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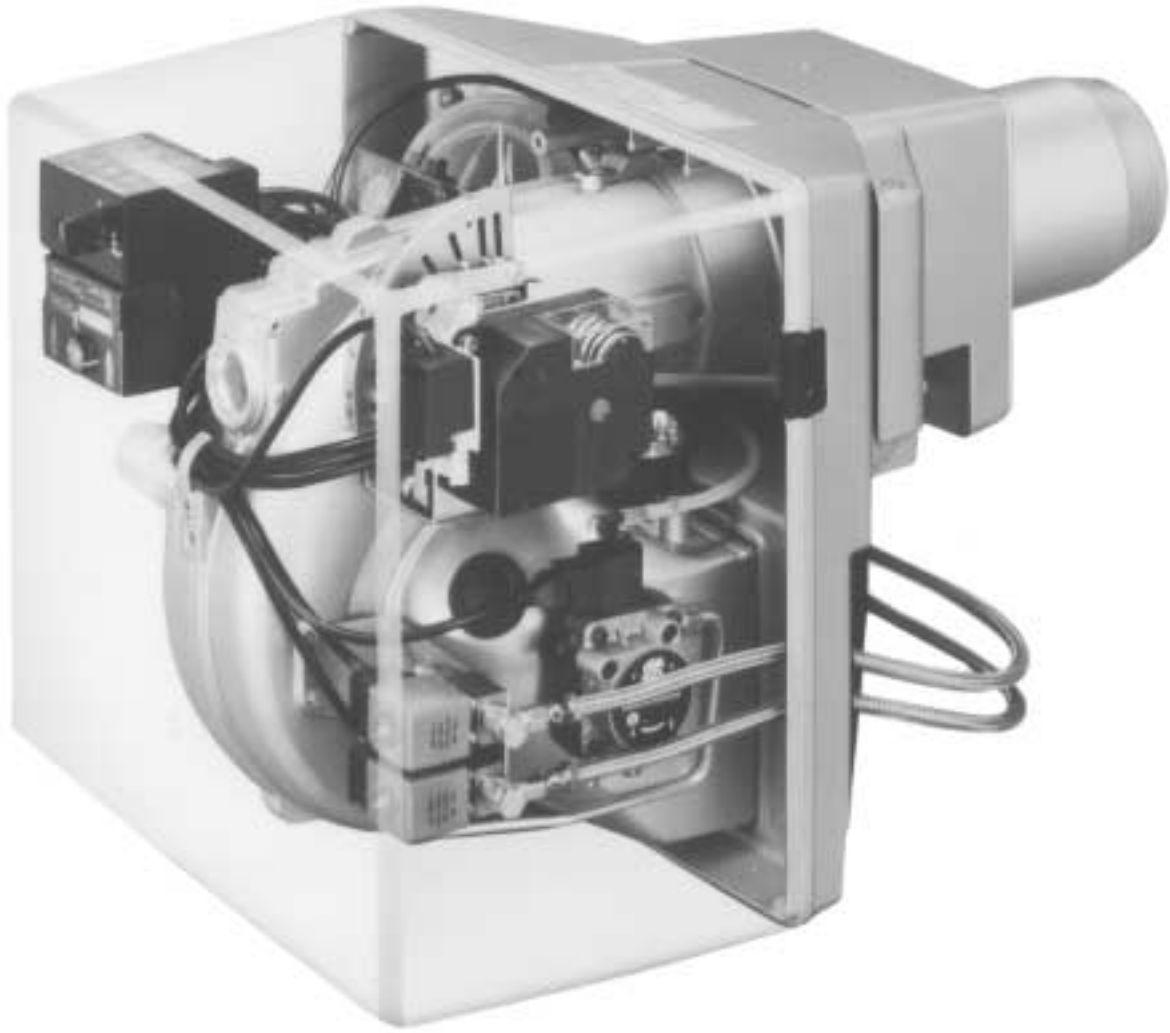
Installation and operating instructions Weishaupt dual fuel burners WGL30

for gas types Natural Gas E and LL, Liquid Petroleum Gas B / P and oil EL

– weishaupt –



Conformity certification

We hereby confirm that Weishaupt dual fuel burners

WGL30...

conform to the basic requirements of the following EC guidelines:

– 90/396/EEC Gas Appliances Directive
– 98/37/EEC Construction Products Directive
– 89/392/EEC Machinery Directive
– 92/31/EEC Electromagnetic Compatibility Directive
– 93/68/EEC Low Voltage Directive
– 92/42/EEC Hot Water Boiler Efficiency Directive

Therefore the burner carries the CE Label.

Extensive quality assurance is guaranteed by a certified Quality Management System to DIN EN ISO 9001.

Max Weishaupt GmbH
Burner and Heating Systems
D-88475 Schwendi

Contents

Regular maintenance saves energy and protects the environment

We recommend regular plant maintenance of all combustion equipment. It saves fuel and ensures constantly good combustion results.

Excellent combustion quality is a pre-requisite for environmentally friendly operation.

Abbreviated instructions

The following table gives an overview of the procedures for installation and commissioning.

To ensure safe installation and commissioning all instructions given in these installation and operating instructions must be followed.

Step	Action	Chapter
1	Burner installation	2.2 to 2.4
2	Installation of oil supply	2.6
3	Installation of gas valve trains	2.3
4	Soundness test of valve trains	2.7.1
5	Checking the gas supply pressure	2.7.3
6	Venting the gas supply line	2.7.3 and 2.7.4
7	Sequence test	2.7.2
8	Nozzle selection	3.2
9	Checking the mixing head	3.3
10	Checking the plant	2.7.5
11	Commissioning gas side	2.8.1
12	Commissioning oil side	2.8.2

Safety

To ensure safe burner operation, the burner has to be installed and commissioned by qualified personnel and all guidelines in these operating instructions have to be followed.

Special attention should be paid to the relevant installation and safety guidelines given (i.e. local Codes of Practice).

Flame monitoring devices, limit controls, correcting elements and all other safety devices must be commissioned by, and may only be replaced by, the manufacturer or the authorised agent.

Failure to comply can lead to serious injury or death and can cause considerable damage to the plant.

Qualified personnel according to this operating manual are persons who are familiar with the installation, mounting, setting and commissioning of the product and which have the necessary qualifications such as:

– Training, instruction or authorisation to switch electrical circuits and electrical devices on and off, to earth them and to mark them in accordance with the safety standards.

– Training, instruction or authorisation to carry out installation, alteration and maintenance work on gas installations in buildings and on site.

– Training, instruction or authorisation to use fuels in accordance with the relevant regulations for flammable liquids in the relevant degree of danger class (oil EL degree of danger class A III).

Operating instructions

The installation and operating instructions included with each burner must be displayed clearly in the plant room. We refer to DIN 4755, point 5 and DIN 4756, point 6. The address of the nearest service centre must be entered on the reverse of the instructions.

Instruction of personnel

Problems are often caused by incorrect burner operation. The operating staff should be thoroughly instructed with regard to the operation of the burner. With frequently occurring burner faults, the nearest service centre must be notified.

Installation

The installation of oil fired equipment must be carried out in accordance with extensive guidelines and regulations. It is the duty of the installer to familiarise himself with all regulations. Installation, commissioning and maintenance must be carried out with care. Fuel oils to DIN 51 603, part 1 should be used.

Electrical wiring

Each burner is supplied with a wiring diagram and burner connection diagram as standard.

Maintenance

If, during maintenance, control seal joints have to be opened, these have to be thoroughly cleaned and new seals fitted when re-assembling.

Maintenance and service
In accordance with DIN 4755 and DIN 4756, the whole installation including the burner should be inspected by a qualified engineer of the supplier at least once a year. The combustion figures should be checked after each service and each time a fault has been rectified.

Ambient requirements
Material, construction and type of protection of the burner and gas valve trains are designed for use indoors. The permitted ambient temperature is -15°C to + 40°C

Electrical installation
When installing the electrical connection cables ensure that these are long enough to allow the burner and boiler door to be hinged open.

Control circuits, which are taken from one of the supply phases, must only be connected with an earthed neutral conductor.

On a mains supply which is not earthed the control voltage must be supplied via an isolating transformer.

The pole of the transformer, which is to be used as the neutral conductor must be earthed.

The control circuit phase and neutral conductors must be connected correctly.

Ensure the correct fuse ratings are not exceeded. Earthing and neutral conductors must conform to local regulations.

General information for gas operation
When installing a gas combustion system, local regulations and guidelines must be observed.

The subcontractor responsible for the installation or changes of the gas system must inform the gas supplier of the type and extent of the installation planned and the intended work. The subcontractor must ascertain that an adequate gas supply to the installation is ensured. Installation, alteration and maintenance work on gas systems in buildings and on process sites, must only be carried out by installers who have a contract with the gas supplier.

Gas characteristics
The following information must be obtained from the gas supplier:
Type of gas, calorific value in kWh/m^3, max. CO_2 content of flue gas, gas supply pressure.

Gas line
The gas pipework must be subject to a preliminary and main test or the combined loading test and soundness test, according to the pressure range intended. The air or purge gas required for the test must be expelled from the pipework.

The determination of the pipework diameter usually gives a diameter, which is at least one diameter larger than the size of the burner valve train.

Gas valve train
Observe the sequence and flow direction. The distance between burner and DMV valve should be as small as possible in order to guarantee trouble free start.

Pipe thread connection
Only tested and approved sealing material should be used. Please observe individual user instructions!

Soundness test
Brush connection points with foam forming agents or similar, non-corroding material.

Gas types
The burner must only be operated with the type of gas stipulated on its name plate. When converting to other types of gas re-commissioning is required. A conversion kit may also be needed.

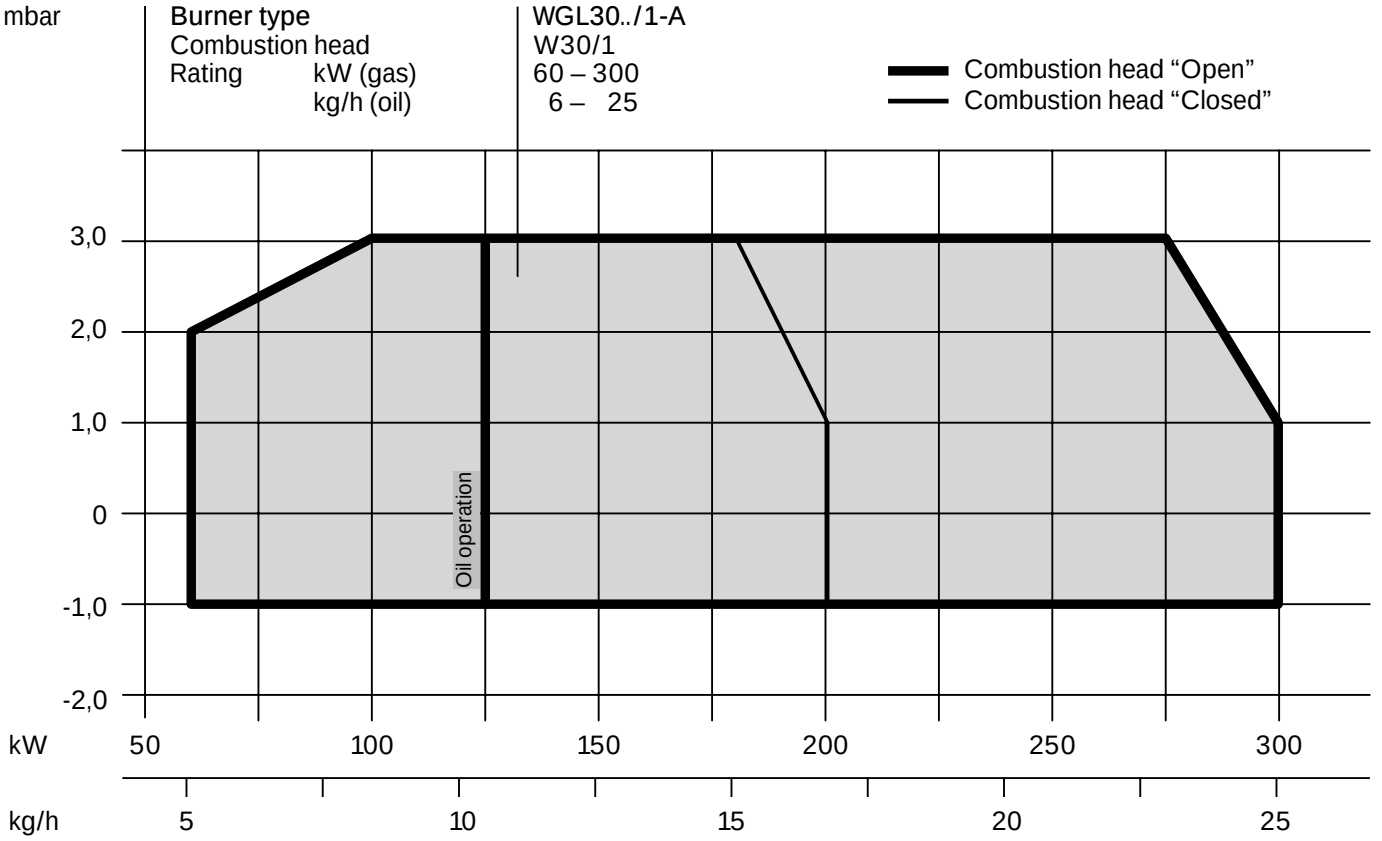
Valve train installation
The valve train must be fixed and supported securely. Standard connection is from the right.

Gas meter
The siting, size and type of gas meter are the responsibility of the gas supplier. Only those meters, which have been approved should be used. If no gas meter is fitted, as for instance on liquid petroleum gas installations, the operator has to be made aware that the burner can not be set to its optimum, because basic testing is not possible without a meter installation.

Thermal shut off device TAE
If a thermal shut off device is required, this should be fitted in front of the ball valve.

2. Installation

2.1 Capacity graphs

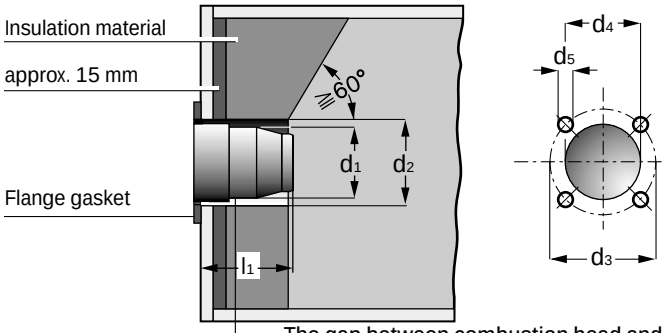


2.2 Dimensions for burner installation

The drawing shows a refractory for heating appliances without cooled front. The front edge of the combustion head should protrude beyond the refractory by approx. 30 mm. Alternatively the refractory may take a conical form (≥ 60°C). Refractory may not be required on boilers with water cooled fronts, depending on the boiler manufacturer’s instructions.

The fixing plate of the heat exchanger must be to the dimensions given below (EN 226).

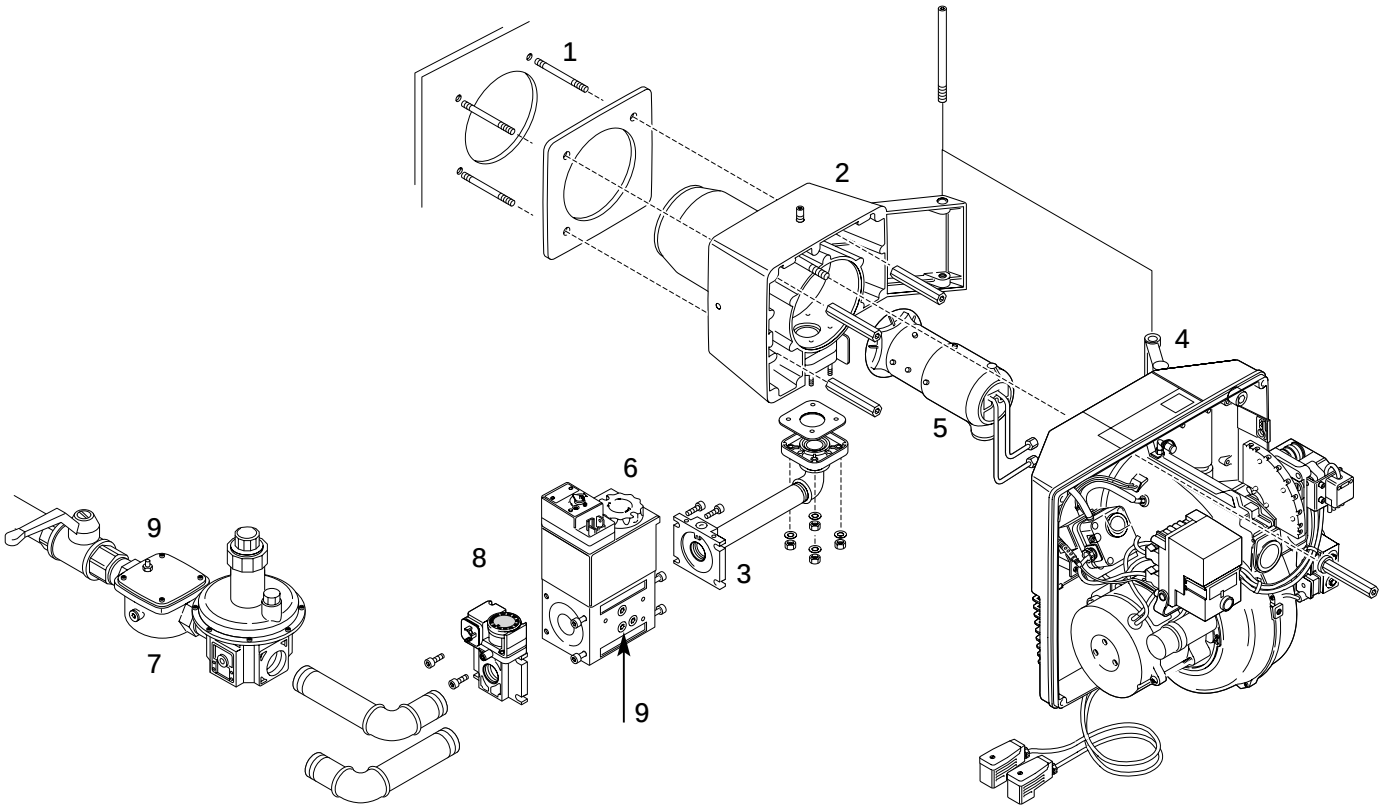
Installation example for heat exchanger with refractory



The gap between combustion head and refractory must be filled with flexible insulating material. Do not make solid.

Combustion head type	Dimensions in mm d_1	d_2	d_3	d_4	d_5	l_1
W30/1	128	140	170	130	M8	170

2.3 Burner and valve train installation



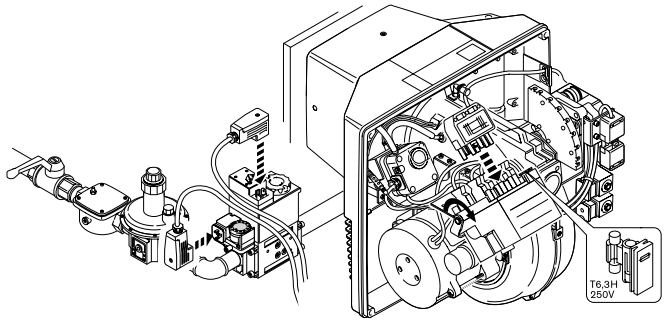
Exploded view
1 Studs
2 Burner flange
3 Valve train to burner flange
4 Burner head to body hinge flange
5 Mixing head
6 DMV valve
7 Pre assembled valve train section
8 Pressure switch
9 Pressure test nipple (fitted to filter inlet and DMV test point 1)

Assembly alignment and joint cleanliness must be ensured. The 'O'-ring seals must be fitted correctly on the machined faces. Do not compensate for misalignment by over tightening. Assemble gas train remotely from the burner to avoid damage to the burner (damage to flange fixing screws).

Attention!
If no elbow is used between FRS and DMV, then a double nipple of minimum 200 mm long must be used.

2.4 Electrical connection

The 7-pole connection plug of the boiler control is fitted directly to the connection console of the burner. For two stage version the additional 4-pole plug X7 is plugged into the servomotor connection. The two cable plugs from the burner housing are used for connection to the gas valves and the pressure switch. (GW = gas pressure switch, DMV = solenoid valve)



2.5 Fusing

To protect the electrical components of the burner a fuse (T6.3 A) is fitted in the back of the connection console. A replacement fuse has also been fitted in the socket.

2.6 Oil supply

The oil supply installation must be in a position where tension free connection of the oil hoses is possible.

A foot valve, isolating valve and a filter with a mesh size of 0.1 mm max. must be fitted in the suction line. A non return valve must be fitted in the return flow line.

For oil tank installations, which are at a higher elevation than the burner, a shut off valve is recommended to stop the gravity-flow of oil into the supply line during burner shut down. We recommend the use of a solenoid valve (normally closed) to carry out this function. Anti-siphon valves are not recommended due to their high resistance.

The burner can be connected to a two pipe system with a suction and return line (picture 2) or to a single pipe system (picture 1) - in which case remove the bypass plug in the pump. In either case the supply pressure must not exceed 2.0 bar.

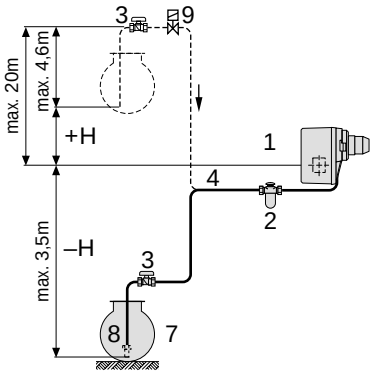
The oil lines must undergo a pressure test after installation. This is carried out using compressed air or nitrogen with a minimum pressure of 5 bar. The burner must not be connected during the test. All horizontal and vertical pipes, including bends, are designated as the equivalent total pipeline length. The static suction height H (max. 4.0 m) is the vertical distance between the pump and the suction valve in the tank. The suction resistance should not exceed 0.4 bar. A higher suction-lift will cause severe noise and result in damage to the pump.

Filter

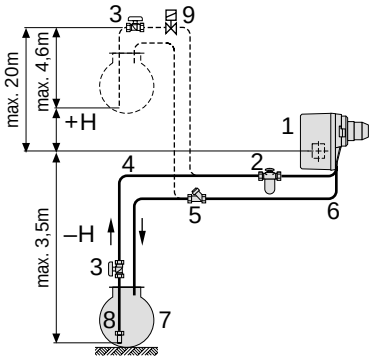
An oil filter must be fitted at the end of the oil line before the burner's pump. The oil filter must be installed between the rigid suction line and the flexible oil hoses. The filter protects the burner from foreign bodies in the oil and supply pipes. The following problems can occur without an oil filter:

- Pump seizure,
- Fouling of solenoid valve, atomising nozzle etc.

Picture 1 - single pipe system



Picture 2 - two pipe system



1 Oil burner
2 Filter with shut off valve
3 Quick action isolating valve
4 Suction line
5 Non return valve
6 Return line
7 Fuel oil storage tank
8 Foot valve
9 Solenoid valve

Determination of pipe line length on:

Single pipe installation

Oil throughput [kg/h]	DN [mm]	H [m] 4.0	3.5	3.0	2.5	2.0	1.5	1.0	0.5	0	-0.5	-1.0	-1.5	-2.0	-2.5	- 3.0	-3.5	-4.0
2.5 to 6.3	4	44	41	39	36	34	31	29	26	24	21	19	16	13	11	8	6	3
	6	100	100	100	100	100	100	100	100	100	100	93	84	71	59	4 6	33	20
	8	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
6.3 to 12	6	100	100	97	94	89	82	76	69	63	56	50	43	36	30	23	16	8
	8	100	100	100	100	100	100	100	100	100	100	100	100	98	87	75	54	34
12 to 25	6	59	56	53	50	46	43	40	37	34	31	27	24	21	18	15	12	9
	8	100	100	100	100	100	100	100	100	100	97	87	77	65	57	47	37	27

Two pipe installation

Pumps	DN [mm]	H [m] 4.0	3.5	3.0	2.5	2.0	1.5	1.0	0.5	0	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-3.5	-4.0
AL 65 C	6	16	15	14	13	12	12	11	10	9	8	7	7	6	5	–	–	–
	8	50	47	45	42	39	37	34	31	29	26	23	21	18	15	13	10	7
	10	100	100	100	100	96	90	83	77	70	64	57	50	44	37	31	24	18

Determination of dimension of pipe line

The above tables for one-pipe and two-pipe installations show the maximum pipe line lengths depending on 3 factors:

- Elevation difference between pump and tank (H)
- Oil throughput and/or pump type
- Pipe line diameter (NB)

Average individual resistances resulting from the filter, foot valve, shut off valve and pipe bend have been allowed for in these tables.

When installing the oil hoses in the supply and return (between pump and rigid pipe installation) pay attention to product specific installation drawings.

For oil EL oil hoses to DIN 4798, part 1, pressure class A, are supplied.

Technical data:
Nominal pressure _____ P_N = 10 bar
Test pressure _____ P_P = 15 bar
Operating temperature _____ T_B = 70°C

After installation the oil lines must undergo a pressure test. This is carried out using compressed air or nitrogen with a minimum pressure of 5 bar. The burner must not be connected during this test.

2.7 Safety checks prior to commissioning

2.7.1 Soundness test of valve trains

Soundness test of the gas train must be carried out with the main isolating cock and DMV valves closed.

1st. Test phase: ball cock up to 1st valve seat (V1)

The test assembly is connected to the gas filter and DMV inlet. During pressure testing, the test point 2 between DMV valve seats V1 and V2 has to be opened.

2nd. Test phase: volume between 1st and 2nd valve seat

The test assembly is fitted to the DMV test point 2. Test point 3 is opened.

3rd. Test phase: Valve train connection parts and gas butterfly valve

The test assembly is fitted to the DMV outlet. For pressure testing, the blanking plate supplied must be fitted between mixing head and the gas butterfly.

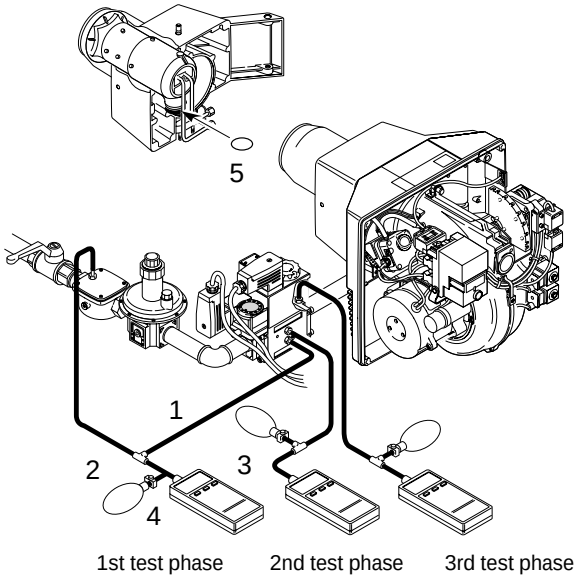
Attention!
Following a successful pressure test, the blanking plate must be removed, ensuring a gas tight seal is made.

The test pressure in the valve trains should be a minimum of 100 - 150 mbar.

Wait 5 minutes for pressure equalisation.
The valve train is not leaking if the pressure drop is no more than 1 mbar after the test period of 5 minutes has elapsed. External leaks can be found by brushing on a soap solution or by using a special leak locating spray. No bubbles should appear.

Results of the pressure test must be recorded on the service/commissioning report.

Attention!
After all maintenance and commissioning work on gas supplying components a soundness test must be carried out.



Legend:
1 Rubber hose with T piece
2 Aspirator
3 U-tube manometer or electronic manometer
4 Hose clamp
5 Blanking plate

2.7.2 Sequence test without gas

Wiring connection check

Check that the wiring to all parts, especially the valve train, is carried out in accordance with the wiring diagram supplied with the burner.

Checking sequence of operation (without gas)

When the gas and electric side of the installation has been checked, the burner sequence test is carried out. The isolation valve must be closed.

Using the aspirator connected to test point 1 of the DMV, air is pumped into the valve train. The pressure must correspond at least to the subsequent operating pressure.

The plant is then switched on.
Fault signals are described in the program sequence of the controller

If faults occur during the sequence test refer to the instructions of controller.

2.7.3 Purging the gas supply line

Lines have to be purged with gas until the remaining air or inert gas has been expelled from the line. This work is carried out by qualified gas fitters. If work has been carried out on the gas line, i.e. exchanging of parts, valve trains or gas meters, re-commissioning may only be carried out after the relevant lines have been purged by a qualified gas fitter.

2.7.4 Purging the gas valve train

Before switching on for trial start the valve train must also be purged. A hose, leading out to safe atmosphere, is connected to the test point 1 of the DMV valve to purge the air.

The isolating valve is opened and the gas in the pipework vents to atmosphere via the hose. Small amounts of gas can be burnt off at the exit of the hose via a suitable burner, i.e. test burner.

If the replacement of parts is needed when working on valve trains, purging and testing for air has to be carried out before re-commissioning the burner.

2.7.5 Checking the heat exchanger

The following should be checked before trial start:
- the heating appliance is adequately filled with water
- on air heaters the fan is operating correctly
- flue ways are clear and explosion flaps are free to move
- refractory, where used, is installed correctly
- a measuring point is provided for flue gas sampling
- correct setting of temperature regulator or pressure regulator and limit controls
- ensure the gas connection is correct

2.8 Commissioning and adjustment

2.8.1 Gas side

Combustion head setting dimension X

– Pre-set to diagram in chapter 3.1

Air damper setting

– Disengage the servomotor.

– Turn cam disc to full load
(servomotor and gas butterfly valve = 90°).

– In this position, pre-set the air damper to diagram chapter 3.1 by adjusting the curve band.

– Adjust the spring band to achieve even adjustment of the air damper across the whole range

– Re-engage servomotor.

– Set On/Off switch on servomotor to position “1”.

Burner adjustment

– Set fuel selection switch to “Gas”.

– Open ball valve and switch on burner.

– Burner runs to full load (pre-purge approx. 30 secs).

– The servomotor then closes (ignition position).

– Once the ignition position has been reached, set the On/Off switch on the servomotor to position “0”.

– Await flame formation.

– Set regulating pressure Pa to the value given in the table (see chapter 3.1).

– Set the O_2 or CO_2 value relating to the gas used with the cam band for the gas butterfly valve.
(Loosen lock nut, see picture, re-tighten when adjusted).

Turn connecting rod to the right to “extend”
= decreased throughput
Turn connecting rod to the left to “shorten”
= increased throughput

	CO_2	O_2
Natural Gas E	8.8 – 9.3 %	5 – 4 %
Natural Gas LL	9.0 – 9.5 %	5 – 4 %
LPG B/P	10.3 – 11.0 %	5 – 4 %

The CO content should not be higher than 0.005 % V (50ppm).

– By operating the On/Off switch of the servomotor, run from partial progressively to full load and correct all combustion settings with the cam band

– The following O_2 and CO_2 values should be achieved with CO as low as possible:

	CO_2	O_2
Natural Gas E	9.1 – 10.0 %	3 – 4.5 %
Natural Gas LL	9.3 – 10.2 %	3 – 4.5 %
LPG B/P	10.7 – 11.7 %	3 – 4.5 %

Set full load

The exact rating setting is the result of the adjustment of the gas throughput calculated for the burner rating. The setting pressure values Pa given in the table serve as a setting aid and guide.

– Set calculated value by adjusting the regulating pressure Pa and check measurements with gas meter

– Carry out combustion test (see chapter 3.7)

– Optimise flue gas values by re-adjusting air cam band

– Carry out re-check of flue gas values on all intermediate settings from full load to partial load as described above. The regulating pressure Pa must not be altered or adjusted. All combustion corrections are carried out by adjusting the air cam band.

Set partial load

– Set the required gas quantity for partial load with the control cams on the servomotor and measure at gas meter. Partial load depends on the lower ratings limits of the capacity graphs, the flue gas temperature and instructions of the appliance manufacturer.

After final setting the On/Off switch on the servomotor must be set to position “1” and the mechanical gears must be re-engaged.

Final testing and documentation

– Set gas pressure switch on full load and check (chapter 3.5.4).

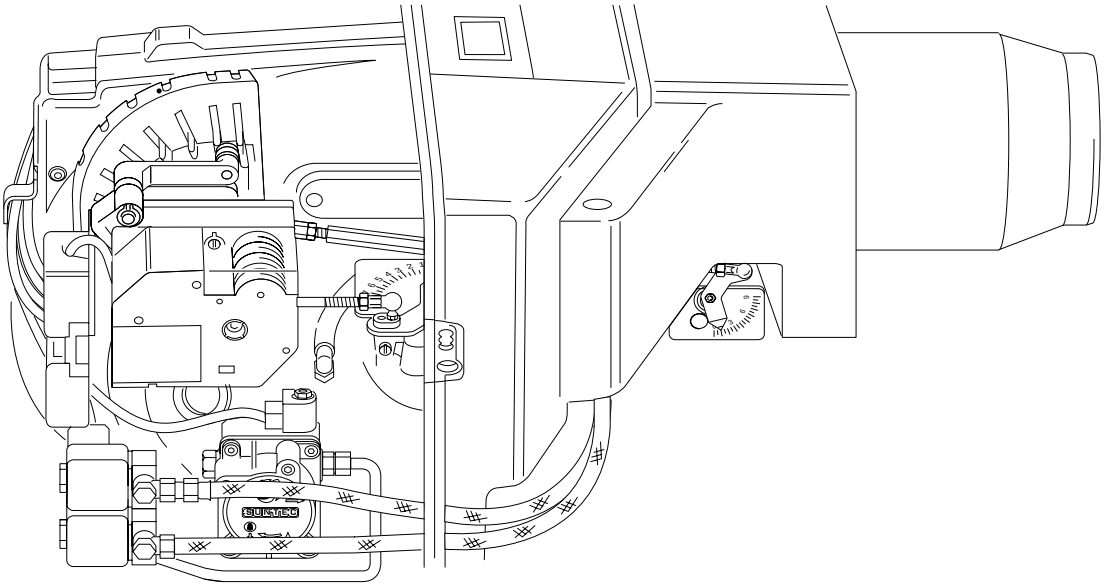
– Check air pressure switch on ignition load (chapter 3.5.5).

– Set control and safety equipment of the appliance, and test their operation

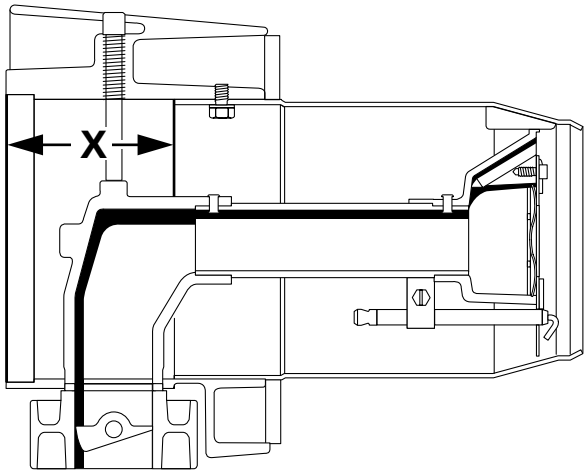
– Record all test results

After all maintenance and commissioning work on gas supplying components a soundness test must be carried out by brushing with soap solution or with leak indicating fluid.

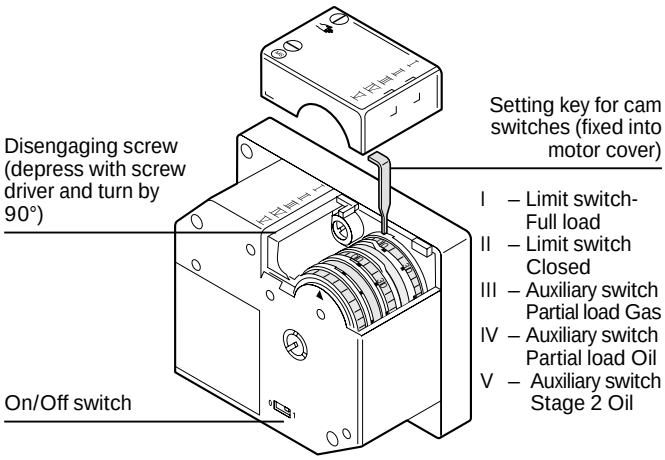
Mechanical gas / air compound regulation burner WGL30, (burner shown in partial load position)



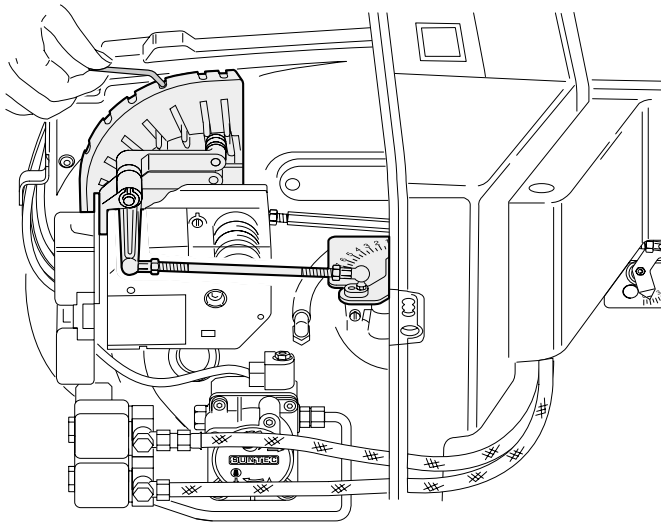
Combustion head setting dimension X



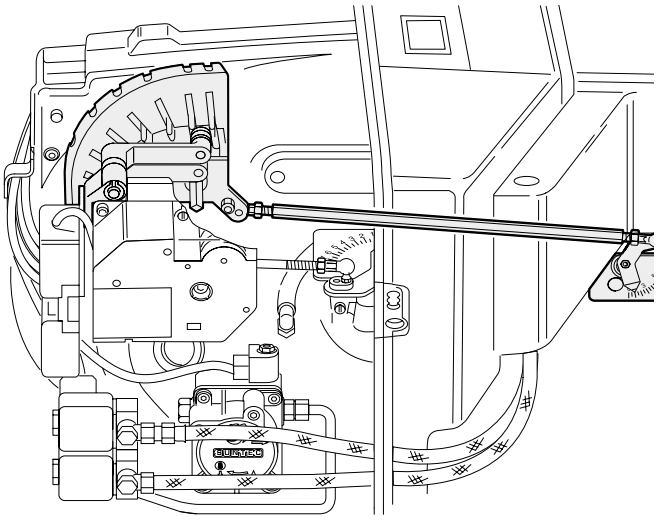
Servomotor SQN 90.200



Air damper setting



Gas butterfly valve setting



A. Nozzle selection
- Select nozzle according to the burner ratings required from table chapter 3.2.

B. Burner pre-setting
Flame tube and cam band have already been set during the gas side commissioning and must not be altered.

- Fit selected nozzles, see chapter 3.2.
- Set control cam IV approx. 10 degrees of angle higher than control cam III (see picture chapter 2.8.1).
- The supply line to the oil pump must be filled with oil prior to commissioning (if necessary use an oil primer to suck oil to the pump)
  Automatic priming could, on some installations, lead to damage of the oil pump (dry run).
- Connect vacuum pressure gauge.

C. Burner adjustment
- Switch fuel selection switch on the burner control to oil operation.
- Servomotor runs to full load position and starts the pre-purge period (approx. 30 secs.).
- The servomotor then runs to partial load position (control cam IV).
- Await ignition and run up to partial load (nozzle 1) and full load (nozzles 1 and 2).
- Switch On/Off switch on servomotor to position “0”.

- Ratings setting full load:
  The setting of the air cam band must not be altered!
  The oil pressure is adjusted by altering the pump pressure (10 to 14 bar) (if necessary select different nozzle sizes).
  A smoke number of < 1 and CO_2 values of > 13% should be achieved with good flame stability.

- Ratings setting partial load:
  Set On/Off switch to position “1”.
  Servomotor runs from full load to partial load. Adjust combustion air quantity with control cam IV.
  Check the combustion values as for full load.

When setting partial load pay attention to the ratings limits of the capacity charts, the flue gas temperature and instructions given by the appliance manufacturer.

D. Documentation
On full and partial load:
- Oil throughput
- Nozzle types
- Pump pressure
- CO_2
- Smoke number
- Flue gas temperature
- Fan pressure
- Combustion chamber pressure
- Sensor current

Attention:
Once the settings for gas and oil have been completed, the On/Off switch on the servomotor must be set to position “1”.

3. Technical description

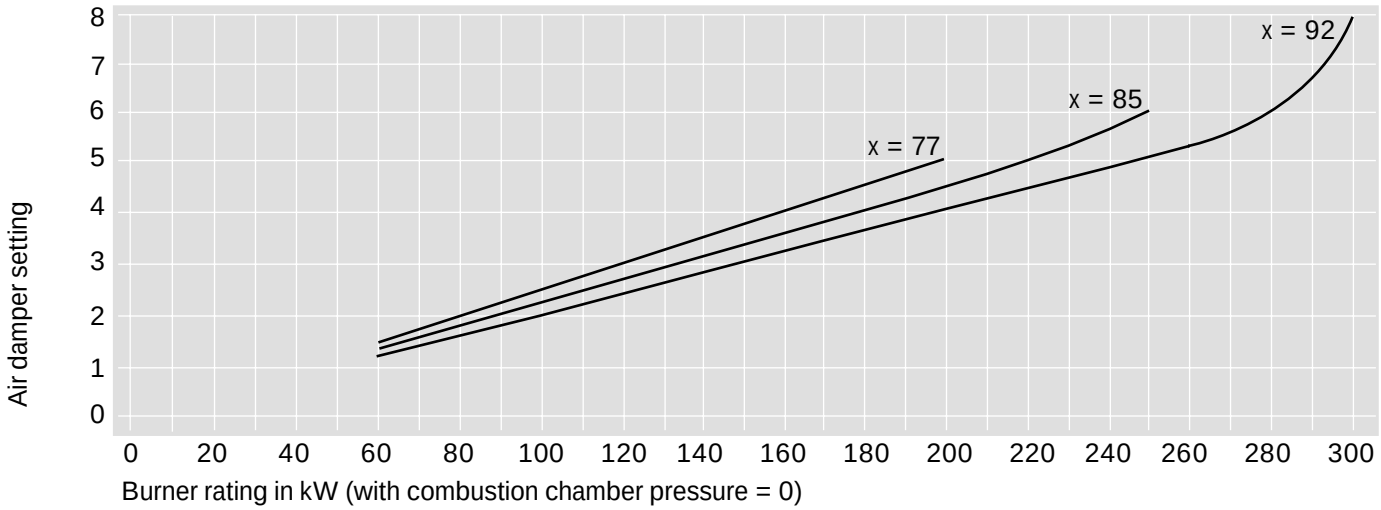
3.1 Mixing head, gas pressure

The results of the following tables have been calculated on flame tubes under idealised conditions. The values are therefore guidelines for basic settings. Small variations may occur when commissioning depending on individual installations.

- Mixing head
  To achieve accurate control it is important to use the whole angle range of the servomotor. This means that the full load setting is usually carried out at 90° b and the relevant flame tube setting (setting dimension X). In some cases, where the low gas pressure regulating limit of Pa = 4 mbar is not attained, a setting with good combustion values must be achieved with a setting angle < 90°.
- Gas pressure
  The pressures given in the table are guide values and must be checked by carrying out a combustion analysis.

Air damper setting depending on burner rating

WGL30../1-A



WGL30N/1-A

Rating kW	Connection pressure into isolating valve in mbar (P_e max = 300 mbar) Nominal diameter of valve trains					Setting pressure into solenoid valve in mbar Nominal diameter of valve trains				
	1/2”	3/4”	1”	1 1/2”	2”	1/2”	3/4”	1”	1 1/2”	2”
Natural Gas E, Hi = 37.26 MJ/m³ (10.35 kWh/m³), d= 0.606, Wi = 47.84 MJ/m³ (13.29 kWh/m³)										
100	15	10	7	6	6	6	5	4	3	3
105	16	10	7	7	6	7	6	4	4	4
110	17	11	8	7	7	8	7	4	4	4
115	19	12	8	7	7	8	7	5	5	5
120	20	13	9	8	8	9	8	5	5	5
125	21	14	10	8	8	10	8	6	6	5
130	23	15	10	9	8	11	9	6	6	6
140	26	17	11	10	9	12	10	7	7	7
150	30	19	12	11	10	14	12	8	8	8
160	33	20	13	11	11	15	13	9	8	8
170	36	22	14	12	11	16	14	9	9	8
180	39	23	14	12	11	18	15	9	9	9
190	43	25	15	13	12	19	16	10	9	9
200	46	27	16	13	12	20	17	10	10	9
210	50	29	17	13	13	22	18	11	10	10
220	54	31	17	14	13	24	19	11	11	10
230	59	33	18	14	13	25	21	12	11	11
240	63	35	19	15	14	27	22	12	12	11
250	68	37	20	15	14	29	23	13	12	11
260	73	40	21	16	15	30	25	13	12	12
270	78	42	22	17	15	32	26	14	13	12
280	83	45	23	17	15	34	27	14	13	13
290	88	47	24	18	16	36	29	15	14	13
300	93	50	25	18	16	38	30	15	14	13
Natural Gas LL, Hi = 31.79 MJ/m³ (8.83 kWh/m³), d= 0.641, Wi = 39.67 MJ/m³ (11.02 kWh/m³)										
100	19	12	8	7	7	8	7	4	4	4
105	21	13	8	7	7	9	7	5	5	4
110	23	14	9	8	7	10	8	5	5	5
115	24	15	10	8	8	11	9	6	6	5
120	26	16	10	9	8	12	10	6	6	6
125	28	17	11	9	9	13	11	7	7	6
130	31	19	12	10	9	14	11	7	7	7
140	35	21	13	11	10	16	13	8	8	8
150	40	24	14	12	11	18	15	9	9	9
160	44	26	15	13	12	19	16	10	10	9
170	48	28	16	13	12	21	18	11	10	10
180	53	30	17	14	13	23	19	11	11	10
190	58	33	18	14	13	25	21	12	11	11
200	64	35	19	15	14	27	22	12	12	11
210	69	38	20	16	14	29	24	13	12	12
220	75	41	21	16	15	31	25	13	13	12
230	81	44	22	17	15	34	27	14	13	12
240	88	47	23	18	16	36	29	15	14	13
250	94	50	25	18	16	38	31	15	14	13
260	101	53	26	19	17	41	32	16	15	14
270	–	57	27	20	17	–	34	17	15	14
280	–	60	28	20	18	–	36	17	16	15
290	–	64	30	21	18	–	38	18	16	15
300	–	67	31	22	19	–	40	18	17	16

Rating kW	Connection pressure into isolating valve in mbar (P_e max = 300 mbar) Nominal diameter of valve trains					Setting pressure into solenoid valve in mbar Nominal diameter of valve trains				
	1/2”	3/4”	1”	1 1/2”	2”	1/2”	3/4”	1”	1 1/2”	2”
Liquid Petroleum Gas B / P, Hi = 93.20 MJ/m³ (25.89 kWh/m³), d = 1.555, Wi = 74.74 MJ/m³ (20.76 kWh/m³)										
100	9	7	6	6	6	4	4	3	3	3
105	10	8	6	6	6	5	4	4	3	3
110	11	8	7	6	6	5	5	4	4	4
115	11	9	7	7	7	6	5	4	4	4
120	12	9	8	7	7	6	6	5	5	5
125	13	10	8	8	7	7	6	5	5	5
130	14	10	9	8	8	7	7	5	5	5
140	16	12	9	9	9	8	8	6	6	6
150	17	13	10	10	9	9	9	7	7	7
160	19	14	11	10	10	10	9	7	7	7
170	20	14	11	10	10	11	10	8	7	7
180	21	15	11	10	10	11	10	8	8	7
190	23	16	12	11	10	12	10	8	8	8
200	24	17	12	11	10	12	11	8	8	8
210	26	17	12	11	11	13	11	8	8	8
220	28	18	13	11	11	14	12	9	8	8
230	30	19	13	12	11	14	13	9	9	8
240	32	20	13	12	11	15	13	9	9	9
250	33	21	14	12	11	16	14	9	9	9
260	35	22	14	12	12	17	14	10	9	9
270	38	23	15	13	12	17	15	10	9	9
280	40	24	15	13	12	18	16	10	10	9
290	42	25	15	13	12	19	16	10	10	10
300	44	26	16	13	13	20	17	11	10	10

The combustion chamber pressure in mbar must be added to the minimum gas pressure determined.

3.2 Nozzle selection

Oil throughput [kg/h] at pump pressure 8 to 15 bar

Nozzle size [USg ph]	p = 8 bar	9 bar	10 bar	11 bar	12 bar	13 bar	14 bar	15 bar
0.75	2.5	2.7	2.8	3.0	3.1	3.2	3.4	3.5
0.85	2.9	3.1	3.2	3.4	3.5	3.7	3.8	4.0
1.00	3.4	3.6	3.8	4.0	4.2	4.3	4.5	4.7
1.10	3.7	4.0	4.2	4.4	4.6	4.8	5.0	5.1
1.25	4.2	4.5	4.7	5.0	5.2	5.4	5.6	5.8
1.35	4.6	4.9	5.1	5.4	5.6	5.8	6.1	6.3
1.50	5.1	5.4	5.7	6.0	6.2	6.5	6.7	7.0
1.65	5.6	5.9	6.3	6.6	6.9	7.1	7.4	7.7
1.75	5.9	6.3	6.6	7.0	7.3	7.6	7.9	8.1
2.00	6.8	7.2	7.6	8.0	8.3	8.7	9.0	9.3
2.25	7.6	8.1	8.5	9.0	9.4	9.7	10.1	10.5
2.50	8.5	9.0	9.5	10.0	10.4	10.8	11.2	11.6
2.75	9.3	9.9	10.4	11.0	11.4	11.9	12.4	12.8
3.00	10.2	10.8	11.4	12.0	12.5	13.0	13.5	14.0
3.50	11.9	12.6	13.3	13.9	14.6	15.2	15.7	16.3

The WGL30 dual fuel burner is equipped with two single nozzles.

Matching tests on various heating appliances have shown that the nozzles stated in the following table are the most suitable.

45°R and 60°S nozzles: long, narrow flame, particularly suitable for reverse flame combustion chambers.
60°R nozzles, short bushy flame.

Combustion head	Nozzle	
W30/1	Steinen	60°S
	Monarch	45°R
	Monarch	60°R

Oil throughput tables for calculation of nozzle throughputs in relation to the nozzle's oil pressure

The oil throughput table gives the oil throughput at each of the different pump pressures.
The fuel throughput or the burner rating is measured during the adjustment of the burner.

Calculation of the oil throughput in [kg/h] from the burner rating in [kW]:

Oil throughput [kg/h] = burner rating [kW] / 11.9

The table is based on figures from the nozzle manufacturer.

Atomisation pressure

Single and two stage burners:
Factory setting _____12 bar
Usual setting _____10 to 14 bar

If nozzle is fouled

– Do not clean the nozzle
– Always fit new nozzle.

Changing nozzles

– Hinge open the burner
– Take out the flame tube with the sleeve (bayonet)
– Remove the diffuser and hose
– Unscrew the old nozzles
– Fit the new nozzles
– Remount the diffuser and hose
– Check the positioning of the nozzles and the ignition electrodes
– Replace the flame tube and close up the burner

Priming the nozzle head

– Place the burner on its base, with the nozzle head uppermost
– Fill the nozzle head (without the nozzles) to the brim with fuel oil
– Screw in nozzles

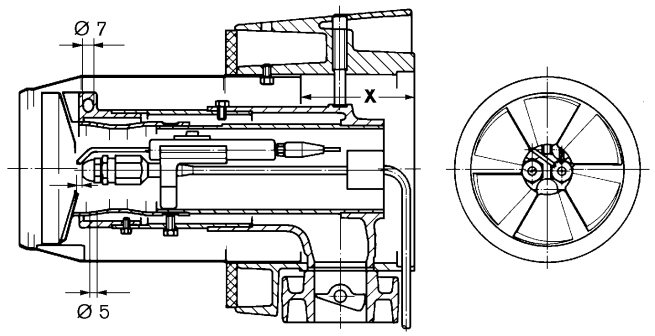
3.3 Combustion head

3.3.1 Dimensions

Burner type	Rating kW (Gas) min. to max.	kg/h (Oil) min. to max.	Flame tube Typ	Diffuser mm ø outer	mm ø inner
WGL30N/1-A	60 - 300	6 - 25	W30/1	102	33
WGL30F/1-A	60 - 300	6 - 25	W30/1	102	33

All components of the mixing head are pre-set by the works and adjusted for optimum combustion.
The flame tube can be moved by 15 mm. By increasing the fan pressure behind the diffuser, combustion and flame stability can be improved according to the appliance's requirements.

Mixing head



3.3.2 Removing the mixing head

Removal:
- Switch off installation.
- Un-clip rod on gas butterfly valve.
- Remove fixing screw in the burner.
- Push ignition cable through the rubber grommet into the burner throat.
- Hinge open burner approx. 60°.
- Loosen fixing screw for nozzle head and remove nozzle head (do not twist pressure hoses).
- Loosen clamp screw on burner flange and remove mixing chamber.

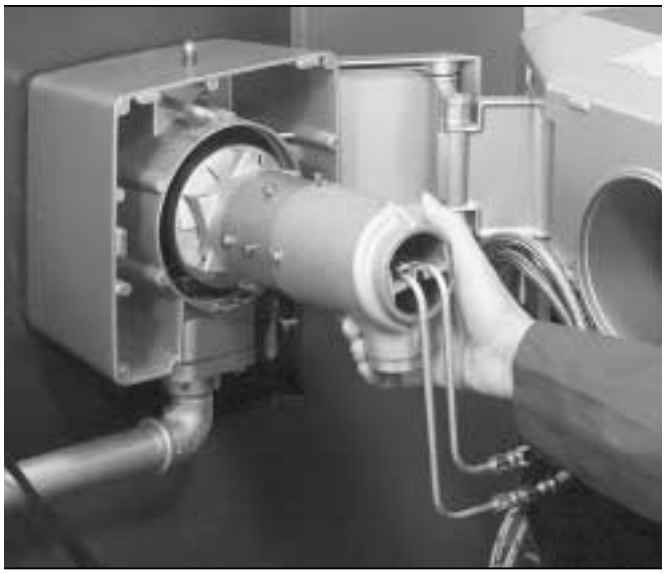
Refitting:
Reverse action

Attention!

Before hinging open
- un-clip rod on gas butterfly valve
- unplug ignition cable from the ignition transformer

After hinging shut
- refit rod
- plug in ignition cable and pull out of housing by approx. 5 cm.

Mixing head

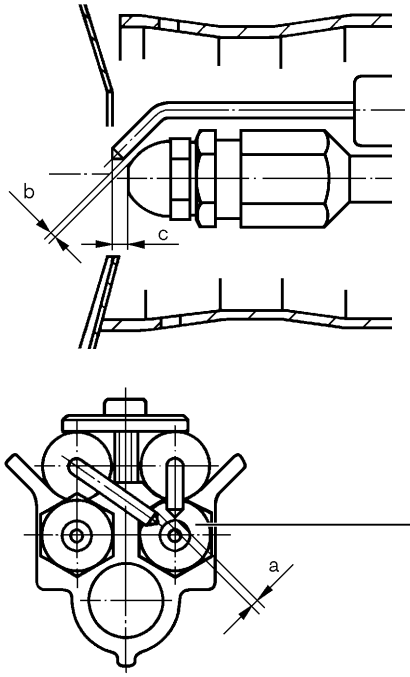


3.3.3 Setting dimensions for ignition electrode

The setting dimensions of the ignition electrodes can be checked or adjusted according to the following table. The ignition electrodes should be set to the stage 1 nozzle.

The ignition electrodes must not come into contact with the nozzle's conical spray.

Burner	Dimensions in mm a	b	c
WGL30	2.5 – 3.0	2.0 – 2.5	3.0



Stage 1 nozzle

3.4 Oil pumps and sequence diagram

The pumps are supplied suitable for two pipe installation. In certain cases the pumps may be used in single pipe installations. For single pipe operation the bypass plug must be removed and the return line closed (cover plug and screw cap in bag). The bypass plugs, inside the pumps, are to be found in the following place:

AL65 C – behind the return connection union SW4 (2)

All pumps are fitted with pressure regulating valves and a solenoid valve on the nozzle supply side (normally closed).

Operation

On start up the oil flows from the suction line via the filter to the gears. The solenoid valve (7) is closed during the pre-purge period. The fuel oil on the pressure side pushes the valve piston in the regulator and via a control orifice allows the oil to pass to the return connection.

Some of the oil flows via a vent slot directly into the return, enabling the pumps to prime themselves automatically on two pipe installations.

On single pipe installations it is only possible to prime the pump via the nozzle line or pressure test connection (4) when the solenoid valve (7) is open.

When solenoid valve (7) is energised oil is delivered to the nozzle. The pump pressure can be set on all pumps at the pressure regulating screw (6). When the burner shuts down the solenoid valve (7) closes the orifice to the nozzle and the nozzle oil delivery is immediately cut off.

The pump capacities are:
AL65 C = 100 l/h

For two pipe or single pipe installations the suction line should be sized according to the table in chapter 2.6.

Pump setting

1. Release the closing plug (4) on the pressure gauge connection of the pump. Start the burner and wait until bubble free oil flows out.

Caution!

Dry running of the pump can lead to seizure. Fill the suction line with oil before commissioning.

2. To check the vacuum, insert vacuum gauge into connection (5).
3. To check the pressure setting, insert pressure gauge into connection (4).

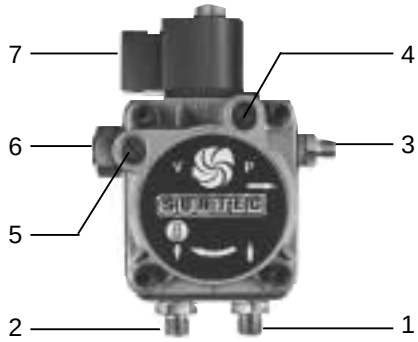
4. Set required pump pressure:
   Clockwise rotation = Pressure increase
   Anticlockwise rotation = Pressure reduction

Pressure rating _____ 8 to 15 bar
Factory setting _____ 12 bar

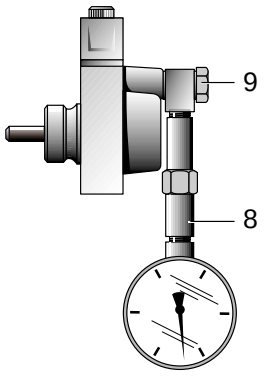
Note

With a centralised oil supply system the maximum oil supply must not exceed 2 bar. The suction resistance must be a maximum of 0.4 bar.

Suntec pump type AL65 C 9525

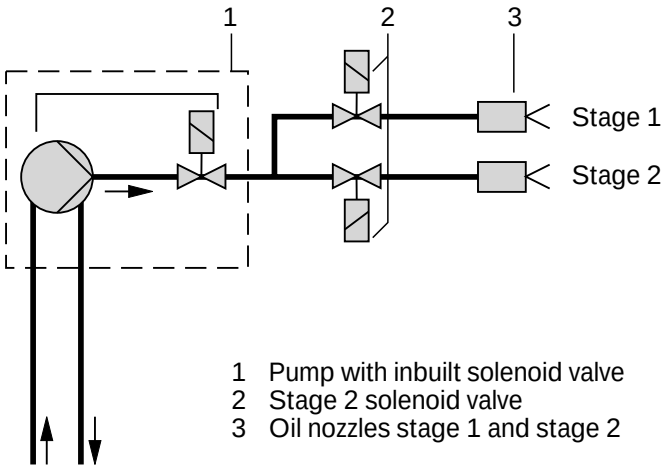


Pressure gauge connection



1 Suction connection
2 Return flow connection
3 Nozzle supply line
4 Pressure gauge connection
5 Vacuum gauge connection
6 Pressure regulating screw
7 Solenoid valve (normally closed)
8 Vacuum or pressure gauge with nipple
9 Pressure gauge union

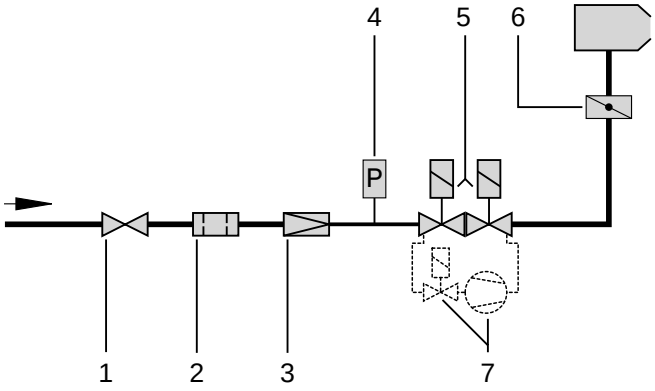
Two stage sequence diagram



1 Pump with inbuilt solenoid valve
2 Stage 2 solenoid valve
3 Oil nozzles stage 1 and stage 2

3.5 Gas valve trains

3.5.1 Sequence diagram of gas valve train



Legend
1 Ball valve
2 Gas filter
3 Gas governor
4 Gas pressure switch
5 Double solenoid valve (DMV)
6 Gas butterfly valve
7 Valve proving VPS 504 (as special equipment)

3.5.2 Double solenoid valve type DMV

Operation

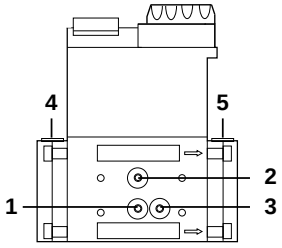
DMV-D/11
Two single stage solenoid valves normally closed, fast opening and closing, manual limit of gas flow possible by main flow adjustment at valve 1 (V1).

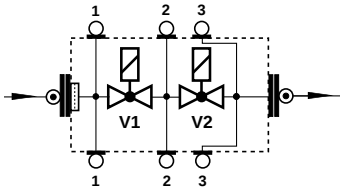
Technical data

Max. operating pressure	500 mbar
Voltage/frequency	~(AC) 230 V - 15 %... to 240 V + 10 % 50/60 Hz or ~(AC) 110 V 50/60 Hz
Installation	Horizontal gas train - solenoid vertical above Vertical gas train - solenoid horizontal

Pressure test points

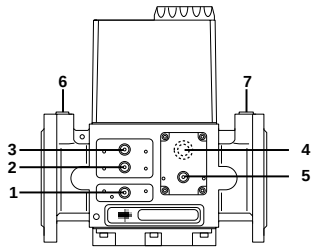
DMV-D 503/11 - 520/11

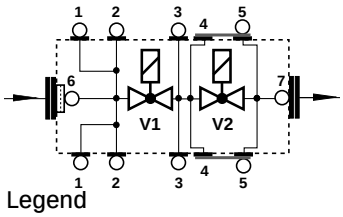




Legend
1 Pressure before V1
2 Pressure between V1 and V2
3 Pressure after V2
4 Inlet connection flange
5 Outlet connection flange

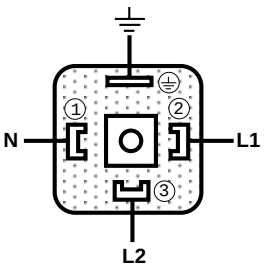
DMV-D 5040/11 - 5125/11

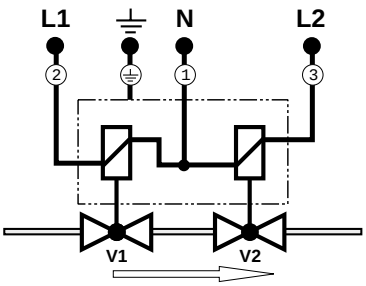




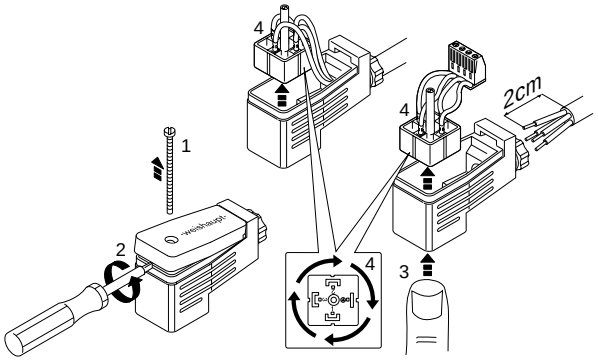
Legend
1, 2 Pressure before V1
3 Pressure between V1 and V2
4 Ignition gas outlet (not used on WGL30)
5 Pressure after V2
6 Inlet connection flange
7 Outlet connection flange

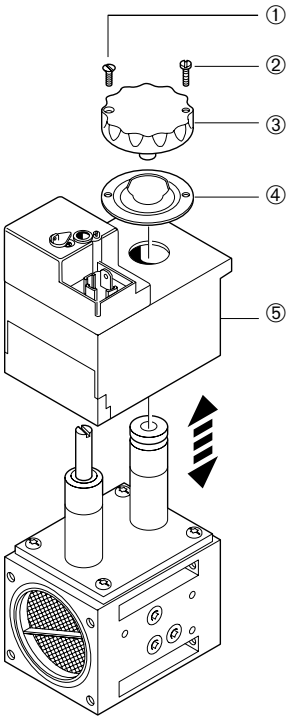
Electrical connection





DMV and GW plug





① Counter sunk screw
② cheese head screw
③ Cap
④ Metal plate
⑤ Solenoid

Changing solenoid

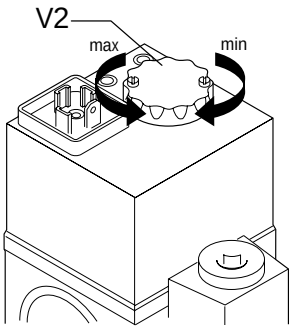
1. Switch off and isolate installation.
2. Remove connecting plug.
3. Remove paint seal from counter sunk screw ① and remove screw.
4. Remove cheese head screw ②.
5. Remove cap ③ and metal plate ④.
6. Change solenoid ⑤, checking new unit is correct type/voltage!

Installation

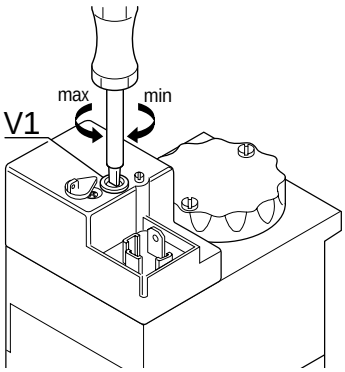
Install in reverse order.
Please note:
☞ Do a gas tightness test between V1 and V2:
p_{min} = 100…150 mbar
(see chapter 2.7.1)
☞ Switch on and test burner operation.

Gas throughput adjustment

DMV 503



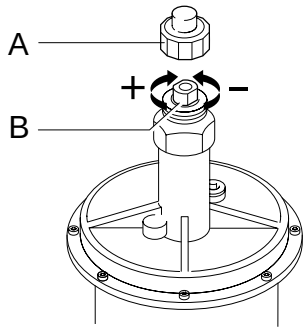
DMV 507-5125



DMV 503/11	Throughput adjustment on V2 loosen locking screw and turn the adjuster. One turn = 0.5 mm stroke adjustment, anti-clockwise to increase flow, and vice-versa.
DMV 507 - 520/11	Throughput adjustment on V1 via covered adjusting screw. One turn = 0.5 mm stroke adjustment, anti-clockwise to increase flow , and vice-versa.
DMV 5040 - 5125	Throughput adjustment on V1 via covered adjusting screw. One turn = 1 mm stroke adjustment, anti-clockwise to increase flow , and vice-versa.

3.5.3 Gas governor type FRS

Outlet pressure adjustment (set point setting)



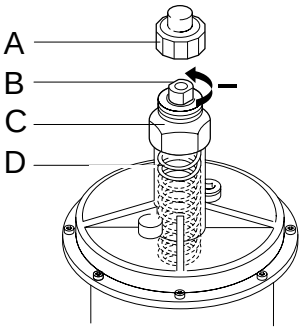
Factory - standard spring 5 - 20 mbar

1. Remove cap A
2. To increase, turn screw B clockwise. = increase of outlet pressure (set value)

or

3. To reduce, turn screw B anti-clockwise. = reduction in outlet pressure (set value)
4. Prove the adjustment is correct.
5. Replace cap A

Changing the spring

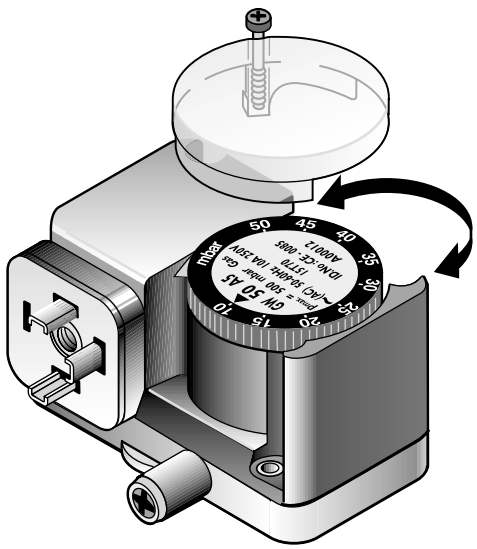


1. Remove cap A. Turn screw B totally anti-clockwise.
2. Remove spring retainer C, and remove the spring D.
3. Fit new spring D.
4. Re-fit spring retainer C, and by turning screw B set the required outlet pressure.
5 Prove adjustment is correct and re-fit cap A, and new range label.

Type of spring / colour	Outlet pressure range mbar
orange	5 – 20
blue	10 – 30
red	25 – 55
yellow	30 – 70
black	60 – 110
pink	100 – 150

3.5.4 Gas pressure switch

Gas pressure switch



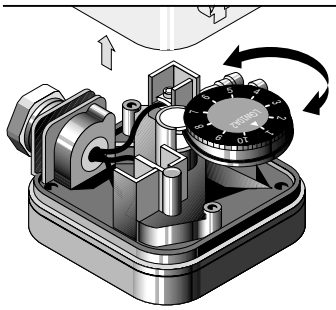
To set a pressure switch for gas, a manometer has to be fitted to test point 1 of the DMV. When determining the switch point, pay attention that this is not below half the regulated pressure and that combustion is CO < 1000 ppm (CO increase due to excess air).

Setting is carried out in the following manner:

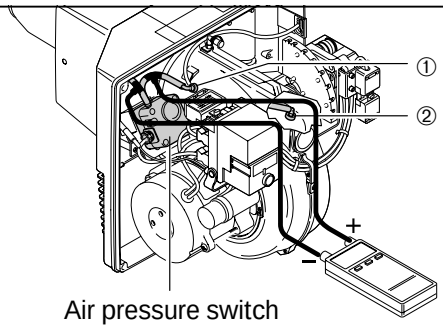
1. Burner is operating
2. Gradually close ball valve so that the pressure at the pressure test unit slowly decreases.
3. Setting pressure has been reached when
   – CO increases
   – sensor current is only 20 µA
   – or when half the regulated gas pressure has been reached.
4. Slowly turn the setting cam of the gas pressure switch to the right until the burner carries out a controlled shutdown.
5. Control - the burner is restarted with open ball valve. If the ball valve is closed again, the shut down pressure can be tested. The burner control must not go to lockout.

3.5.5 Air pressure switch

Air pressure switch type LGW50A2



Differential pressure test



Air pressure switch

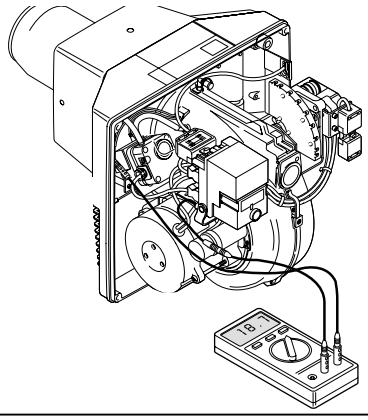
The air pressure switch is pre-set to 8 mbar. The switch point must be checked and adjusted during commissioning

For this a differential pressure measurement between points ① and ② is required. Pressure behaviour is monitored throughout the set range of the burner by the pressure test unit (i.e. U tube). The lowest differential pressure value is used for the determination of switch point. The switch point is set to > 80% of this value.
To do this, unscrew the cover from the LGW and set the required value with the setting wheel.

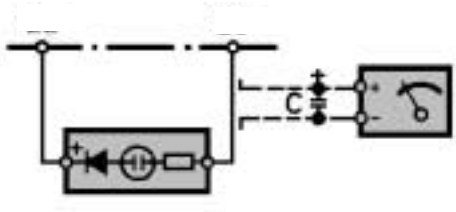
Example:
reduced differential : 11.5 mbar
switch point air pressure switch : 11.5 x 0.8 = 9.2 mbar

Installation dependant influences, such as flue gas recirculation, heat exchanger, installation or air supply, on the air pressure switch and the settings may result in adjustments having to be made.

3.5.6 Flame monitoring



UV monitoring



A microammeter with a range of 0 to 600 µA or 0 to 1 mA should be used.

Testing the flame sensor
UV-cell: by removing it from its holder on the burner flange.

Minimum required sensor current in µA

	UV cell
min. required sensor current	200
normally reached values	200-500

3.6 Determination of gas throughput

Conversion from standard pressure to operating pressure conditions

General:
The calorific value ($H_{i,n}$) of combustible gases is generally given in relation to the standard conditions (0°C, 1013 mbar).

Throughput calculation:
To determine the correct loading of the heat exchanger, the gas throughput must be determined beforehand.

Normal volume V_n:

$$V_n = \frac{Q_N}{\eta \cdot H_{i,n}}$$

Actual volume V_B:

$$V_B = \frac{V_n}{f} \quad \text{or} \quad V_B = \frac{Q_N}{\eta \cdot H_{i,B}}$$

Measuring time in seconds for 100 litres gas throughput

$$\text{Measuring time [secs]} = \frac{3600 \cdot 0.1[m^3]}{V_B\ [m^3/h]}$$

Example:

Height above sea level	=	500	m
→ Barometric air pressure $P_{Baro.}$ as tab.	=	953	mbar
Gas pressure P_G at meter	=	20	mbar
Total pressure P_{ges} (B_o+P_G)	=	973	mbar
Gas temperature t_G	=	10	°C
→ Conversion factor f as tab.	=	0.9266	
Boiler rating Q_N	=	25	kW
Net Efficiency (assumed)	=	90	%
Net Calorific value $H_{i,n}$	=	10.35	kWh/m³

$$V_n = \frac{25}{0.90 \cdot 10.35} \rightarrow V_n \approx 2.7\ m^3/h$$

$$V_B = \frac{2.7}{0.9266} \rightarrow V_B \approx 2.9\ m^3/h$$

Measuring time in seconds for 100 litres gas throughput

$$\text{Measuring time} = \frac{3600 \cdot 0.1}{2.9} \rightarrow \approx 124 \text{ secs.}$$

For two stage burners, partial load is calculated and controlled the same way!

Determination of factor f

Gas pressure $P_{Baro.}$ + P_{Gas} [mbar] →

↓ Gas temperature t_G [°C]	950	956	962	967	973	979	985	991	997	1003	1009	1015	1021	1027	1033	1036
0	0.9378	0.9437	0.9497	0.9546	0.9605	0.9664	0.9724	0.9783	0.9842	0.9901	0.9961	1.0020	1.0079	1.0138	1.0197	1.0227
2	0.9310	0.9369	0.9427	0.9476	0.9535	0.9594	0.9653	0.9712	0.9770	0.9829	0.9888	0.9947	1.0006	1.0064	1.0123	1.0153
4	0.9243	0.9301	0.9359	0.9408	0.9466	0.9525	0.9583	0.9642	0.9700	0.9758	0.9817	0.9875	0.9933	0.9992	1.0050	1.0079
6	0.9176	0.9234	0.9292	0.9341	0.9399	0.9457	0.9514	0.9572	0.9630	0.9688	0.9746	0.9804	0.9862	0.9920	0.9978	1.0007
8	0.9111	0.9169	0.9226	0.9274	0.9332	0.9389	0.9447	0.9504	0.9562	0.9619	0.9677	0.9734	0.9792	0.9850	0.9907	0.9936
10	0.9047	0.9104	0.9161	0.9209	0.9266	0.9323	0.9380	0.9437	0.9494	0.9551	0.9609	0.9666	0.9723	0.9780	0.9837	0.9866
12	0.8983	0.9040	0.9097	0.9144	0.9201	0.9257	0.9314	0.9371	0.9428	0.9484	0.9541	0.9598	0.9655	0.9711	0.9768	0.9796
14	0.8921	0.8977	0.9033	0.9080	0.9137	0.9193	0.9249	0.9306	0.9362	0.9418	0.9475	0.9531	0.9587	0.9644	0.9700	0.9728
16	0.8859	0.8915	0.8971	0.9017	0.9073	0.9129	0.9185	0.9241	0.9297	0.9353	0.9409	0.9465	0.9521	0.9577	0.9633	0.9661
18	0.8798	0.8854	0.8909	0.8955	0.9011	0.9067	0.9122	0.9178	0.9233	0.9289	0.9344	0.9400	0.9456	0.9511	0.9567	0.9594
20	0.8738	0.8793	0.8848	0.8894	0.8949	0.9005	0.9060	0.9115	0.9170	0.9225	0.9281	0.9336	0.9391	0.9446	0.9501	0.9529
22	0.8679	0.8734	0.8788	0.8834	0.8889	0.8944	0.8998	0.9053	0.9108	0.9163	0.9218	0.9273	0.9327	0.9382	0.9437	0.9464
24	0.8620	0.8675	0.8729	0.8775	0.8829	0.8883	0.8938	0.8992	0.9047	0.9101	0.9156	0.9210	0.9265	0.9319	0.9373	0.9401

1 mbar = 1 hPa = 10.20 mm WS 1 mm WS = 0.0981 mbar = 0.0981 hPa

The figures in the table are based on the following simple formula:

$$f = \frac{P_{Baro.} + P_G}{1013} \cdot \frac{273}{273 + t_G}$$

The moisture content of the gas is negligible and therefore is not considered in the table. The table allows for conversion factors in the low pressure range (up to 100 mbar).
The factor can also be determined in the high pressure range according to the formula to the left.

Mean annual barometric pressure

Average geodetic height	*from*		1	51	101	151	201	251	301	351	401	451	501	551	601	651	701
of supply area	*to*	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
mean annual air pres. above sea level	*mbar*	1016	1013	1007	1001	995	989	983	977	971	965	959	953	947	942	936	930

Legend:

Q_N = Boiler rating [kW]
η = Efficiency [%] based on Net CV basis
$H_{i,n}$ = Standard calorific value [kWh/m³]
$H_{i,B}$ = Operating calorific value [kWh/m³]
f = Conversion factor
$P_{Baro.}$ = Barometric pressure [mbar]
P_G = Gas pressure at meter [mbar]
t_G = Gas temperature at meter [°C]

3.7 Combustion analysis

To ensure efficient and problem free operation of the installation, flue gas measurements must be taken.

The various maximum CO_2 contents can be obtained from the local gas board (guide values see table).

Example:
at 15% excess air (λ = 1.15) and max. 12% CO_2 a test value of

$$CO_2 \text{ meas.} \sim \frac{12}{1.15} = 10.4\ \% \text{ should be achieved.}$$

The CO content must not be more than 0.005 Vol. % (50 ppm)

Flue gas temperature for full load (nominal load) is the result of burner setting at nominal loading.

Flue gas temperature for partial load is the result of the control range adjustment.

The instructions of the manufacturer are to be followed closely on hot water boiler installations. Normally a partial load of 50 - 65% of the nominal load is set (some of the data may be on the boiler rating plate).

On air heater installations the partial load is normally even higher. Again, the instructions of the manufacturer should be closely followed.

The flue gas installation should also be set out to protect against damage through condensation (excluding acid proof chimneys).

Limitation of flue gas losses
According to the "First Regulation for Implementation of the Federal Emission Protection Act (Regulation on small combustion system 1. BlmSchV)" oil and gas combustion systems must be so operated that the limits given in the table below for flue gas losses are not exceeded.

Nominal-output	Limits for flue gas losses % from thermal oil and gas combustion systems			
	up to 31.12.82	after 1.1.83	from 1.10.88 3.10.90 *)	from 1.1.98
kW				
4 to 25	15	14	12	11
25 to 50	14	13	11	10
over 50	13	12	10	9

*) in the new Federal States

Determination of flue gas losses
The oxygen content of the flue gas and the difference between flue gas and combustion air temperature must be determined. The oxygen content and the flue gas temperature must be measured at the same time at one point. Instead of oxygen content, the carbon dioxide of the flue gas can also be measured. The combustion air temperature is measured in the proximity of the burner air intake.

The flue gas losses are calculated when measuring the oxygen content according to the equation:

$$q_A = (t_A - t_L) \cdot \left(\frac{A_2}{21 - O_2} + B\right)$$

If the carbon dioxide content is measured instead of the oxygen content, the calculation is carried out according to the equation:

$$q_A = (t_A - t_L) \cdot \left(\frac{A_1}{CO_2} + B\right)$$

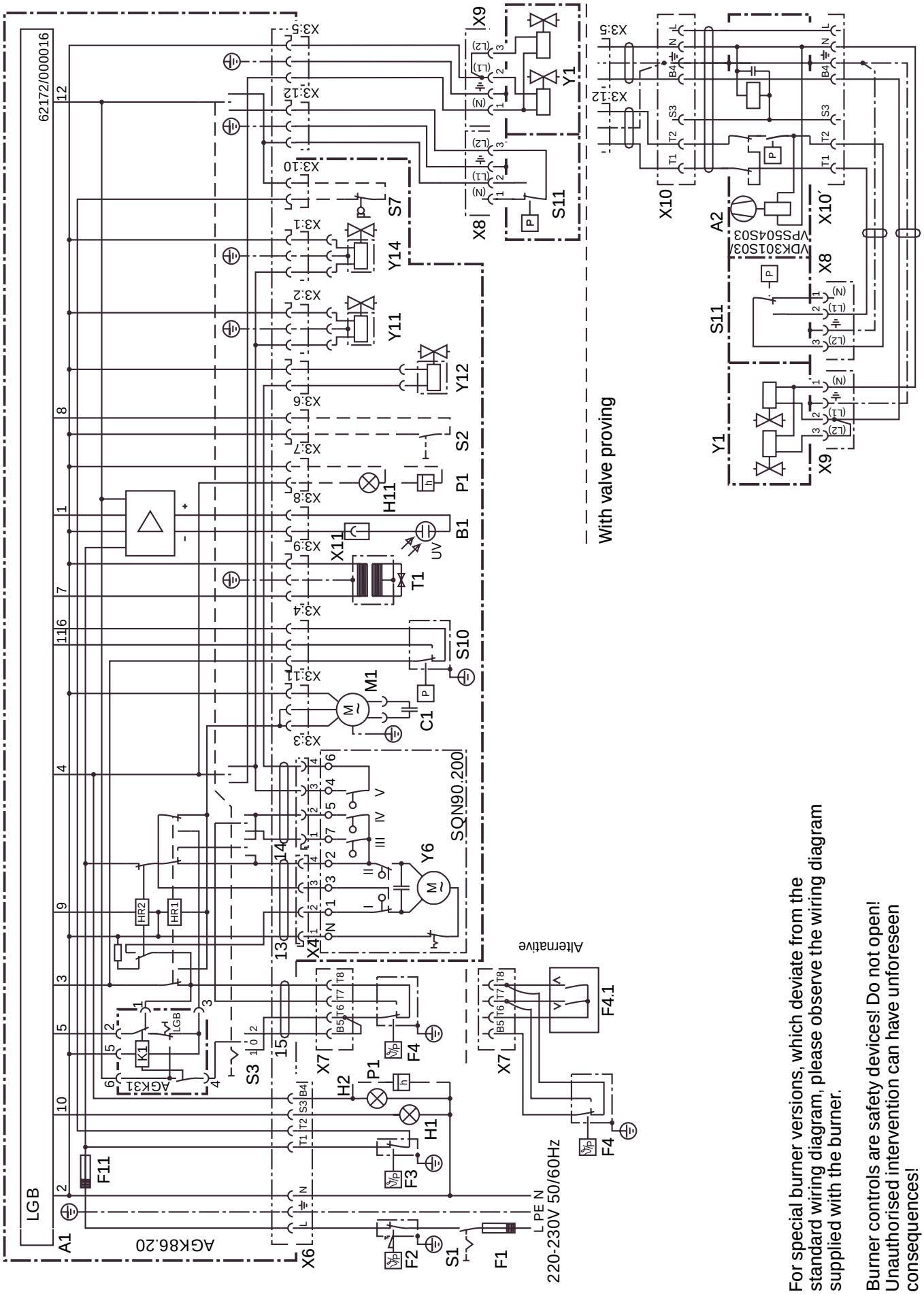
whereby:
q_A = flue gas losses in %
t_A = flue gas temperature in °C
t_L = combustion air temperature in °C
CO_2 = volume of carbon dioxide content in dry flue gas %
O_2 = volume of oxygen content in dry flue gas %

		Oil	Natural Gas	Towns Gas	Coke Gas	Liquid Petroleum Gas and LPG/Air mixture
A_1	=	0.50	0.37	0.35	0.29	0.42
A_2	=	0.68	0.66	0.63	0.60	0.63
B	=	0.007	0.009	0.011	0.011	0.008

Calorific value of various types of gases and max. CO_2:

Gas type	Calorific value $H_{i,n}$ MJ/m³	kWh/m³$_n$	CO_2-max.
Second gas family			
Group LL (Natural Gas)	28.48 … 36.40	7.91 … 10.11	11.5 … 11.7
Group E (Natural Gas)	33.91 … 42.70	9.42 … 11.86	11.8 … 12.5
Third gas family			
Propane P	93.21	25.99	13.8
Butane B	123.81	34.30	14.1

Basic wiring diagram



Legend

A1	Burner control box
A2	Valve proving
B1	Flame sensor
F1,F11	Fuse
F2	Temperature or pressure limit controller
F3	Temperature or pressure controller
F4	Temperature or pressure controller - Full load
F4.1	Stepping controller for modulating regulation on gas operation
H1	Fault indicator lamp
H2	Indicator lamp Operation
H11	Indicator lamp Operation int.
K1	Auxiliary relay AGK31
M1	Burner motor
P1	Hour counter/impulse counter
S1	Mains switch
S2	Reset button
S3	Selector switch 1 Gas - 0 Off - 2 Oil
S7	Limit switch on burner flange
S10	Air pressure switch
S11	Gas pressure switch
T1	Ignition transformer
X3	Plug console
X4	Terminals on servomotor
X6, X7	Burner connection plug
X8, X9	Gas valve train connection plug
X10	Valve proving connection plug
X11	Test plug flame sensor
Y1	Double solenoid valve
Y6	Servomotor
Y11	Solenoid valve Oil
Y12	Solenoid valve Oil stage 2
Y14	Additional solenoid valve Oil
I	Limit switch Full load
II	Limit switch Closed (ignition load)
III	Auxiliary switch Partial load Gas
IV	Auxiliary switch Partial load Oil
V	Auxiliary switch stage 2 Oil

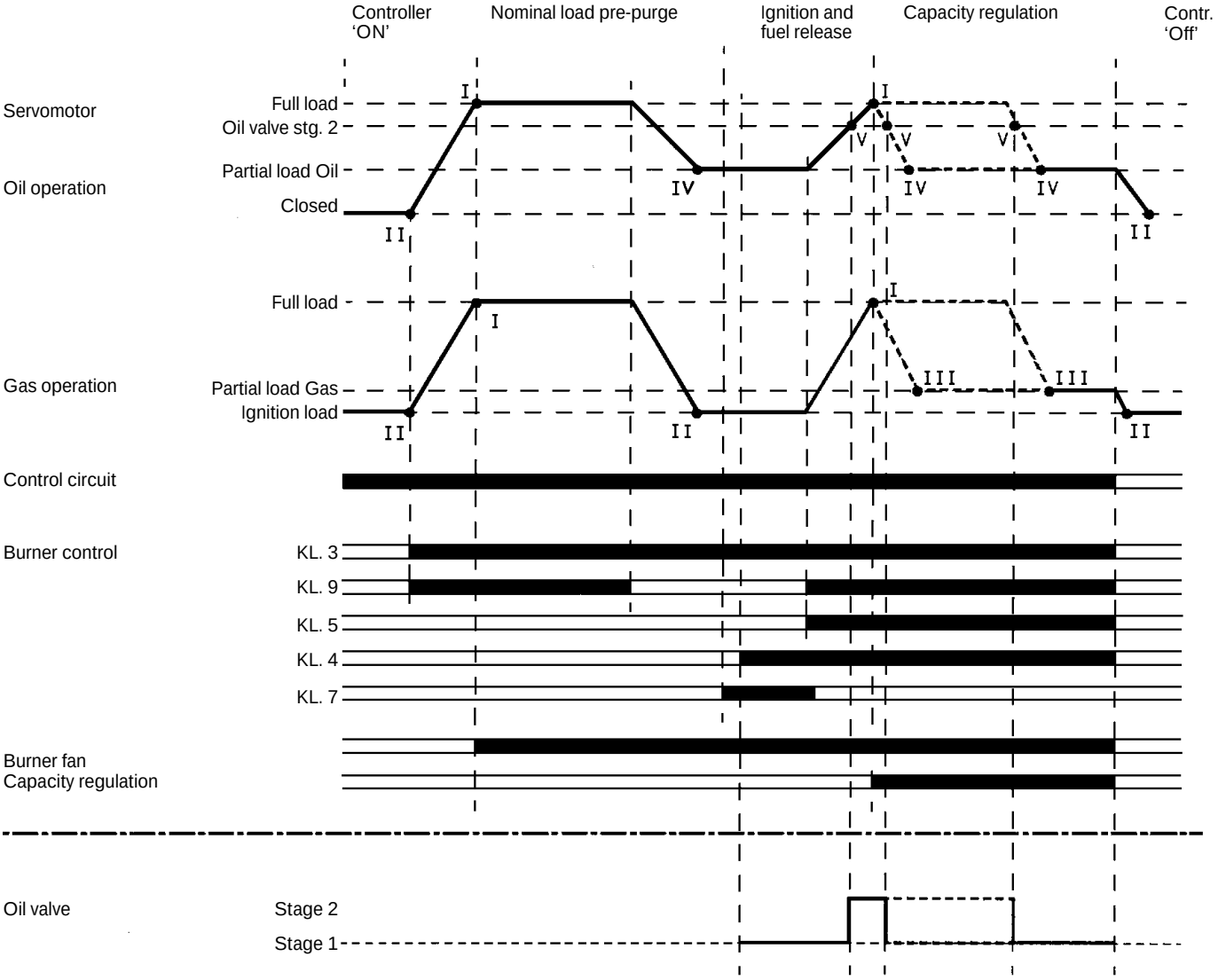
Technical data burner control LGB22.330

Operating voltage _____ 220V–15%...240V+10%
Main frequency _____ 50 Hz–6%...60Hz+6%
Max. pre-fuse _____ 10 A slow
Max sensor line length _____ 20 m
Sensor signal UV
(measured at the sensor) _____ min 200
max 500 µA

Switching times

Waiting time TW _____ 8 seconds
Pre-purge time TV _____ 30 seconds
Pre ignition time TVZ _____ 3 seconds
Safety time TS _____ 3 seconds
Post ignition time _____ < 3 seconds

Sequence diagram WGL30Z



Function

The programme indicator can be read through the cover of the control box. If a fault shutdown occurs the programme controller stops and indicates the type of fault shutdown.

On all fault shutdowns the fuel supply is immediately interrupted. One cause of this may be a premature or non-existing flame signal or the air pressure switch has switched at the wrong moment.

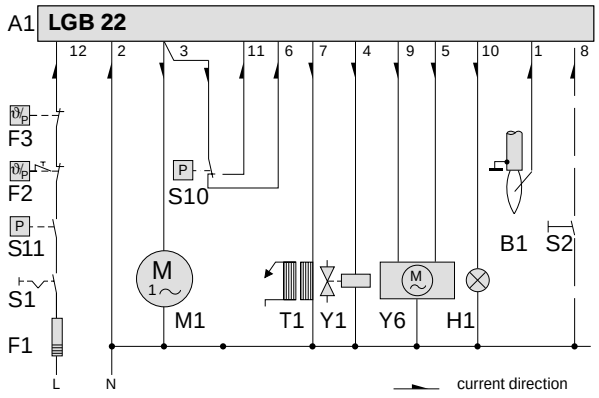
Cause	Effect
– Mains voltage loss or voltage < 140 V	Repeat start when voltage returns
– Premature flame signal	From commencement of pre-purge immediate fault shutdown
– Air pressure switch in operating before burner start	Start prevented, continuous non-functioning programme sequence
– No load terminal 3	Start prevented, continuous non-functioning programme sequence
– No air pressure switch signal or reset during operation	Fault shutdown from programme mark “P”
– No flame formation	Fault shutdown at programme mark “1”
– Flame signal failure during operation	Immediate fault shutdown

Programme indication

- Start position / operating position
- Waiting time and servomotor runs to full load
- Servomotor in full load and burner motor switched on
- P Air pressure switch test
- Full load pre-purge
- Servomotor runs to ignition position
- Solenoid valves open
- 2 ... 1 Fault shutdown after safety time interval
- Release of capacity regulation
- Start position / operating position

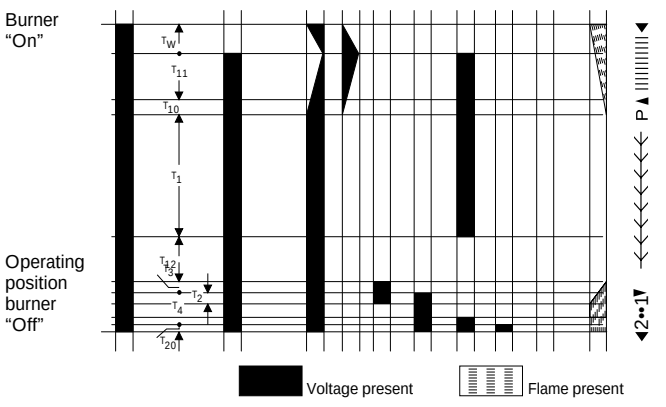
Gas burner control LGB22...

Basic connection



Function diagram:

Start with flame formation — Programme indicator

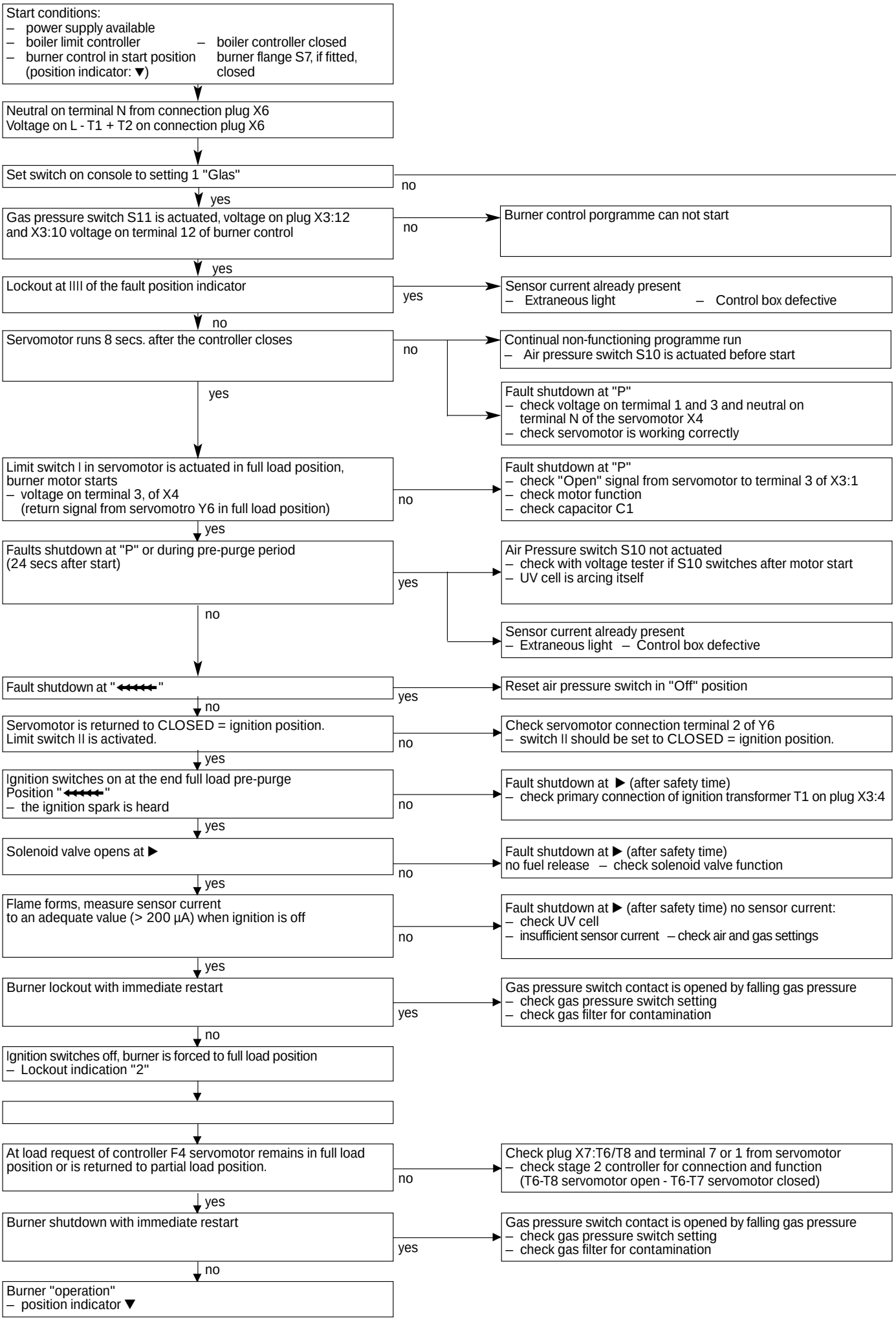


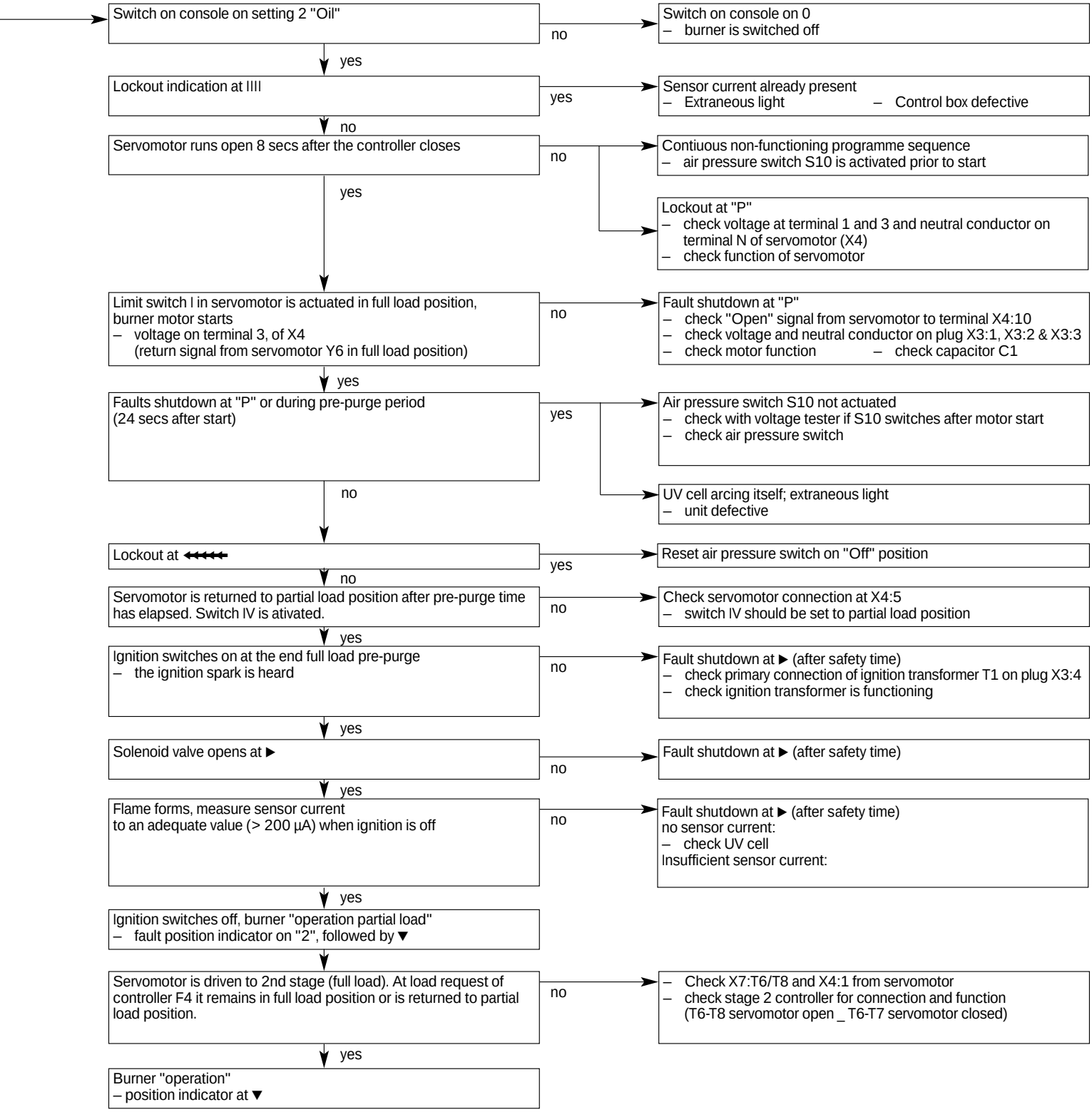
Legend

A1	Burner control
B1	Flame sensor
F1	Fuse
F2	Temperature or pressure limit
F3	Temperature or pressure regulator
H1	Fault indicating lamp
M1	Burner motor
S1	Mains switch
S2	Reset button
S10	Air pressure switch
S11	Gas pressure switch
T1	Ignition transformer
Y1	Solenoid valve
Y6	Servomotor

Legend

T_W	Waiting time	8 secs.
T_{11}	Run time of SA from closed to open	max. 12 secs.
T_{10}	Standard time air pressure switch	4 secs.
T_1	Pre-purge time	30 secs.
T_{12}	Run time of SA from open to closed	max. 12 secs.
T_3	Pre-ignition time	3 secs.
T_2	Safety time	max. 3 secs.
T_4	Interval from terminal 4 to terminal 5	8 secs.
T_{20}	Interval to programme stop	2 secs.


Start conditions:
– power supply available
– boiler limit controller
– burner control in start position (position indicator: ▼)
– boiler controller closed
burner flange S7, if fitted, closed
Neutral on terminal N from connection plug X6
Voltage on L - T1 + T2 on connection plug X6
Set switch on console to setting 1 "Glas"
no
yes
Gas pressure switch S11 is actuated, voltage on plug X3:12 and X3:10 voltage on terminal 12 of burner control
no
Burner control porgramme can not start
yes
Lockout at IIII of the fault position indicator
yes
Sensor current already present
– Extraneous light
– Control box defective
no
Servomotor runs 8 secs. after the controller closes
no
Continual non-functioning programme run
– Air pressure switch S10 is actuated before start
Fault shutdown at "P"
– check voltage on termimal 1 and 3 and neutral on terminal N of the servomotor X4
– check servomotor is working correctly
yes
Limit switch I in servomotor is actuated in full load position, burner motor starts
– voltage on terminal 3, of X4 (return signal from servomotro Y6 in full load position)
no
Fault shutdown at "P"
– check "Open" signal from servomotor to terminal 3 of X3:1
– check motor function
– check capacitor C1
yes
Faults shutdown at "P" or during pre-purge period (24 secs after start)
yes
Air Pressure switch S10 not actuated
– check with voltage tester if S10 switches after motor start
– UV cell is arcing itself
Sensor current already present
– Extraneous light
– Control box defective
no
Fault shutdown at "◄◄◄◄◄"
yes
Reset air pressure switch in "Off" position
no
Servomotor is returned to CLOSED = ignition position. Limit switch II is activated.
no
Check servomotor connection terminal 2 of Y6
– switch II should be set to CLOSED = ignition position.
yes
Ignition switches on at the end full load pre-purge Position "◄◄◄◄◄"
– the ignition spark is heard
no
Fault shutdown at ▶ (after safety time)
– check primary connection of ignition transformer T1 on plug X3:4
yes
Solenoid valve opens at ▶
no
Fault shutdown at ▶ (after safety time)
no fuel release – check solenoid valve function
yes
Flame forms, measure sensor current to an adequate value (> 200 µA) when ignition is off
no
Fault shutdown at ▶ (after safety time) no sensor current:
– check UV cell
– insufficient sensor current – check air and gas settings
yes
Burner lockout with immediate restart
yes
Gas pressure switch contact is opened by falling gas pressure
– check gas pressure switch setting
– check gas filter for contamination
no
Ignition switches off, burner is forced to full load position
– Lockout indication "2"
At load request of controller F4 servomotor remains in full load position or is returned to partial load position.
no
Check plug X7:T6/T8 and terminal 7 or 1 from servomotor
– check stage 2 controller for connection and function (T6-T8 servomotor open - T6-T7 servomotor closed)
yes
Burner shutdown with immediate restart
yes
Gas pressure switch contact is opened by falling gas pressure
– check gas pressure switch setting
– check gas filter for contamination
no
Burner "operation"
– position indicator ▼

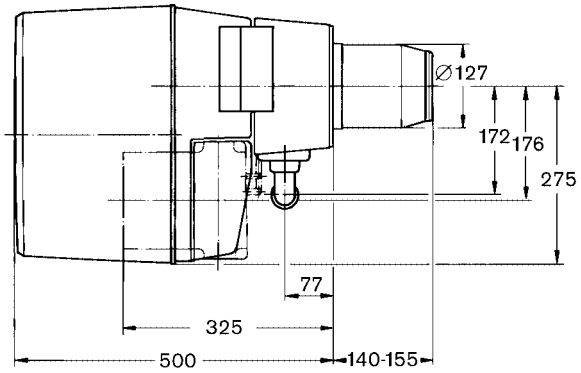

Switch on console on setting 2 "Oil"
no
Switch on console on 0
– burner is switched off
yes
Lockout indication at IIII
yes
Sensor current already present
– Extraneous light
– Control box defective
no
Servomotor runs open 8 secs after the controller closes
no
Contiuous non-functioning programme sequence
– air pressure switch S10 is activated prior to start
yes
Lockout at "P"
– check voltage at terminal 1 and 3 and neutral conductor on terminal N of servomotor (X4)
– check function of servomotor
Limit switch I in servomotor is actuated in full load position, burner motor starts
– voltage on terminal 3, of X4 (return signal from servomotor Y6 in full load position)
no
Fault shutdown at "P"
– check "Open" signal from servomotor to terminal X4:10
– check voltage and neutral conductor on plug X3:1, X3:2 & X3:3
– check motor function
– check capacitor C1
yes
Faults shutdown at "P" or during pre-purge period (24 secs after start)
yes
Air pressure switch S10 not actuated
– check with voltage tester if S10 switches after motor start
– check air pressure switch
no
UV cell arcing itself; extraneous light
– unit defective
Lockout at ◄◄◄◄◄
yes
Reset air pressure switch on "Off" position
no
Servomotor is returned to partial load position after pre-purge time has elapsed. Switch IV is ativated.
no
Check servomotor connection at X4:5
– switch IV should be set to partial load position
yes
Ignition switches on at the end full load pre-purge
– the ignition spark is heard
no
Fault shutdown at ► (after safety time)
– check primary connection of ignition transformer T1 on plug X3:4
– check ignition transformer is functioning
yes
Solenoid valve opens at ►
no
Fault shutdown at ► (after safety time)
yes
Flame forms, measure sensor current to an adequate value (> 200 µA) when ignition is off
no
Fault shutdown at ► (after safety time)
no sensor current:
– check UV cell
Insufficient sensor current:
yes
Ignition switches off, burner "operation partial load"
– fault position indicator on "2", followed by ▼
Servomotor is driven to 2nd stage (full load). At load request of controller F4 it remains in full load position or is returned to partial load position.
no
– Check X7:T6/T8 and X4:1 from servomotor
– check stage 2 controller for connection and function (T6-T8 servomotor open _ T6-T7 servomotor closed)
yes
Burner "operation"
– position indicator at ▼

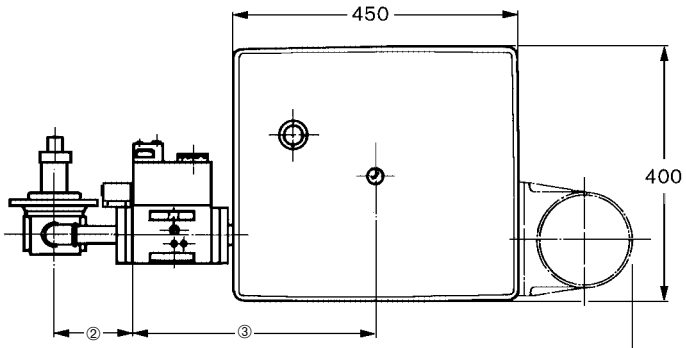
5. Technical data

5.1 Burner equipment

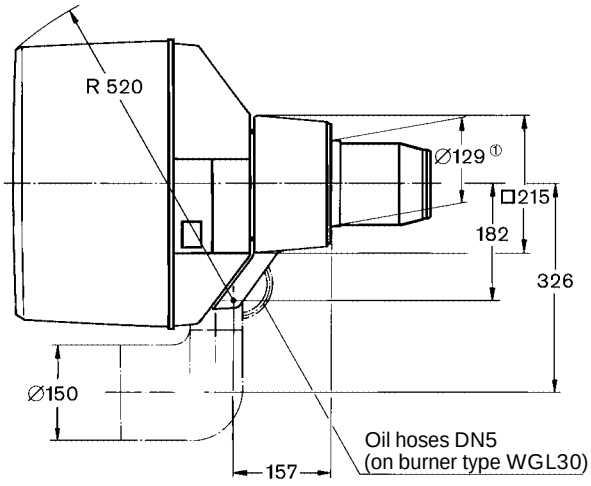
Type	Control unit with console	Motor	Servomotor	Fan wheel	Ignition transformer	Air pressure switch	Weight approx. kg Burner/valve train	
WGL30	LGB22.330 AGK86.20	ECK05-2 220V, 50 Hz 2,750 1/min 0,30 kW, 2.5A Kond. 12µF	SQN90.200 220V-240V 50-60 Hz 12 sec. run time	170 x 70	ZA20 100E 2 x 5000V	LGW 50 A2	28	4.0 4.0 7.2 7.9

5.2 Burner dimensions

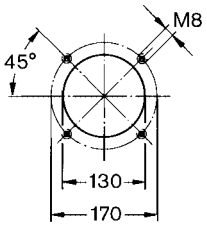




Air intake flange for air intake hose (installation left or right, but always opposite the valve train)



Oil hoses DN5
(on burner type WGL30)



Drilling dimensions of burner plate
(flange gasket with 3 drillings)

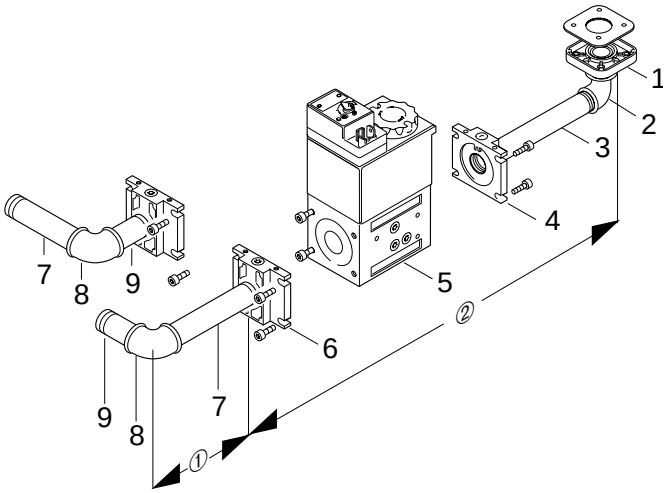
① With combustion head extension the extension tube has a diameter of 129 mm

② on gas valve trains
- 1/2": 77 or 187 mm
- 3/4": 77 or 187 mm
- 1": 79 or 189 mm
- 1 1/2": 87 or 217 mm

(depending on which way the connection pieces have been fitted)

③ on gas valve trains
- 1/2": 371 mm
- 3/4": 371 mm
- 1": 403 mm
- 1 1/2": 404 mm

5.3 Valve train dimensions



Pos. 1 Valve train fixing flange
2 Elbow
3 Double nipple
4 DMV flange
5 DMV
6 DMV flange
7 Double nipple
8 Elbow
9 Double nipple

① on valve trains
– 1/2”: 77 or 187 mm
– 3/4”: 77 or 187 mm
– 1”: 79 or 189 mm
– 1 1/2”: 87 or 217 mm
(depending on which way the connection pieces have been fitted)

② on valve trains
– 1/2”: 395 mm
– 3/4”: 395 mm
– 1”: 428 mm
– 1 1/2”: 461 mm

	Valve train	Connection pieces								
	R	Pos. 1	Pos. 2	Pos. 3	Pos.4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9
WGL30	1/2”	WG30-1”	W1” x 3/4”	3/4” x 250	507-3/4”	507	507-1/2”	1/2” x 160	W1/2”	1/2” x 50
	3/4”	WG30-1”	W1” x 3/4”	3/4” x 250	507-3/4”	507	507-3/4”	3/4” x 160	W3/4”	3/4” x 50
	1”	WG30-1”	W1”	1” x 250	512-1”	512	512-1”	1” x 160	W1”	1” x 50
	1 1/2”	WG30-1”	W1” x 1 1/2”	1 1/2” x 250	512-1 1/2”	512	520-1 1/2”	1 1/2” x 200	W1 1/2”	1 1/2” x 50

5.4 Electrical data

	Mains voltage	max. pre fuse	max. internal fuse	Consumption with oil pump fitted start/run
WGL30../1-A	220-230V; 50 Hz	16A gl	T 6.3A / 250V	913 / 583 VA

Permitted ambient conditions for electrical components

Temperature	Humidity	Requirements re. EMV	Low voltage guideline
In operation -15 … +60°C Transport /storage -20 … +70°C	max. 80% rel. humidity	Directive 89/336/EEC EN 50081-1 EN 50082-1	Directive 72/23/EEC EN 60335

6. Cause and rectification of faults

If faults occur the basic requirements for correct operation must first be examined

1. Check the electric supply
2. Check that the gas supply is correct and that manual valves are open
3. Check that all controls e.g. thermostats, pressure switches, water level interlocks, limit and time switches are correctly set
4. Ensure that the burner air or gas settings have not been altered
5. Is the tank filled with oil

When it is established that the fault is not due to external conditions, the functions of the burners must be tested.

If the burner is found in lockout for example, it must be reset and switched on to find the fault. By careful observation of the sequence of operation, the cause can usually be recognised quickly and rectified.

When testing, the use of a microammeter and U tube manometer is essential.

Condition	Cause	Remedy
General faults		
Burner motor does not start	No electric supply	Close circuit. Reset safety limit control
	Fuse faulty	Replace
	Neutral open circuit	Repair
	Burner motor faulty	Replace
	Condenser faulty	Replace
	Control circuit open	Look for contact break, switch on or reset regulator or detector
	Selector switch on gas operation: Gas supply interrupted isolating valve closed	Open isolating valve, inform gas authority if no gas for a prolonged period
	Burner control faulty	Replace
Lack of air		
Burner motor starts, after or during pre-purge lockout occurs	Air pressure switch faulty	Replace
	Pressure or suction tubes faulty	Replace
Note: The air pressure is operational at gas and oil operation	Pressure switch contact drops (air pressure too low)	Set air pressure correctly If necessary replace
	Fan dirty	Clean
No ignition		
Burner motor starts, voltage on plug X3:4 (burner control)	Ignition electrode gap too wide	Adjust
No ignition after a short time lockout occurs	Ignition electrodes of ignition line have earth fault, insulator faulty	Correct earth fault, replace damaged electrodes or cables
	Ignition transformer faulty	Replace ignition transformer
Shortage of gas		
Motor starts, ignition is in order, after short time lock-out occurs	Solenoid valves do not open, as solenoid valve is faulty or cables interrupted	Replace solenoid valve and correct interruption to supply (check voltage to terminal 5)
Burner motor starts, ignition in order, after a short time shutdown occurs (no fault)	Gas pressure drop when solenoid valve opens due to blocked filter	Clean insert or replace

Condition	Cause	Remedy
Flame monitoring fault		
UV monitoring		
Burner motor starts, ignition is audible, normal flame establishment then fault shutdown	Sensor current, fluctuates, too low	Reduce spark gap
	Gas/air mixture setting not correct	Re-adjust (see commissioning)
Pump		
Pump supplies no oil	Gears damaged	Replace
	Suction valve leaking	Clean or replace
	Suction line leaking	Tighten joints
	Suction line not primed	Prime at gauge connection on pump
	Isolating valve closed	Open
	Filter blocked	Clean
	Filter leaking	Replace
	Pump blocked	Replace
Poor combustion	Atomising pressure too low	Set pump pressure higher
	Filter blocked	Clean
Mechanical pump noise	Air in pump	Tighten joints
	Vacuum in oil line too high	Clean filter, check oil line diameter
Combustion head		
Heavy carbon deposits	Faulty nozzle	Replace
	Incorrect setting	Correct setting
	Combustion air quantity incorrect	Readjust burner
	Boiler house not adequately ventilated	The boiler house ventilation must be via a permanent opening, the cross section of which must be at least 50% of all chimney cross sections belonging to the plant
Solenoid valve		
Does not open	Coil faulty	Replace coil
Does not close tightly	Particles on valve seat	Dismantle valve, remove foreign bodies
Nozzles		
Uneven atomisation	Orifice partly blocked	Replace
	Nozzle filter blocked	Replace
	Worn due to use	Replace
No oil flow	Nozzle blocked	Replace
Oil flows immediately on start of burner motor	Pump solenoid valve passing oil, due to dirt on valve seat	Check and clean, replace if necessary

Weishaupt products and service

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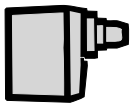
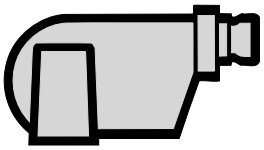
Print No. 444 GB, Decembre 98

– weishaupt –

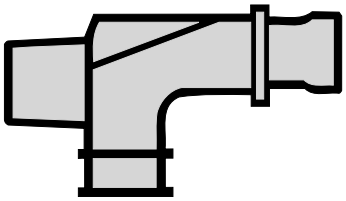
Oil, gas and dual fuel burners types W and WG / WGL
up to 570 kW
They are used mainly in houses and small buildings.
Advantages: fully automatic, reliable operation, individual components easily accessible, easy to service, quiet operation.



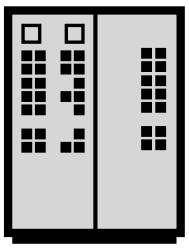
Oil, gas and dual fuel burners types Monarch
R, G, GL, RGL – up to 10.900 kW
These are used on all types and sizes of central heating plant. The basic model which has proved successful over many years is the basis for a variety of versions. These burners have founded the outstanding reputation of Weishaupt products.



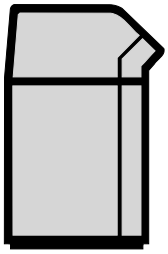
Oil, gas and dual fuel burners types WK –
up to 17.500 kW
WK types are decidedly industrial burners.
Advantages: Built to the modular system, load dependent variable combustion head, sliding two stage or modulating operation, easy to service.



Weishaupt control panels, the proven complement to Weishaupt burners
Weishaupt burners and Weishaupt control panels form the ideal unit, a combination which has already proved successful in hundreds of thousands of combustion installations. The advantages: Cost saving during planning, installation, servicing and guarantee work. The responsibility belongs to one manufacturer.



Weishaupt Thermo Unit / Weishaupt Thermo Gas.
These Units combine the technical innovations and operating efficiencies developed from over 1 million installations. Weishaupt Thermo Gas and Weishaupt Thermo Unit provide the ideals of complete heating centres for houses and appartments.



Product and service are the complete Weishaupt achievement
An extensive service organisation guarantees Weishaupt customers the greatest possible reliability. In addition our customers are looked after by heating firms who have been working with Weishaupt for many years.