Terminals 6, 7 and 15 remain under voltage until the fault is corrected.

1 **Lock-out,**
because no flame signal has been received on completion of the saftey time.

| **Lock-out,**
because the flame signal has been lost during burner operation or air pressure failure has occurred.

◀ **Lock-out on completion or after completion of control programme sequence**
due to extraneous light (e.g. flame not extinguished, leaking fuel valves) or due to a faulty flame signal (e.g. fault in flame supervision circuit or similar).

a - b **Start-up sequence**

b - b´ **"idle steps"**
up to the self shutdown of the sequence switch

b (b´) - a **Post-purge sequence**

Technical data LAL 1...

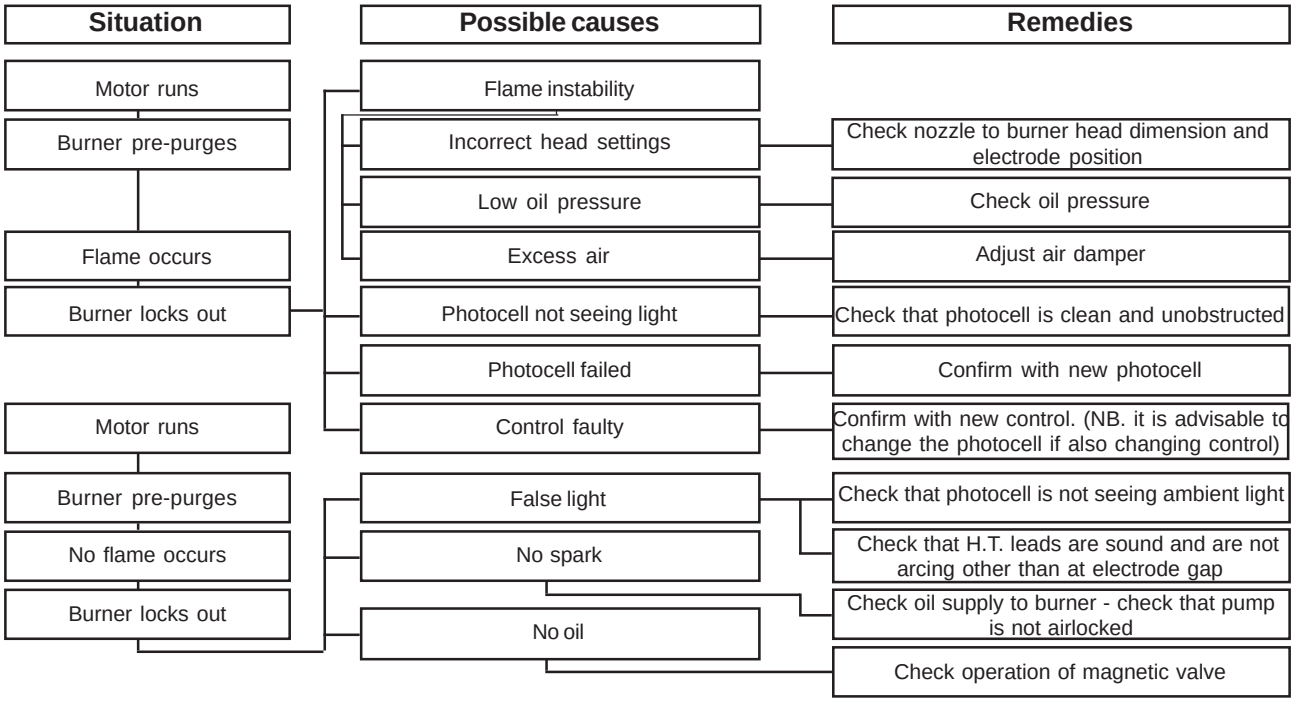
Pre-ignition time:	from start
Pre-purge time with full air volume:	22 s
Safety time:	5 s
Post-ignition time:	15 s
Interval between Mv1 and Mv2:	7,5 s
Reset after lock-out:	Immediately
Time of re-start:	47 s
Ambient temperature:	- 20 to + 60°C
Min. required current at 220 V and 240 V respectively:	95/105 µ A
Max. current:	160 µ A
Protective standard:	IP40

Control of photo current

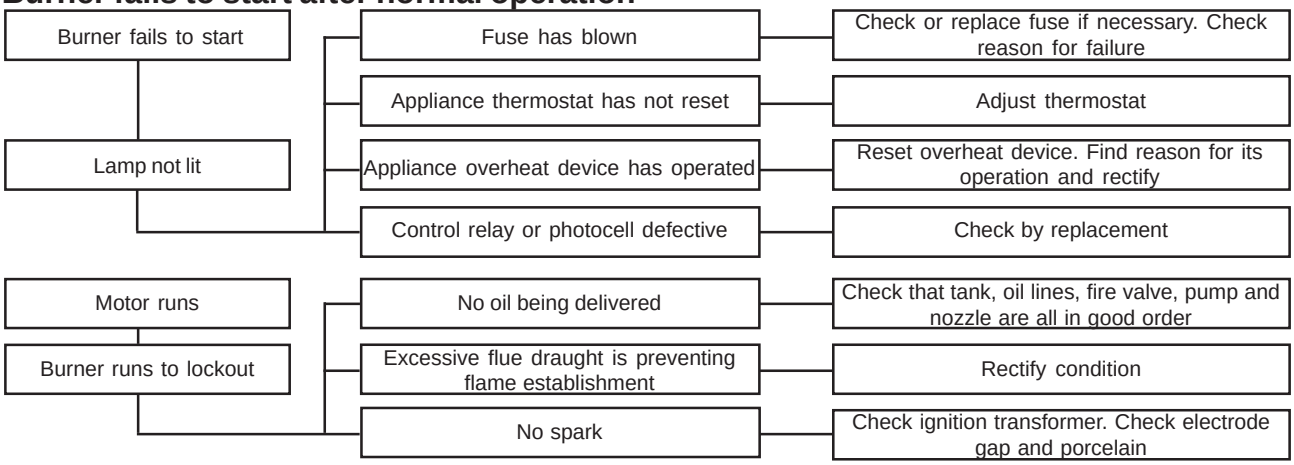
Current through photo unit is measured with a d.c. ammeter (a moving coil instrument connected in series with the photo unit).

10. FAULT LOCATION

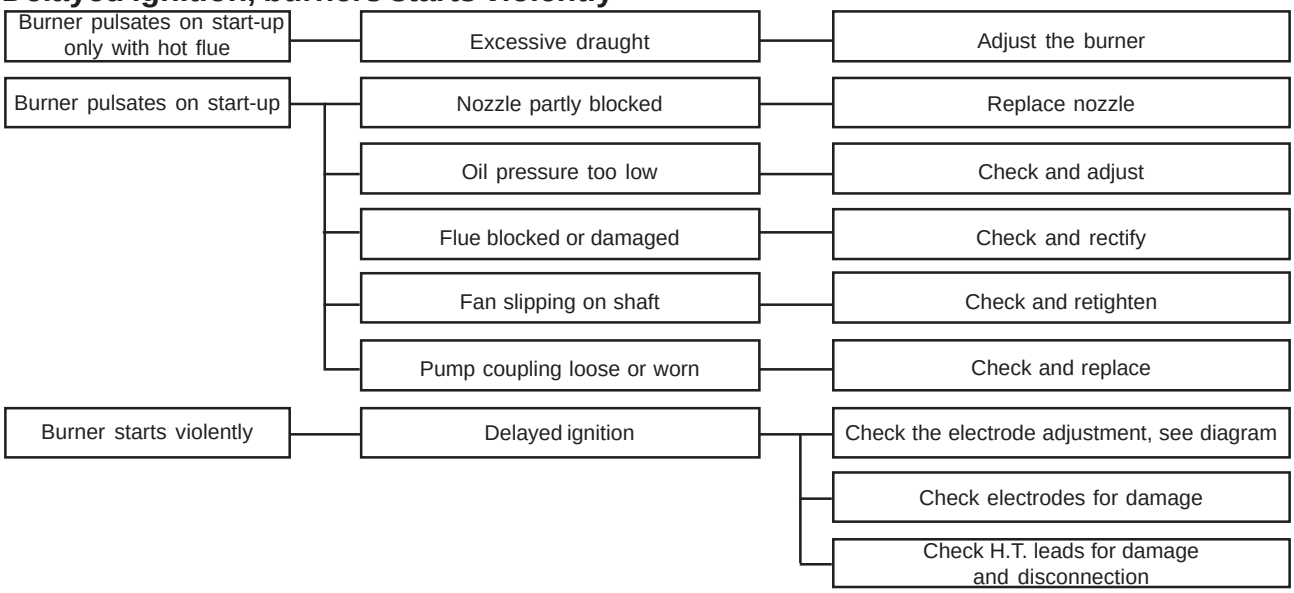
Burner fails to start



Burner fails to start after normal operation



Delayed ignition, burners starts violently



11. SPARE PART LIST

11. SPARE PART LIST

1. Flame cone
- 304mm **119 728 0105**
- 404mm **119 728 0205**
- 504mm **119 728 0305**

55
- 288mm **119 721 0105**
- 388mm **119 721 0205**
- 488mm **119 721 0305**

65

2. Nozzle assembly
- 380mm **919 746 01**
- 480mm **919 746 02**
- 580mm **919 746 03**

55-2
- 380mm **919 749 01**
- 480mm **919 749 02**
- 580mm **919 749 03**

65-2
- 368mm **919 750 01**
- 468mm **919 750 02**
- 568mm **919 750 03**

55-3
- 368mm **919 751 01**
- 468mm **919 751 02**
- 568mm **919 751 03**

65-3

3. Nozzle line
- 368mm **118 414 01**
- 468mm **118 414 02**
- 568mm **118 414 04**

55-3, 65-3
- 380mm **118 104 01**
- 480mm **118 104 02**
- 580mm **118 104 04**

55-2, 65-2

4. Brake plate
- 55-2, Ø120mm **119 347 01**
- 55-3, Ø120mm **119 735 01**
- 65-2, Ø120mm **112 841 15**
- 65-3, Ø120mm **112 841 19**

5. Bracket **112 738 01**

6. Bracket **111 552 01**

7. Ignition electrode pair off
- 55-3, 65-3 **919 247 01**
- 65-2 **919 246 01**
- 55-2 **919 245 01**

8. Adjustment plate compl.
- 55-2H, 65-2H **118 229 01**

9. Adjustment plate compl.
- 55-R, 65-R **918 288 01**

10. Axle compl.
- 55-2, 65-2 **918 298 02**
- 55-3, 65-3 **918 298 01**

11. Adjustment bar
- 55-3, 65-3 **118 450 01**
- 55-2, 65-2 **118 290 01**

12. Adjustment device
- 55-R, 65-R **918 299 04**

13. Gasket set
- 55-R, 65-R **118 322 02**

14. Nozzle key **113 461 01**

15. O-ring, nozzle assembly
- 55-3, 65-3 **113 168 02**

16. Fixing flange compl. **118 490 02**
- Guide bars **118 093 02**
- Fixing flange **118 235 01**

17. Gasket **112 788 03**

18. Gasket fan housing-flange **118 398 01**

19. Motor
- 0,75kW 3-phase **120 316 01**

55
- 1,5kW 3-phase **120 316 03**

65

20. Cable 700mm **119 449 03**

21. Fan wheel
- 224x62x19 **118 245 04**

55
- 224x82x19 **118 245 05**

65

22. Drive coupling compl. **118 115 03**

23. Coupling part, pump **04 390 448 66**

24. Coupling part, fan wheel **118 065 01**

25. Flange, motor **119 737 0105**

26. Conical shield plate **117 935 01**

27. Pump
- RSA95 **110 197 23**

55
- RSA125 **110 197 19**

65

28. Solenoid valve compl. **919 946 01**
- Coil **115 971 01**

29. Solenoid valve bloc compl. **919 947 01**
55-2, 65-2

30. Solenoid valve bloc compl. **919 947 02**
55-3, 65-3

31. Connecting pipe pump-solenoid valve bloc compl. **118 237 01**
55-2H, 65-2H

32. Connecting pipe solenoid valve-adjustment device **118 428 01**
55-2H, 65-2H

33. Nipple, connection solenoid valve bloc **118 423 01**

34. Angle **118 404 01**
55-2, 65-2

35. Copper gasket **110 212 16**
10,2x15x1,5

36. Cable solenoid valve
- Stage1, 3 700mm **115 975 03**
- Stage 2 900mm **115 975 06**

37. Hydraulic hose **118 293 01**
55-2, 65-2

38. Hydraulic hose **116 168 01**
65-2

39. Filter set **117 833 01**
RSA 90, 125

40. Control box
- LAL 1.25 **914 939 01**
- LOA44252A27 **915 595 02**
- LMO24.255.R2B **920 242 01**

55-2, 65-2

11. SPARE PART LIST

41. Relay base
LAL **114 942 00**
LOA/LMO **915 596 00**
55-2, 65-2

42. Flange, **112 405 01**
Photoresistor
QRB1

43. Photoresistor **912 409 08**
compl.
QRB-A
700mm

44. Contactor CI 9 **113 110 01**

45. Thermal overload protection
2,7-4,2A **113 111 03**
65
1,8-2,8A **113 111 06**
55

46. Switch
I-II **120 149 01**
0-I **120 149 02**

47. Time meter **117 678 01**

48. Plug-in contact compl.
female 7-pole **115 586 03**
male 7-pole **115 585 00**
green
male 4-pole **119 197 01**
female 4-pole **119 198 01**
55-2, 65-2 stage 2
55-3, 65-3 stage 3
black
male 4-pole **119 103 01**
female 4-pole **119 104 01**
55-3, 65-3 stage 2
male 5-pole **119 199 01**
female 5-pole **119 200 01**

49. Indicating lamp **117 211 03**
green

50. Fuse holder compl.
55-3, 65-3 **118 118 03**
55-2, 65-2 **118 118 04**
Fuse 6,3A **113 322 01**

51. Plug-in contact compl.
7+4+5+4-pole **119 486 10**
55-3, 65-3
4+7+5-pole **119 486 01**
55-2,65-2

52. Locking ring **118 018 01**

53. Inspection glass **118 088 01**

54. Gasket **117 953 01**

55. Protective grating **118 319 01**

56. Cover **118 238 0105**

57. Gasket **118 249 01**

58. Cover, **118 242 0205**
inspection glass

59. Inspection cover **117 080 01**

60. Test nipple **118 053 01**

61. Slewing bracket **119 470 01**
compl.

62. Covering plate,
servo motor **118 239 01 05**
adjustment **118 401 01 05**
device
55-2H, 65-2H

63. End piece **118 103 01**

64. Servo motor
SQN75.294A21B **119 423 03**
2-stage, LAL
SQN75.436A21B **119 423 01**
3-stage, LAL
SQN75.244A21B **119 423 04**
2-stage, LOA/LMO

65. Air damper **918 240 02**
compl.
55-2H, 65-2H **918 241 02**

66. Adjustment device **917 565 03**
55-2H, 65-2H
Spring, compl. **133 799 01**
adjustment device
55-2H, 65-2H

67. Transformer EBI **115 977 01**
Cabel **117 570 04**

68. Ignition cable **119 337 06**
500mm

69. Flexible pipe **113 542 08**
1500mm

70. Oil filter compl. ½" **114 293 04**
Filter **914 314 03**