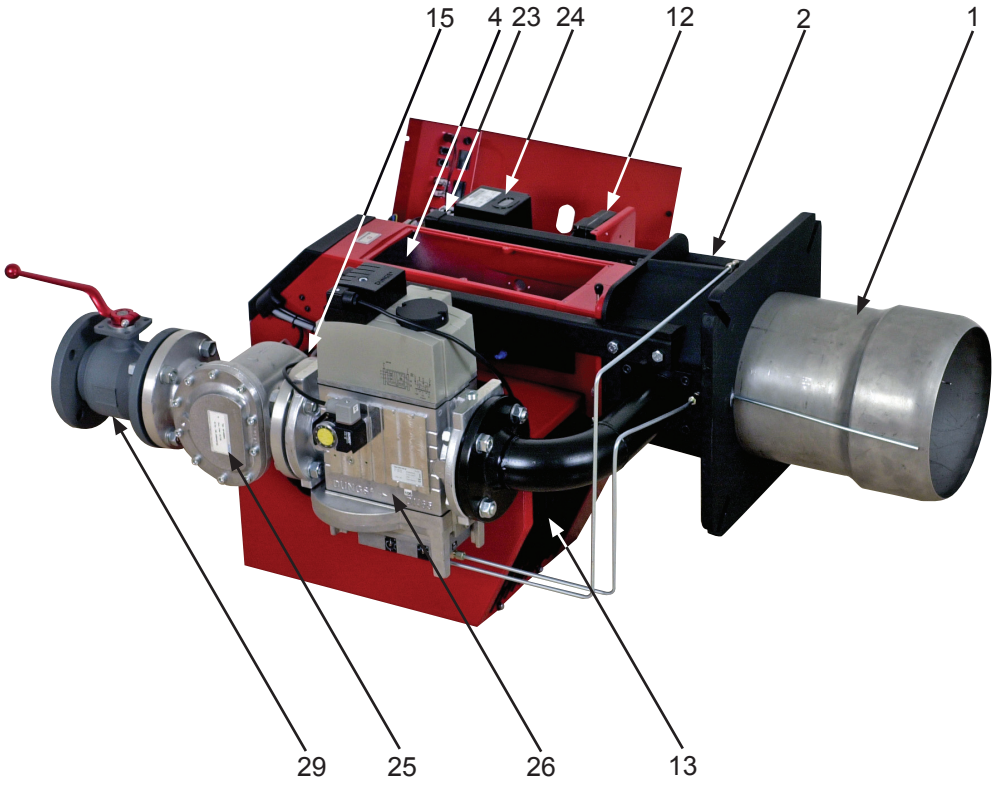
Installation- and maintenance instruction

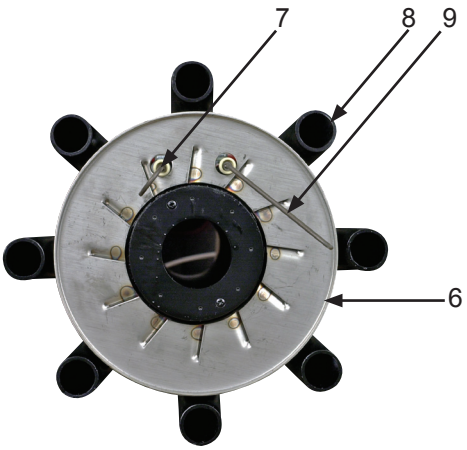
BG950

Contents

1. DESCRIPTION

1.1 Components

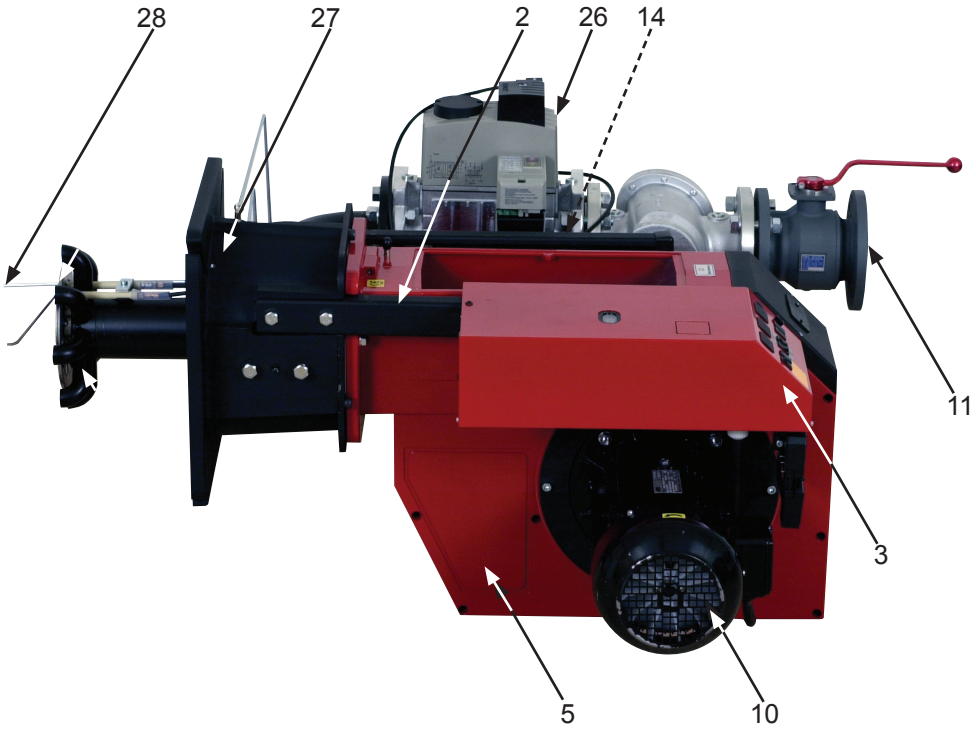


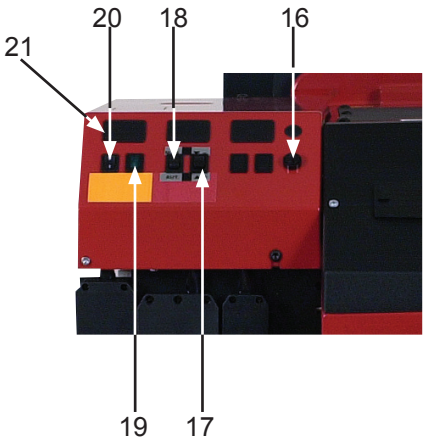


1. Flame cone
4. Fan wheel
6. Shrouded disc
7. Ignition electrode
8. Nozzle
9. Ionisation electrode
12. Ignition transformer
13. Air damper
15. Air pressure switch
23. Contactor with thermal overload protection
24. Control box
25. Filter
26. MultiBloc
29. Ball valve

1. DESCRIPTION

1.1 Components





2. Guide bar
3. Electric panel
5. Fan house
10. Motor
11. Connection gas fittings
14. Air damper motor
16 Fuse holder
17. Change-over switch increase-decrease
18. Change-over switch manually-automatically
19. Indicating lamp
20. Switch I-II
21. Time meter (optional)
26. MultiBloc
27. Connection flange
28. Impulse line fire room

1. DESCRIPTION

1.2 Warning

- Read the manual before assembling or commissioning.
- 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.
- The burner is only to be installed by qualified personnel
- Check that the burner is suitable for the boiler´s power range.
- The burner is to be installed such that it complies with any local regulations relating to electrical safety, boilers and fuel distribution.
- Check that the burner is approved for the gas quality intended used.
- No burner safety systems are to be disengaged.
- The fitter is to ensure that the boiler room is supplied with fresh air ventilation that is sufficient in accordance with local standards.
- Before servicing, shut off the fuel supply and the power supply to the burner.
- The outer temperature of the boiler´s components can exceed 60 °C.
- Check that the guide stop is installed before servicing.
- Take great care when servicing. Trap and pinch risks can be present.
- The boiler´s sound level can exceed 85 dBA during operation. Use ear protectors when present in the boiler room.

1.2.1 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 gas, fire or personal injury is avoided.

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

Notice should be carefully taken by the installer that no electrical cables or gas pipes get squeezed or damaged when installing or at service

If the boiler is provided with an opening door, this should be interlocked with a door switch.

1.2.2 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.

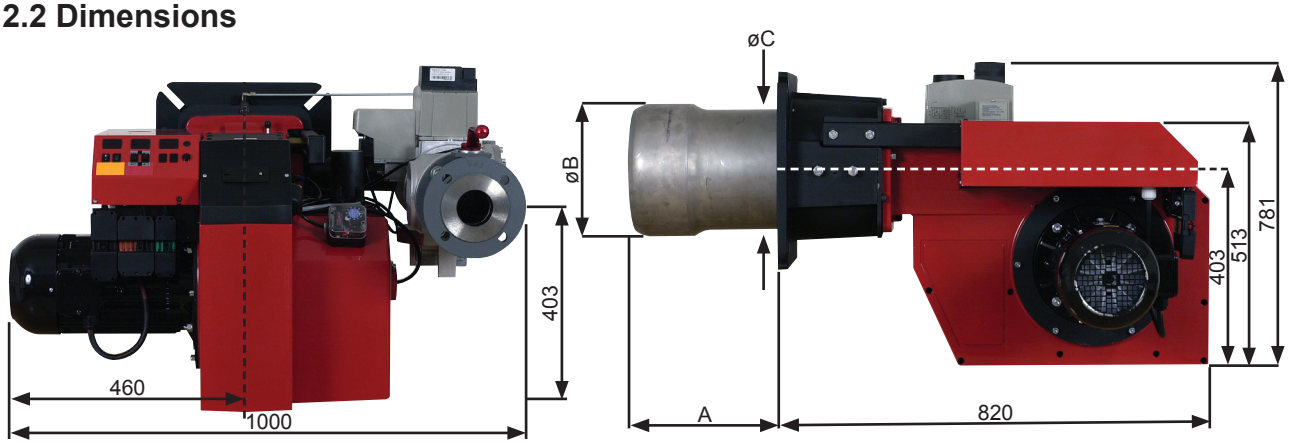
1.2.3 Preparations for installation

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.

2. TECHNICAL DATA

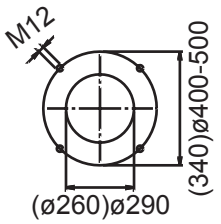
2.1 Type designation BG950

2.2 Dimensions



	Length of burner tube ± 5 mm	Flange Measure A ± 5 mm	Burner tube Measure B	Burner tube Measure C
Standard	350	310	280	260
Standard + 200	550	510	280	260
Standard + 300	650	610	280	260

The above dimensions are max. measurements. Depending on the components used, the measurements may vary.



2.3 Out range

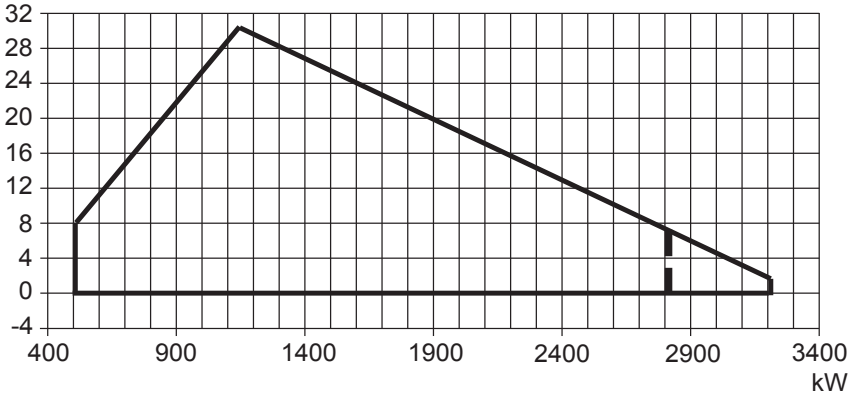
BG950							
Capacity	Gas quality		Calorific value kWh/Nm³	Min Nm³/h	Max Nm³/h	Gas connection	Gas pressure Min mbar
500-3200	Natural gas	G20	9,50	52,63	336,84	2½”	65
500-2800	Natural gas	G25	8,23	60,75	340,21	3”	65
500-3200	Propane	G31	24,41	20,48	131,09	2”	50
500-3200	Butane	G30	32,13	15,56	99,59	2”	50

Motor	Ignition transformer
5,5 kW, 2800U/min 230/400 V, 50Hz 20/11,5A, 3 phase	Primary 230 V, 1 A Secondary 8 000 V

2.4 Capacity chart according to EN 676

——— G20, G30, G31

– – – – G25



2. TECHNICAL DATA

2.7 Declaration of concordance/conformity

Manufacturer:	Enertech AB, Bentone Division
Street address:	Näsvägen SE-341 34 Ljungby, Schweden
Postal address:	Box 309 SE-341 26 Ljungby, Schweden
Product:	Gas burner
Type:	BFG1, BG100, BG150, BG200, STG120, STG146, BG300, BG300LN, BG400, BG-400LN, BG450, BG450LN, BG500, BG500LN, BG550, BG550LN, BG600, BG600LN, BG650, BG700, BG700LN, BG800, BG800LN and BG950 all fan gas burner

Zertifikat TÜV Süddeutschland

Certificatet N0	Burner
CE-0085 BT 0064	BFG1
CE-0085 AO 0230	BG100
CE-0085 AP 0623	BG150
CE-0085 AP 0624	BG200
CE-0085 AT 0192	STG120, STG146
CE-0085 AP 0625	BG300
CE-0085 AP 0626	BG400
CE-0085 AU 0156	BG450
CE-0085 BP 0352	BG550
CE-0085 BP 0353	BG550LN
CE-0085 AO 0084	BG600LN
CE-0085 BP 0354	BG650
CE-0085 AT 0313	BG700
CE-0085 AT 0314	BG800
CE-0085 BR 5754	BG950

Enertech AB declares under its sole responsibility that the above-named products are in conformity with the following standard(s) or other normative document(s) and fulfil the applicable provisions of the below-mentioned EC Directives.

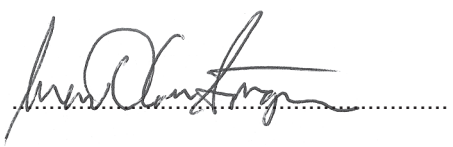
Document:	EN 676	
	DIN 4788	
EU directive:	90 / 396 / EEC	Gas directive
	89 / 336 EEC	EMC directive
	73 / 23 / EEC	Low voltage directive

Because the burner is deemed to conform to the above-mentioned standards and directives, it holds the CE marking.

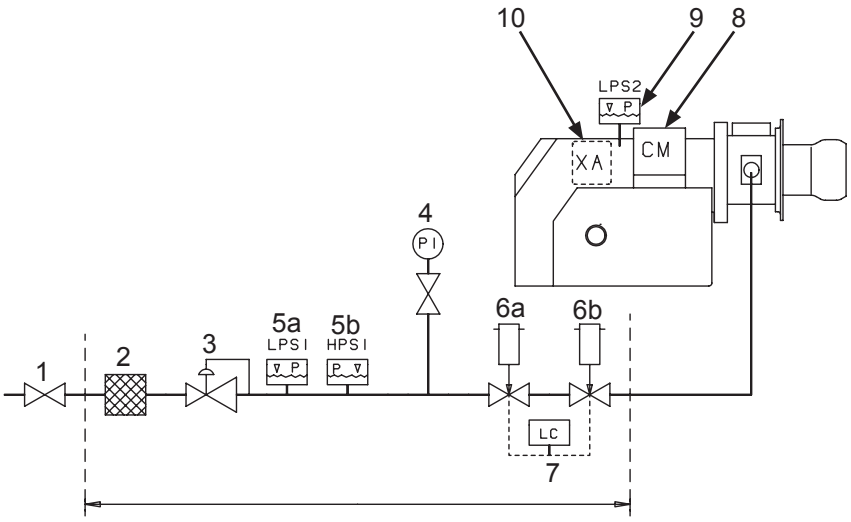
Enertech AB Bentone Division is quality certified according to SS-EN ISO 9001:2000.

Ljungby 070917

Sven-Olov Lövgren



3. SKELETON DIAGRAMS



1. Ball valve
2. Filter
3. Governor
4. Pressure gauge with shut-off cock

5a. Gas pressure switch, mini

5b. Gas pressure switch, maxi

6a. Main valve, 2 -stage

6b. Safety valve

[1)]7. Valve proving system

8. Air damper motor
9. Air pressure switch
10. Gas burner control

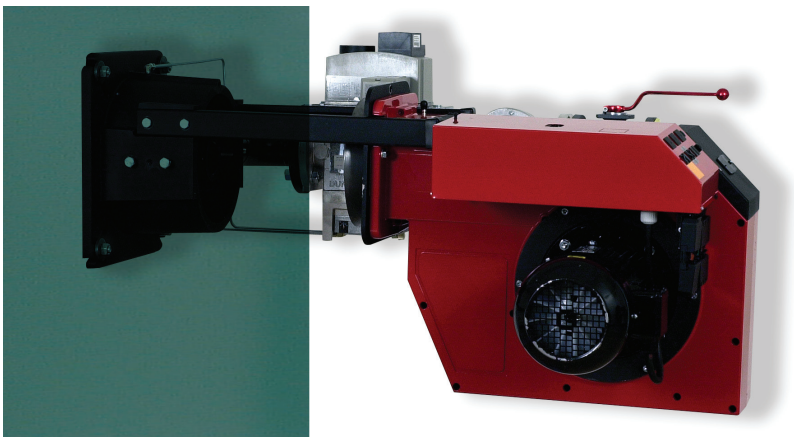
Pos. 5b, 7: Components not required according to EN 676.

[1)] Required over 1200 kW according to EN 676.

Warning

When Bio gas is used, Bentone shall always be contacted

4. MOUNTING OF THE BURNER



To facilitate the mounting of the boiler the burner head with gas flange and pull rods can be removed from the burner.

Do like this:

Loosen the screw "A" on both sides and the two stop bolts at the end of the pull rods. Remember that the electric cables to solenoid valve and gas switch are also disconnected.

When the burner head and the gas flange have been fitted to the boiler it is easy to lift the burner on to the pull rods.

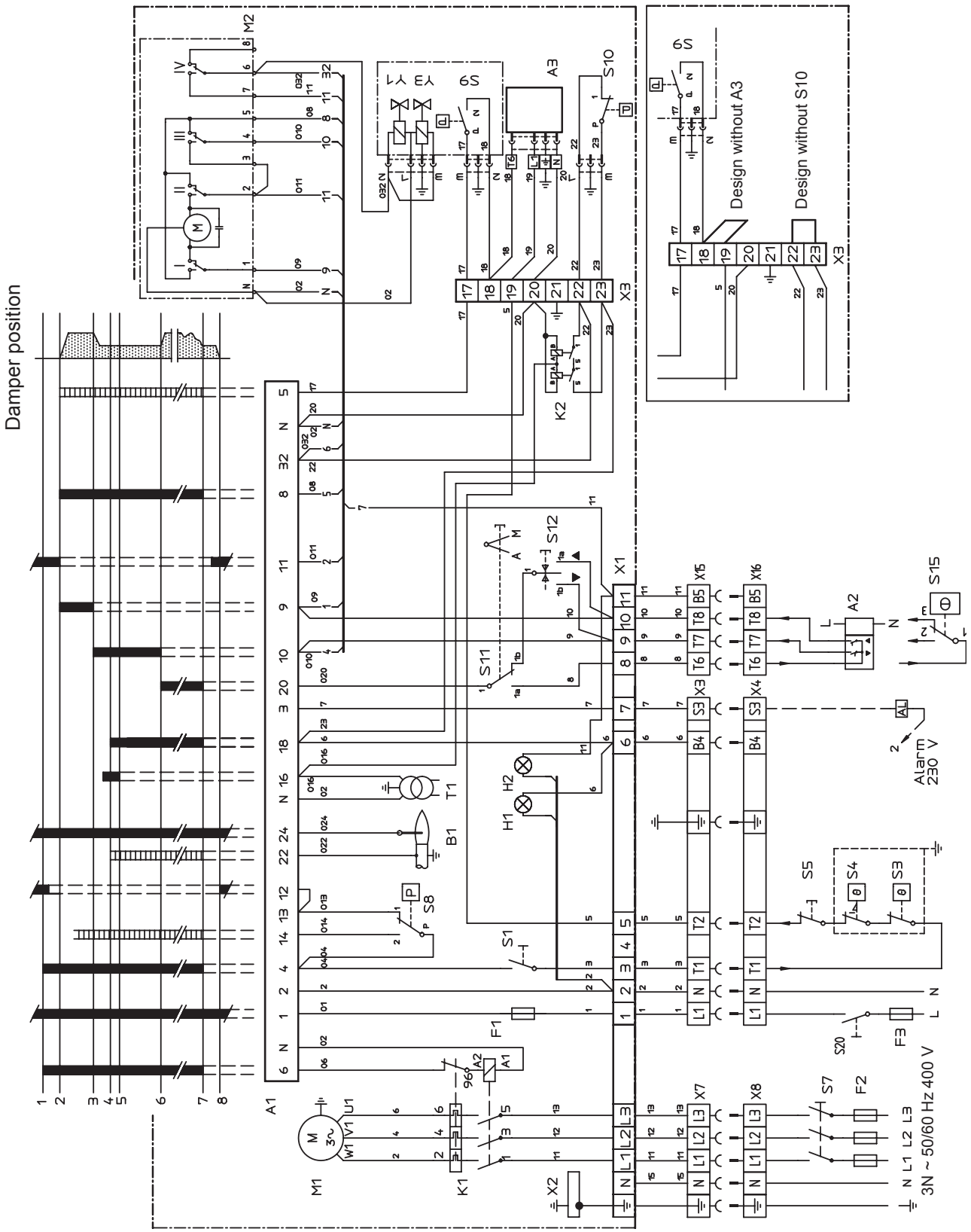
If the gas assembly needs to be inspected the pull rods are very useful. Loosen the screw "A" and pull out the burner on the pull rods. Loosen the screws "B" and withdraw the gas assembly.
Ensure that the O-ring between the gas assembly and the gas flange will be in the correct position when the gas assembly is fitted again.

Note!

For maintenance of the brake plate, nozzles, electrodes etc, when using a long design of the burner tube, you have to **remove the nozzle assembly from the connecting pipe and move the assembly backwards** in the fan housing (from the boiler).

5. ELECTRIC EQUIPMENT

5.1 Wiring diagram LFL 1... with Ionization electrode



5. ELECTRIC EQUIPMENT

5.2 List of components with Ionization electrode

A1 Gas burner control
A2 Power control
A3 Valve, leak tester, Dungs VPS504
B1 Ionization electrode
F1 Operation fuse
F2 Operating fuse
F3 Operating fuse
H1 Operating lamp
H2 Lamp, high capacity
K1 Motor contactor with thermal overload protector
K2 Auxiliary relay
M1 Burner motor
M2 Damper motor, L&S SQN75.664.A21B
S1 Operating switch
S3 Control thermostat
S4 Temperature limiter
S5 Micro switch for hinged door
S7 Main switch
S8 Air pressure switch
S10 Gas pressure switch, max.
S11 Change-over switch, Aut.-man.
S12 Change-over switch, Increase-Reduce
S15 Control thermostat, 3-pole (only for 2-stage sliding)
S20 Main switch
T1 Ignition transformer
X1 Connection terminal board
X2 Earth terminal
X3 Plug-in contact, burner
X4 Plug-in contact, boiler
X7 Plug-in contact, 3 phase, burner
X8 Plug-in contac}t, 3 phase, boiler
X15 Plug-in contact, power controller, burner
X16 Plug-in contact, power controller
S9 Gas pressure switch
Y1 Gas solenoid valve 1
Y3 Safety solenoid valve

Mains connection and fuse in accordance with local regulations.

5.3 Function

1. Operating switch ON-Thermostat ON-Gas pressure switch ON-Air damper closed.
A control is made that the air pressure switch does **not** indicate fan pressure. Then the burner motor starts.

2. Air damper motor opens.
The air damper motor opens the damper to max. position. A control is made that the air pressure switch indicates sufficient fan pressure.

3. Air damper motor closes.
The air damper motor closes to min. load position. Then the ignition spark is formed.

4. Main and safety valves open.
The gas is ignited. The ionization electrode indicates a flame.

5. The safety time expires.
The ignition spark goes out. The safety time expires. If there is no flame or if for some reason the flame disappears after this time limit, the burner control locks out.

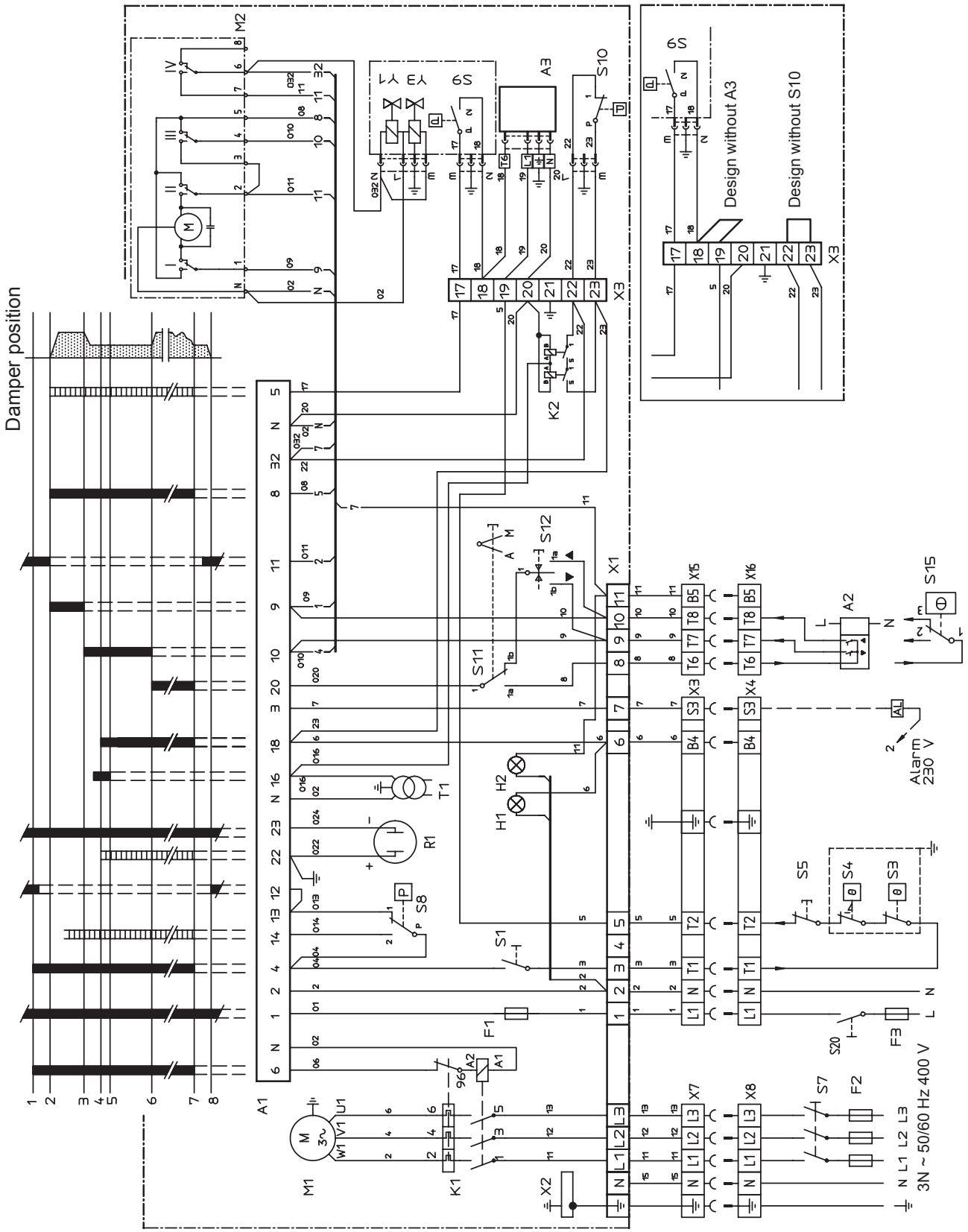
6. Operating position.
The burner is in operating position and can now change over to the capacity controlled by the regulator.

7. Stop.
The operation of the burner can now be interrupted by means of the operating switch or the thermostat.

The control locks out.
The red lamp in the control is lit. Restart the burner by pressing the reset button.

5. ELECTRIC EQUIPMENT

5.4 Wiring diagram LFL 1... with UV-Detector



5. ELECTRIC EQUIPMENT

5.5 List of components with UV-Detector

A1 Gas burner control
A2 Power control
A3 Valve, leak tester, Dungs VPS504
F1 Operation fuse
F2 Operating fuse
F3 Operating fuse
H1 Operating lamp
H2 Lamp, high capacity
K1 Motor contactor with thermal overload protector
K2 Auxiliary relay
M1 Burner motor
M2 Damper motor, L&S SQN75.664.A21B
R1 UV-Detector
S1 Operating switch
S3 Control thermostat
S4 Temperature limiter
S5 Micro switch for hinged door
S7 Main switch
S8 Air pressure switch
S10 Gas pressure switch, max.
S11 Change-over switch, Aut.-man.
S12 Change-over switch, Increase-Reduce
S15 Control thermostat, 3-pole (only for 2-stage sliding)
S20 Main switch
T1 Ignition transformer
X1 Connection terminal board
X2 Earth terminal
X3 Plug-in contact, burner
X4 Plug-in contact, boiler
X7 Plug-in contact, 3 phase, burner
X8 Plug-in contac}t, 3 phase, boiler
X15 Plug-in contact, power controller, burner
X16 Plug-in contact, power controller
S9 Gas pressure switch
Y1 Gas solenoid valve 1
Y3 Safety solenoid valve

Mains connection and fuse in accordance with local regulations.

5.6 Function

1. Operating switch ON-Thermostat ON-Gas pressure switch ON-Air damper closed.
A control is made that the air pressure switch does **not** indicate fan pressure. Then the burner motor starts.

2. Air damper motor opens.
The air damper motor opens the damper to max. position. A control is made that the air pressure switch indicates sufficient fan pressure.

3. Air damper motor closes.
The air damper motor closes to min. load position. Then the ignition spark is formed.

4. Main and safety valves open.
The gas is ignited. The ionization electrode indicates a flame.

5. The safety time expires.
The ignition spark goes out. The safety time expires. If there is no flame or if for some reason the flame disappears after this time limit, the burner control locks out.

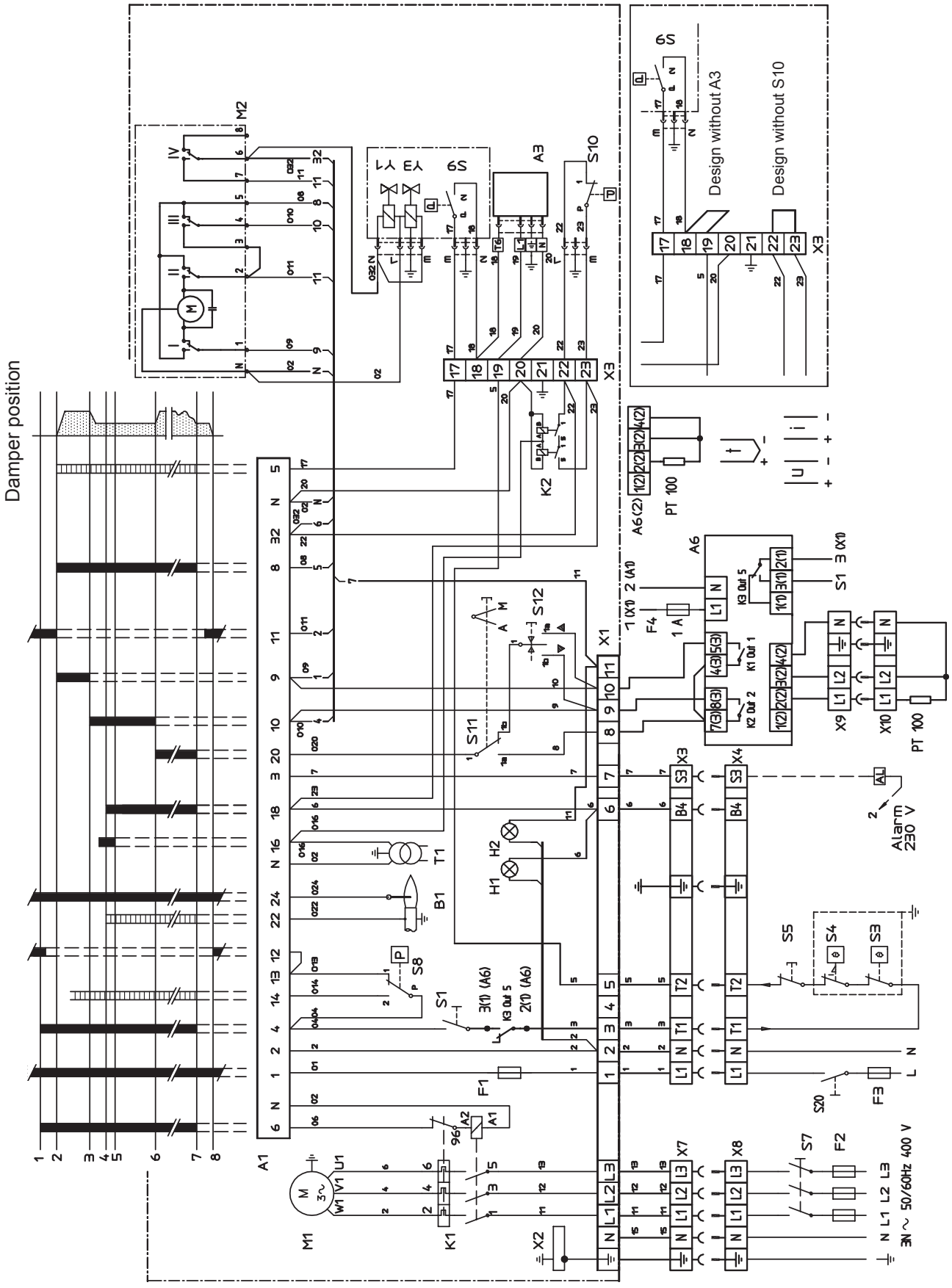
6. Operating position.
The burner is in operating position and can now change over to the capacity controlled by the regulator.

7. Stop.
The operation of the burner can now be interrupted by means of the operating switch or the thermostat.

The control locks out.
The red lamp in the control is lit. Restart the burner by pressing the reset button.

5. ELECTRIC EQUIPMENT

5.4 Wiring diagram LFL 1... with R316



5. ELECTRIC EQUIPMENT

5.5 List of components with R316

A1 Gas burner control
A3 Valve, leak tester, Dungs VPS504
A6 Power control R316
A6(2) PT 100-sensor, Thermocouple, current/voltage
B1 Ionization electrode
F1 Operation fuse
F2 Operating fuse
F3 Operating fuse
F4 Operating fuse 1A
H1 Operating lamp
H2 Lamp, high capacity
K1 Motor contactor with thermal overload protector
K2 Auxiliary relay
M1 Burner motor
M2 Damper motor, L&S SQN75.664.A21B
S1 Operating switch
S3 Control thermostat
S4 Temperature limiter
S5 Micro switch for hinged door
S7 Main switch
S8 Air pressure switch
S10 Gas pressure switch, max.
S11 Change-over switch, Aut.-man.
S12 Change-over switch, Increase-Reduce
S20 Main switch
T1 Ignition transformer
X1 Connection terminal board
X2 Earth terminal
X3 Plug-in contact, burner
X4 Plug-in contact, boiler
X7 Plug-in contact, 3 phase, burner
X8 Plug-in contact, 3 phase, boiler
X9 Plug-in contact, power controller R316 burner
X10 Plug-in contact, power controller R316
S9 Gas pressure switch
Y1 Gas solenoid valve 1
Y3 Safety solenoid valve

Mains connection and fuse in accordance with local regulations.

5.6 Function

1. Operating switch ON-Thermostat ON-Gas pressure switch ON-Air damper closed.
A control is made that the air pressure switch does **not** indicate fan pressure. Then the burner motor starts.

2. Air damper motor opens.
The air damper motor opens the damper to max. position. A control is made that the air pressure switch indicates sufficient fan pressure.

3. Air damper motor closes.
The air damper motor closes to min. load position. Then the ignition spark is formed.

4. Main and safety valves open.
The gas is ignited. The ionization electrode indicates a flame.

5. The safety time expires.
The ignition spark goes out. The safety time expires. If there is no flame or if for some reason the flame disappears after this time limit, the burner control locks out.

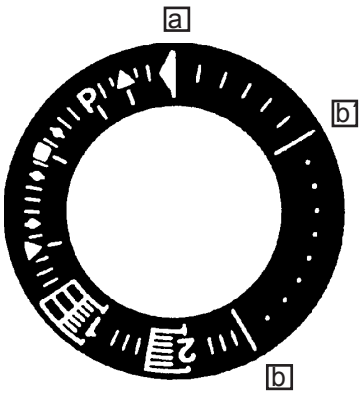
6. Operating position.
The burner is in operating position and can now change over to the capacity controlled by the regulator.

7. Stop.
The operation of the burner can now be interrupted by means of the operating switch or the thermostat.

The control locks out.
The red lamp in the control is lit. Restart the burner by pressing the reset button.

5. ELECTRIC EQUIPMENT

5.7 Control programme under fault conditions and lockout indication LFL1....



In the event of fault conditions the fuel supply is always interrupted immediately and, simultaneously, the sequence switch stops and thus the lockout indicator. The symbol appearing above the reading mark indicates the kind of fault:

◀ **No start,**
because, e.g., the CLOSE signal has not been supplied to terminal 8 or a contact has not been closed between terminals 12 and 4 or 4 and 5.

▲ **Interruption of the start-up sequence,**
because the OPEN signal has not been supplied to terminal 8 from damper motor to switch «max.». Terminals 6, 7and 14 are under tension until the fault has been remedied.

P **Lockout,**
because the air pressure signal has not been received at the start of the air pressure check. **Any air pressure failure after this point in time also causes the control to go to lockout!**

■ **Lockout**
due to a fault in the flame supervision circuit.

▼ **Interruption of the start-up sequence,**
because the position signal for the low-flame position has not been supplied to terminal 8 by the damper motor. Terminals 6, 7 and 14 are under tension until the fault has been remedied.

1 **Lockout**
because no flame signal has been received on completion of the 1st safety time. **Any flame signal failure after completion of the first safety time also causes the control to go to lockout!**

2 **Lockout,**
because no flame signal has been received on completion of the 2nd safety time (flame signal of the main flame with interrupted pilot burners).

| **Lockout,**
because the flame signal has been lost during burner operation or air pressure failure has occured.

◀ **Lockout on completion of control programme sequence**
due to extraneous light (e.g. flame not extinguished, leaking fuel valves) or due to a faulty flame signal.

a - b **Start-up sequence**

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

b (b´) - a **Post-purge sequence**

5.8 Technical data LFL1...

	Pre-purge time with full air volume:	31,5 s
	Pre-iginition time:	6 s
	Safety time:	3 s
	Post-ignition time:	3 s
	Reset after lock-out	Immediately
	Time of re-start:	18 s
	Ambient temperature:	-20°C to +60°C
	Protective standard:	IP 40
Supervision of ionization current	Voltage at the detector electrode	operation: 330V ± 10% test: 380V ± 10%
	Short circuit current	max. 0,5 mA
	Min. required ionization current	6 µA
	Recommended range of measuring device	0...50 µA

6. MEASURES AND CHECKS BEFORE START-UP

6.1 2-Stage or modulating burners

Inner assembly

Ensure that the ignition and ionisation electrodes are correctly ajusted. The sketch (see separate page) shows the correct measurements.

Gas quality

Ensure that the burner head is meant for the gas quality to be used (see fig.).

Venting

The gas line is vented by loosening the screw on the test nipple for the inlet pressure. Connect a plastic hose and conduct the gas into the open air.
After having vented the gas line tighten the screw again.

Electric function test:

Ensure that phase and neutral are not reversed. The gas shut-off cock should be closed.To prevent the gas pressure switch from locking out, it should be linked temporarily.
After the main switch has been switched on and the thermostats have been adjusted, the pre-purging period begins (30-35sec.). At the end of this period the pre-ignition period starts (0,5-2,5 sec. depending on the design of the gas control). The gas valve is energized and opens and flame is established. At the end of the safety time (2-3 sec.) the gas control locks out. The solenoid valve and the motor will be ”dead”. Remove the link from the gas pressure switch after the test is finished.
Note on 2-stage and modulating burners that during the pre-purging period the damper opens to the set value for air on stage 2 and just before the end of the pre-purging period it goes down to the air setting for stage 1. On some burners under 350kW the pre-purging mainly takes place with the air damper set for stage 1.

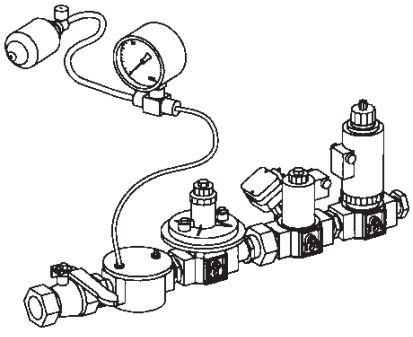
NOTE! Applies only to gas burner control LFL1.

When using LPG (Propane) the burner should be connected for post-purging. Move the connection on terminal 6 to terminal 7 in the base of LFL1.

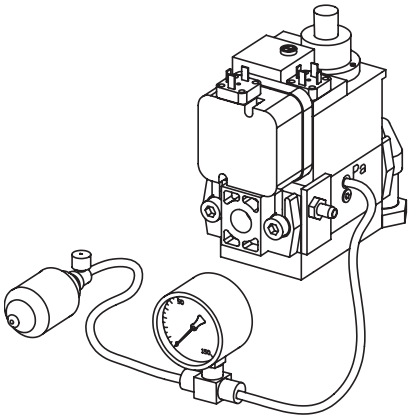
Leakage control

When making a leakage control of the gas supply system, the solenoid valve should be closed. Connect a pressure gauge to the test nipple Pa, see fig. The test pressure in the system should be 1,5x max. inlet pressure or min. 150 mbar. If any leakage, locate the source by means of soapy water or a leak location spray. After tightening repeat the test.

Gas train



Multibloc

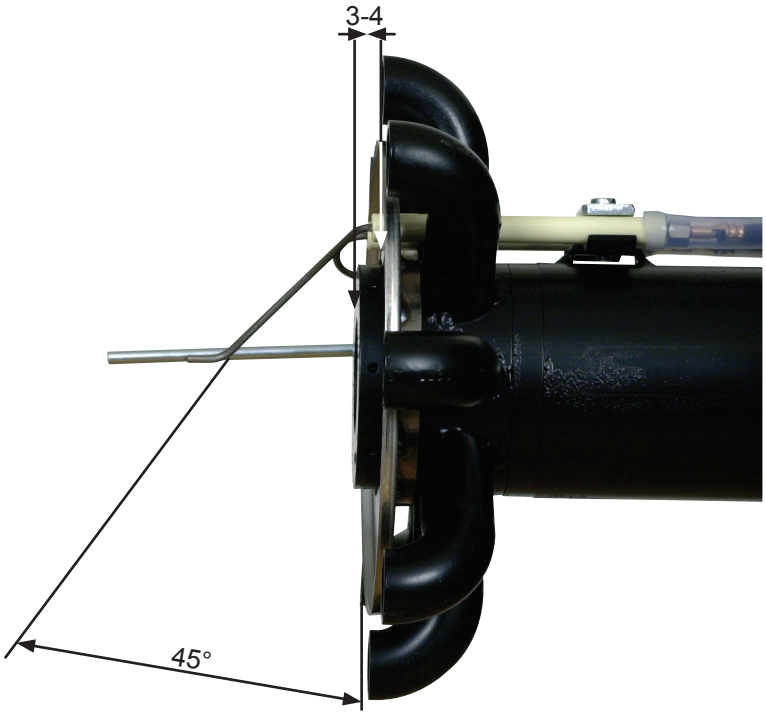


6. MEASURES AND CHECKS BEFORE START-UP

6.2 Inner assembly

Natural gas, LPG

Distance ionisation electrode - shrouded disc.



7. DETERMINATION OF GAS VOLUME FOR THE INSTALLATION

Specifications on natural gas, town gas and biogas vary. For more exact information please contact the gas distributor.

Net calorific value H_u 15°C/1013,25 mbar			
Gas quality		kWh/Nm³	MJ/Nm³
Natural gas	G20	9,50	34,20
Natural gas	G25	8,23	29,63
Propane	G31	24,41	87,88
Butane	G30	32,13	115,67
Biogas		6,00	21,60

7.1 Example how to calculate the gas volume (natural gas)

V = Gas volume Nm³/h

Q = Boiler output 2200 kW

H_u = Calorific value of the gas A. 34,20 MJ/Nm³, B. 9,50 kWh/ Nm³

η = Expected efficiency 90%

Ex. A $V = \frac{Q \cdot 3\,600}{H_u \cdot \eta} = \frac{2200 \cdot 3\,600}{34200\ 144 \cdot 0{,}90} \approx$ 257,3 Nm³/h

Ex. B $V = \frac{2200}{9{,}50 \cdot 0{,}90} \approx$ 257,3 Nm³/h

If the barometer height, pressure and temperature of the gas deviate considerably from the normal values this must be taken into account as follows:

$$f = \frac{273 + t}{273} \cdot \frac{1013{,}25}{B + P_u}$$

t = Temperature of the gas at the gas meter (15°C)

B = Barometer height (945 mbar)

P_u = Pressure of the gas at the gas meter (15,0 mbar)

$$f = \frac{273 + 15}{273} \cdot \frac{1013{,}25}{945 + 15}$$

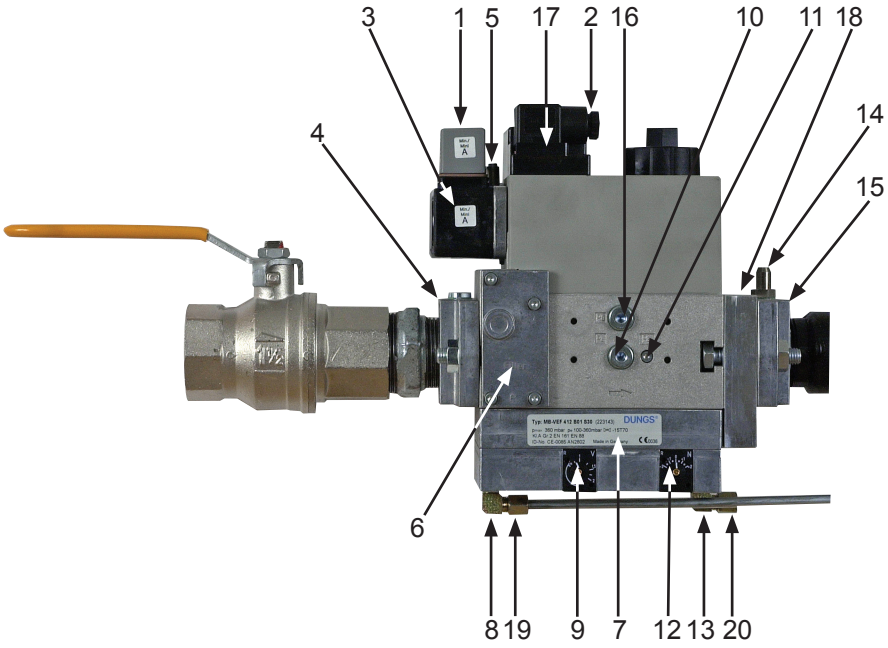
$f \approx 1.11$

The gas volume read on the gas meter actually reads
1,11 · 257,3 = 285,6 m³/h.

8. MULTI-BLOC

8.1 View

8.1.1 MB-VEF 412 - 425 B01

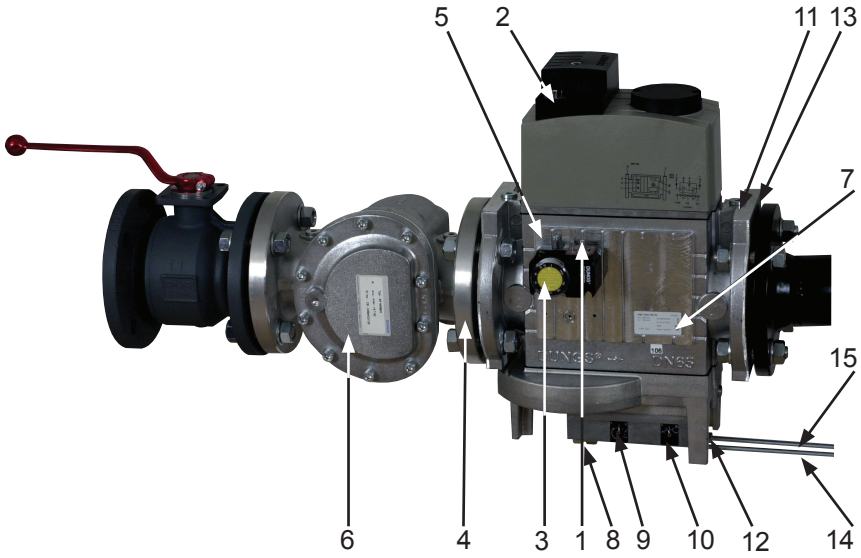


1. Electrical connection gas pressure switch mini
2. Electrical connection gas valve
3. Pressure switch mini
4. Flange connection inlet
5. Test point connection 1/8” before V_1
6. Filter (on Multi-Bloc 425 external filter)
7. Data plate
8. Connection 1/8” P_L
9. Adjustment screw V for ratio P_{Br}: P_L (max. load)
10. Test point connection 1/8” before V_1 (before governor)
11. Connection M4 for measurement of burner pressure after V_2
12. Adjustment screw for zero point adjustment N (min. load)
13. Test point connection 1/8” P_F
14. Test point connection 1/8” (after V_2 burner)
15. Flange connection, outlet
16. Test point connection 1/8” P_a before V_2 (after governor)
17. Indication of V_1 and V_2 in operation (not standard)
18. Impulse flange P_{Br} (gas pressure)
19. Impulse line P_L (air pressure)
20. Impulse line (fire room)

It is possible to connect a leakage control VPS 504 and a gas pressure switch maxi.

8. MULTI-BLOC

8.1.2 MBC 1900 - 3100 VEF



1. Electrical connection gas pressure switch mini
2. Electrical connection gas valve
3. Pressure switch mini
4. Flange connection inlet
5. Test point connection before V_1
6. Filter
7. Data plate
8. Connection 1/8” P_L
9. Adjustment screw V for ratio P_{Br}: P_L (max. load)
10. Adjustment screw for zero point adjustment N (min. load)
11. Test point connection 1/4” (after V_2 burner)
12. Connection 1/8” P_F
13. Flange connection, outlet
14. Impulse line P_L (air pressure)
15. Impulse line (fire room)

It is possible to connect a leakage control VPS 504 and a gas pressure switch maxi.

8.0 MULTI-BLOC, MB-VEF, MBC-VEF

8.2 Technical data

- Max inlet pressure 360 mbar
- Valves V_1+V_2 class A group 2 in accordance with EN 161
- Governor class A group 2 in accordance with EN88
- Ratio V P_{Br}:P_L 0,75:1-3:1
- Filter according to DIN 3386
- Ambient temperature -15°C- +70°C
- Protection standard type IP54 (according to IEC 529, DIN 40050)
- Gas family 1 +2 +3
- Outlet pressure 0,5 - 100 mbar
- Zero point adjustment N ±2 mbar
- Pressure switch DIN3398 TI
- Fan pressure P_L 0,4-100 mbar
- Fire room pressure PF -2 -+5mbar
- Burner pressure P_{Br} 0,5 - 100 mbar

8.3 Mounting instruction - impulse lines P_L, P_F and P_{Br}

- Impulse lines should preferably be made of steel. Inside diametre >ø 4 mm (steel tube ø 6/4)
- For P_L other material can be used.
- Impulse lines P_L and P_{BR} are ready from factory
- Impulse lines shall be mounted in such a way that no conden sate can flow back into the multibloc.This is especially important when P_F is concerned.
- Impulse lines shall be mounted in such a way that they are protected against rupture and damage.
- Impulse lines shall be as short as possible

8.4 Adjustment possibilities

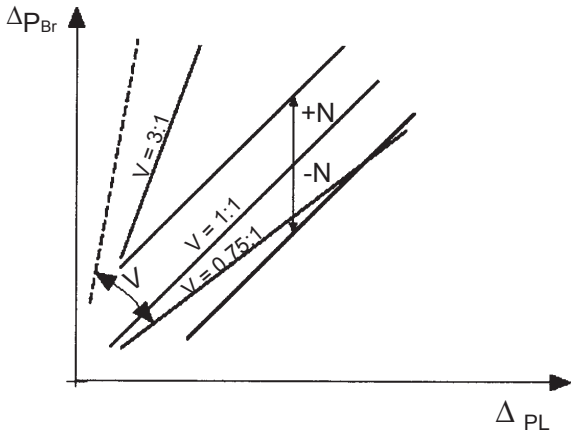
Adjustment range

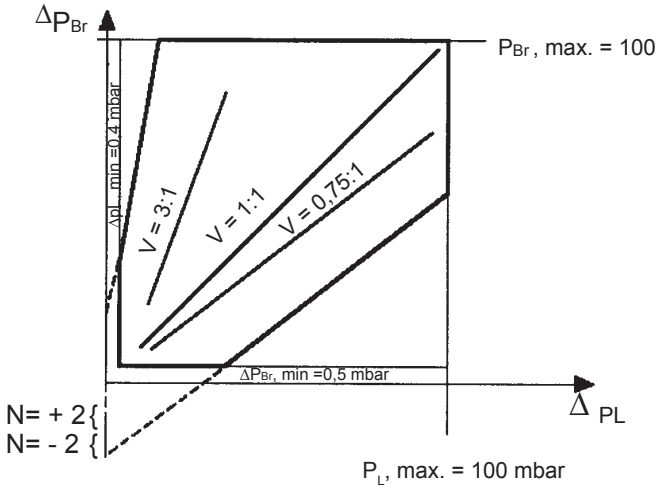
Effective burner pressure

$\Delta P_{Br} = P_{Br} - P_F$

Effective fan pressure

$\Delta P_L = P_L - P_F$

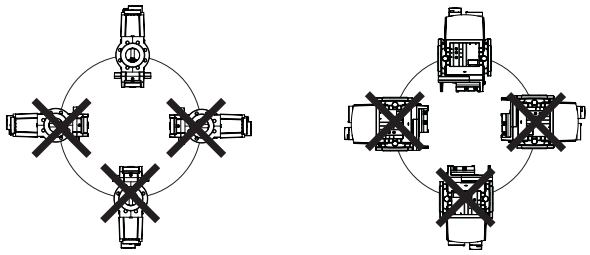




9. Double Solenoid Valve Gas-air-ratio control Type MBC-...-VEF

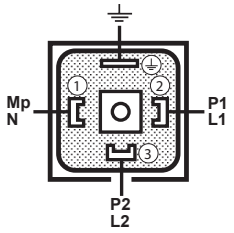
9.1 Nominal diameters DN 65 - DN 125

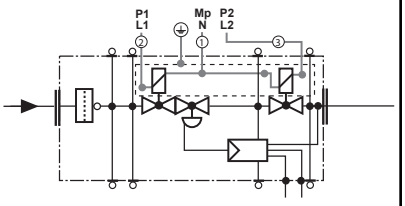
Installation position

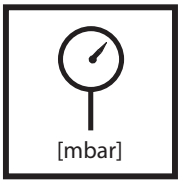


Electrical connection
IEC 730-1 (VDE 0631 T1)

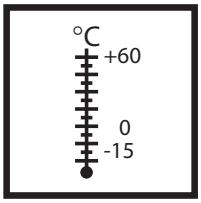
Grounding acc. local regulations



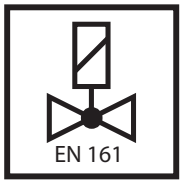




Max. operating pressure 500 mbar
DN 65 - 125 :
$p_{e,min.}$ 15 mbar - $p_{e,max.}$ 360 mbar

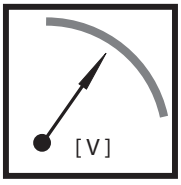


Ambient temperature
-15 °C … +60 °C

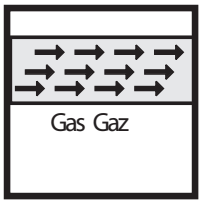


V1+V2 Class A, Group 2
acc. EN 161

Degree of protectionIP 54 acc
IEC 529 (DIN 40 050)

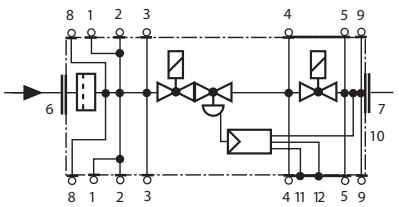


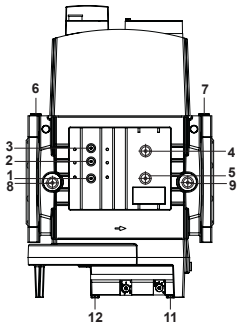
U n ~(AC) 220 V-15 % …- 230 V+10 %
~(AC) 110 V - 120 V, =(DC) 48 V;
=(DC) 24 V - 28 V Switch-on duration 100%



Family 1 + 2 + 3

9. Double Solenoid Valve Gas-air-ratio control Type MBC-...-VEF

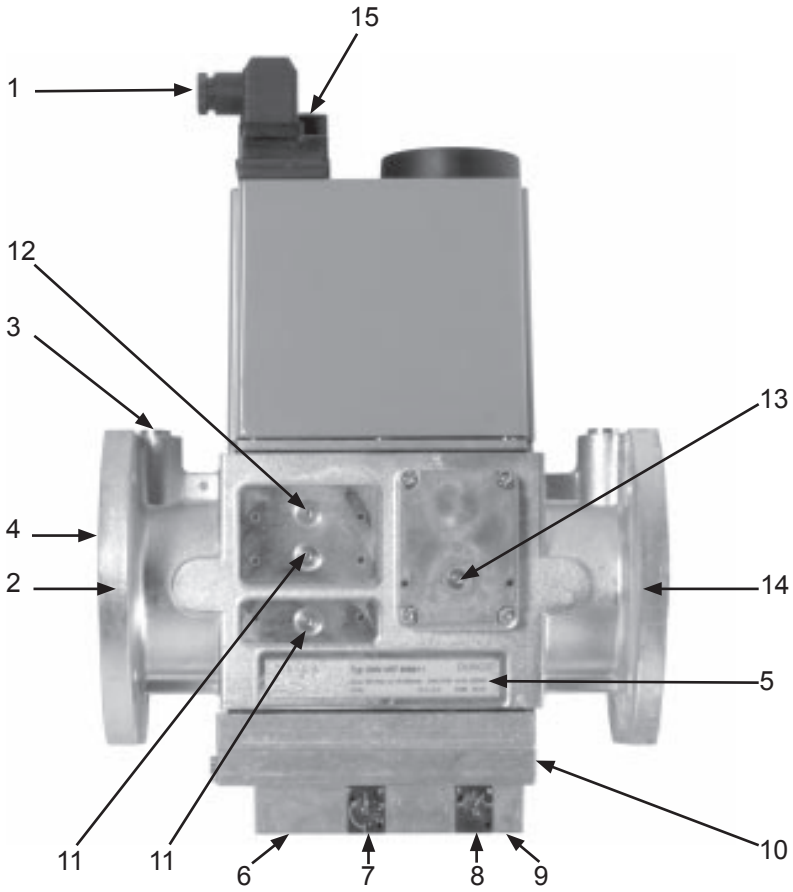




9.2 MBC-...-VEF

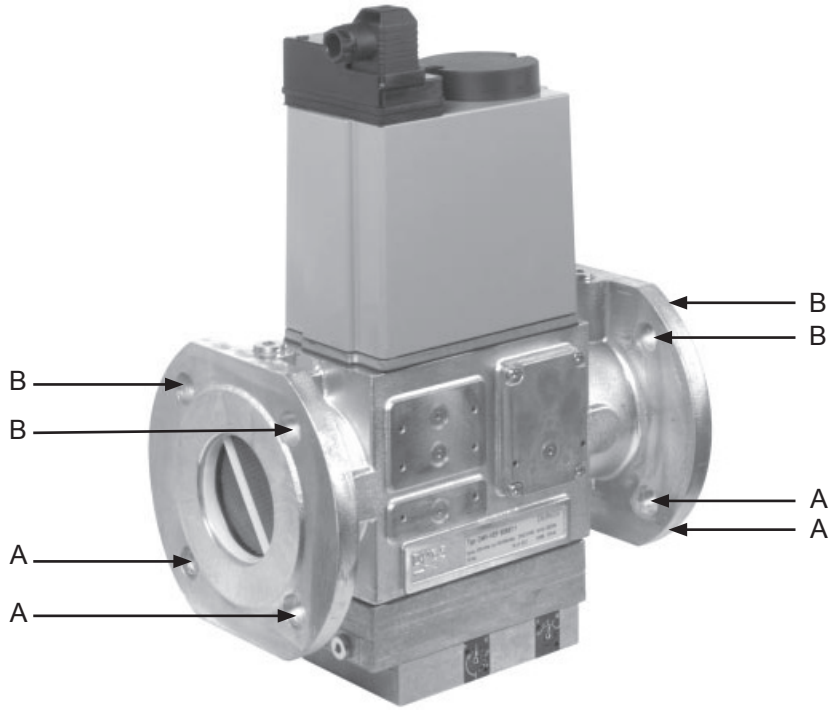
Pressure taps

1, 2, 3 screwed seal plug G 1/8
4, 5, option Connecting bore for system accessories
6, 7 screwed seal plug G 1/4
8, 9, option screwed seal plug G 1/2 (option)
10 Pulse line pBr (built in)
11, 12 Vent plug G 1/8



1. Electrical connection for valves (DIN EN 175 301-803)
2. Input flange
3. Pressure connection G 1/4
4. Sieve
5. Type plate
6. G 1/8 pressure connection for p_L blower pressure
7. Setting screw, ratio V
8. Setting screw, zero point adjustment N
9. G 1/8 pressure connection for p_F furnace pressure
10. Pulse line for burner pressure p_{Br}
11. Test point connection G 1/8 downstream of filter possible on both sides
12. Test point connection G 1/8 downstream of V1, possible on both sides
13. Test point connection G 1/8 downstream of V2
14. Output flange
15. Operation display

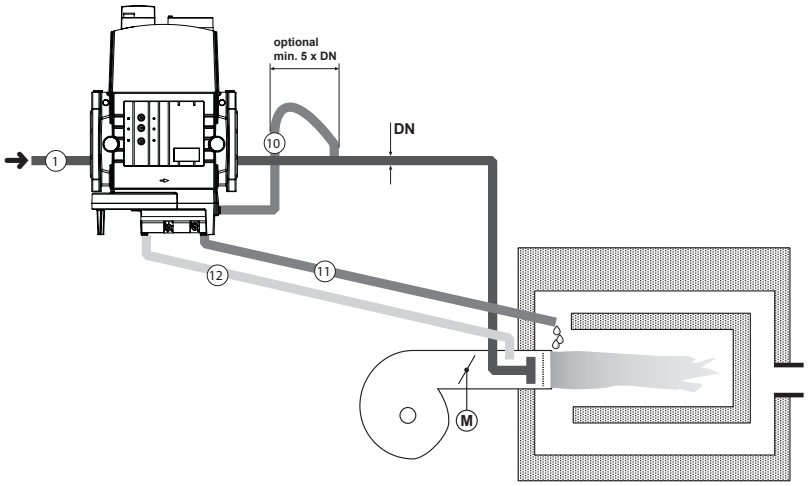
9. Double Solenoid Valve Gas-air-ratio control Type MBC-...-VEF



9.3 Mounting

1. Insert setscrews A
2. Insert seals
3. Insert setscrews B
4. Tighten setscrews A + B.
   Ensure correct seating of the seal!
5. Option externer Impuls:
   Attach pulse lines p_{Br}, p_L, p_F
6. After installation, perform leakage and functional test.
7. Disassembly in reverse order
   $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$.

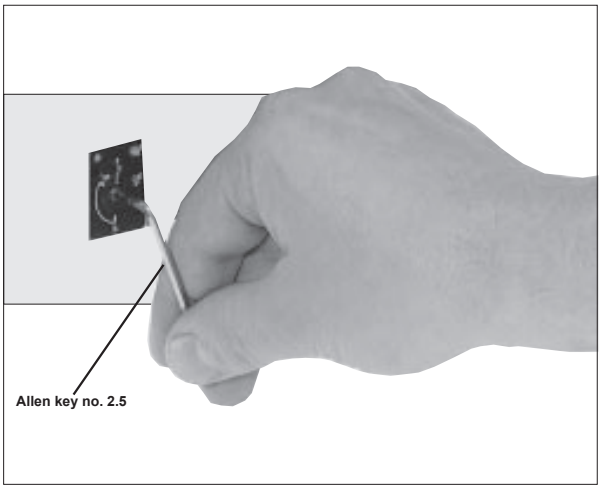
9.4 Installation of pulse lines



1. p_e: Gas inlet pressure 15 - 360 mbar
10. p_{Br}: Burner pressure, gas 0,5 - 100 mbar
11. p_F: Combustion chamber – 20 mbar … + 50 mbar pressure or atmosphere
    Δp_L max. = pL - pF = 100 mbar
    Δp_{BR}max. = pL - pF = 100 mbar
12. p_L: Blower pressure, air 0,4 - 100 mbar

9. Double Solenoid Valve Gas-air-ratio control Type MBC-...-VEF

9.5 Setting the pressure controller



⚠ Pressure controller is provisionally set at the factory. The setting values must be locally adapted to machine conditions.
Important: Follow the instructions of the burner manufacturer.

1. Open protective caps V and N.
2. Start burner. Adjustment of setting values N and V only possible in operation, Fig. 1
3. Check ignition reliability of burner.
4. At min. performance:
   Set zero point adjustment N.
5. At max. performance:
   Set ratio V.
6. If necessary, repeat settings 4. and 5. Check intermediate values.
7. Seal setting screws N and V (see below) with lead.

10. ADJUSTMENT OF GAS FLOW

- Before the burner starts vent the lines to make sure that there is gas vailable at the multibloc
- Use an allen key size 2,5 mm for adjusting N and V
- Connect a pressure gauge for measur-ing P_{Br}, (advisable to find out if the valves are open)
- Set the switch in position MAN.
- Set the gas pressure switch min. and air pressure switch on min. adjustment. Set the gas pressure switch max, if any, on max. adjustment.
- Start the burner, observe the pressure gauge, if no flame is established and the pressure gauge needle does not flicker, increase N. When the flame is established adjust the gas flow by means of the screw N. Use a flue gas instrument.
- Change over to max. load, press the switch “increase”
- Adjust the gas flow with V and check at the same time the combustion values.
- Go back to min. load and check the combustion value. Adjust if necessary.
- If necessary repeat the controls of the adjustment made on min. (N) and max.load(V)
- The desired gas flow on min. and max. has now been adjusted by changing the orange and the red cams. Check the gas flow on the gas meter available on the installation.

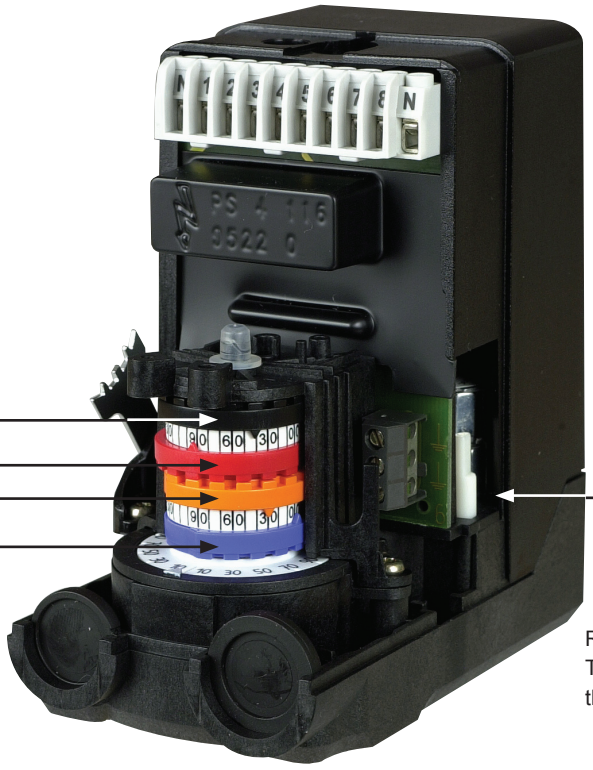
Note! Do not forget to set the air and gas pressure switches after the adjustment, see special instructions

10.1 Damper motor, air volume

Adjust the orange cam for min. load (about 5-10 on scale)
Adjust the red cam for max. load (90°)
The blue cam is factory set for closed position during standstill
The black cam has no function at modulating operation

10.2 Releasing button

By pressing the button and snapping it down, the motor will be released and the damper can easily be turned. This function facilitates an exchange of damper motor.



11. GENERAL INSTRUCTIONS

11.1 Adjustment of burner

The burner is from the factory pre-set to an average value that must then be adjusted to the boiler in question. All burner adjustments must be made in accordance with boiler manu-facturers instructions.These must include the checking of flue gas temperatures, average water temperature and CO_2 or O_2 concentration.

General instructions

The installation of the gas burner must be carried out in accordance with current regulations and standards. The installers of gas burners should therefore be acquainted with all regulations and ensure that the installation complies with the requirements. The installation, mounting and adjustment should be made with the greatest care and only the correct gas should be used.

Operating instructions

The operating instructions accompanying the burner should be left in a prominent position in the boiler room.

Instructions

The user should be thoroughly in-structed in the function of the gas burner and the whole installation. The supplier must instruct the user.

Inspection and maintenance

Daily inspection is advisable.

Start up

After the burner has been fitted to the boiler and the electric connection, the leakage control, the venting and the electric function test have been carried out, the burner will be ready for start-up.

Howerer, study the sections dealing with adjustments of multi-bloc, combustion air and combustion head. Open the ball valve and switch on the main switch. If the burner starts the actual adjustment can be made.

Adjustment of burner head

The burner is equipped with an adjustment device changing the position of the brake plate in the burner head. This is used to adjust the correct pressure drop over the combustion device in order to obtain a good pulsation free combustion.

Which position to use depends on input and overpressure in the boiler. A general rule is that the lower capacity the smaller the opening between brake plate and combustion device.

Commissioning of installation

Control of the combustion. The combustion quality is checked by means of a flue gas analysis device. Adjust the burner to appr. 20% excess air in accordance with the table. Check the flue gas temperature. Calculate the efficiency. Check also the actual gas volume on the gas meter so that the correct input is achieved.

11.2 Service

Service should only be carried out by qualified personnel. Replacement parts should be of the same make and approved by the same authorities as the original. If the burner is converted to fire another gas quality it must be re-commissioned. If town gas is to be fired the combustion head must be converted and the gas train adjusted to suit (e.g.a larger gas armature or a different spring in the governor may be required).

Gas quality	CO_2% lambda 1,2	O_2%	max. CO_2%
Natural gas	10,0	3,5	11,9
LPG	11,5	3,5	13,9

12. GENERAL INSTRUCTION

12.1 Flame monitoring and measurement of ionisation current

The burner is monitored according to the ionisation principle. Check the ionisation current on start-up and on each service call.

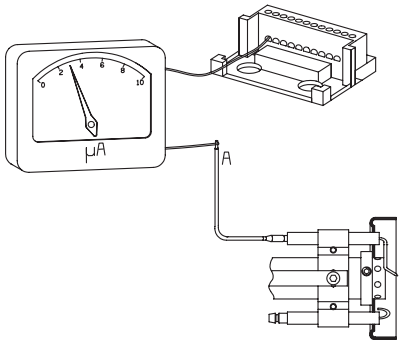
The reason for a low ionisation current may be leaking currents, bad connection to earth, dirt or a faulty position of the flame electrode in the burner head. Sometimes also a faulty gas/air mixture may cause too weak a ionisation current.

The ionisation current is measured by means of a microampere meter (µA) connected in series with the flame electrode and the gas burner control.

Connect the µA-meter, see figure. Min. required ionisation current according to table. In practice this current must be considerably higher, preferably more than 10 µA. All the gas burners are equipped with a ionisation cable that can be slit which facilitates the connection of the µA-device.

Gas control	Connection to terminal in gas control	Min. ionisation current required
LFL	24	10 µ A

Flame monitoring

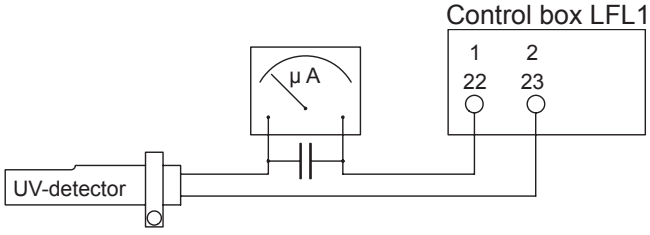


12.2 UV-detector

This should not be exposed to temperatures exceeding 60°C. The current passing through the UV-detector, when it is being illuminated, should be at least 70 µ A for LFL1.. This current can be measured by means of a moving coil instrument. Checks should only be made if a fault is suspected.

The capacitor, which sould be placed between the terminals on the moving coil instrument, must be of 100 µ F 10-25 V.

Flame monitoring



12. GENERAL INSTRUCTION

12.3 Adjustment of air pressure switch

The air pressure switch should stop the burner, if the air volume is reduced.
The air proving device shall be adjusted in such a way that if there is insufficient air supply at the highest or lowest burner operating stage, the device operates before the supervised pressure is less than 80% of the pressure at the controlled stage and the CO content of the combustion products exceeds 1% by volume.
On adjustment, turn the scale on the air pressure switch in clockwise direction. When the switch-off point has been reached and the burner stops read off the value on the scale. Then turn the scale in anti-clockweise direstion to desired value. Make repeated start attempts to ensure that the air pressure switch is not too closely set.

Adjustment range ca:
1-10 mbar LGW 10
2,5-50 mbar LGW 50

12.4 Adjustment of min. gas pressure switch

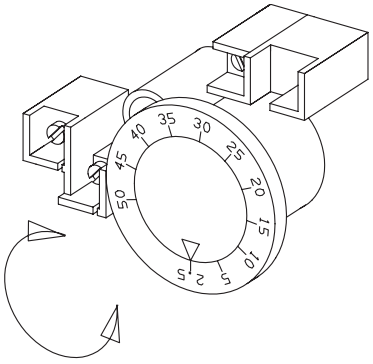
The min. pressure switch should react if the gas pressure is too low and prevent the burner from starting. Too low a gas pressure during operation should stop the burner. The burner may start again when the rated gas pressure has been reached.
Remove the protective cover. Connect a pressure gauge for measuring the rated pressure. Decide on pressure at which the gas switch should switch off. Set this pressure by means of the valve. Carefully turn the knob (see figure) until the gas pressure switch switches off. The value shown on the scale should then approximately correspond with the value shown on the pressure gauge. Tolerance on scale appr. ± 15 %.
Open the ball valve.

12.5 Adjustment of max. gas pressure switch

The burner is equipped with a max. gas pressure switch only on request. It should stop the burner if the gas pressure exceeds the set value. The burner can then only be re-started manually (gas burner control or overpressure switch).
Remove the protective cover. Connect a pressure gauge for measuring the rated gas pressure. Decide on pressure at which the gas pressure switch should switch off. Turn the adjustment knob to this value. Tolerance on the scale ±15%.

Adjustment range:
2,5-50 mbar GW 50
5-150 mbar GW 150

12.6 Gas pressure switch, air pressure switch



13. LEAKAGE CONTROL, DUNGS VPS 504 SERIES 2

13.1 Technical data

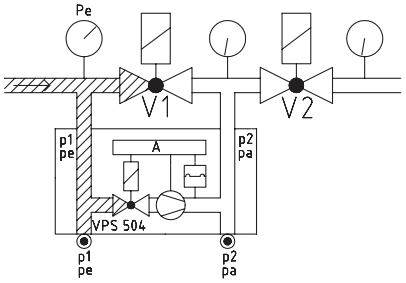
Test volume	≤ 4,0 l
Pressure increase using motor pumps	≈ 20 mbar
Backup (customer supply)	10A fast or 6.3A slow
Fuse integrated in housing, replaceable	T6,3L 250V (IEC 127-2/111) (DIN41662)
Switching capacity	Operating outputs SO1, SO2,SO4: 4A Faul output T7: 1A Faul output SO4 1, 2, 3, T7: 1A
Release time	≈ 10 - 30 s Depending on test volume and input pressure.
Sensitivity limit	50 l/h
Max. number of test cycles	20/h

13.2 Programme sequence

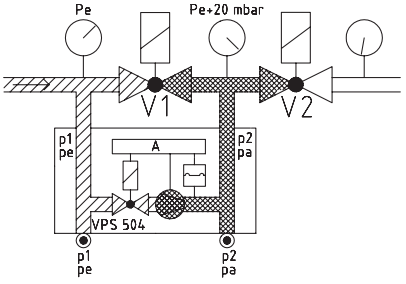
Idle state: Valves 1 and 2 are closed. Pressure build-up: The internal motor pump increases the gas pressure P_e in the section by approx. 20 mbar compared with the input pressure at valve V1. During the test time, the integrated differential pressure sensor monitors the test section for leaks. When the test pressure is attained, the motor pump switches off (end of test period). The release time (10-30 s) is depending on the test volume (max. 4.0 l). If the test section has no leaks, the contact is released to the control box after approx. 30 s and the yellow LED lights up.
If the test section is leaky or if the pressure increase by + 20 mbar is not attained during the test period (max. 26 s), the VPS 504 generates a fault. The red LED is lit as long as the contact is released by the regulator (heat requirement).

After a short voltage drop during testing or during burner operation, an automatic restart is performed.

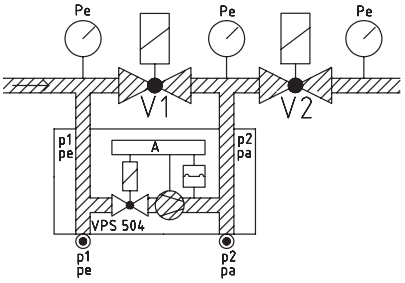
Programmer Idle state



Pressure buildup

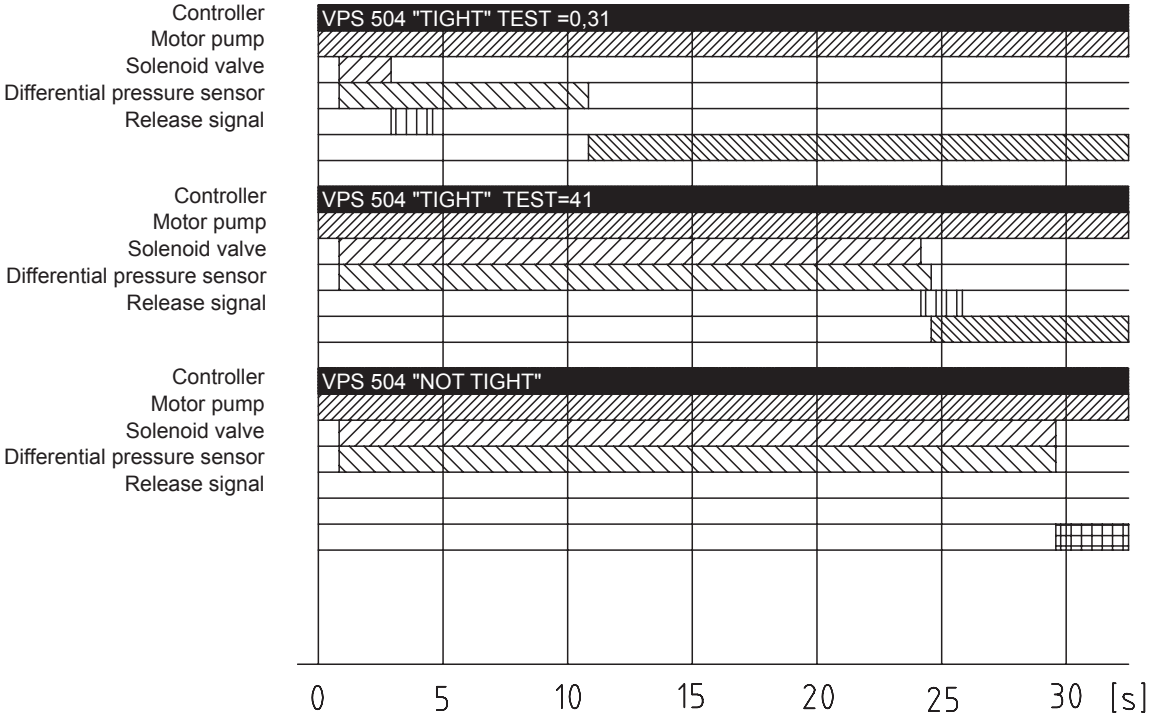


Operation



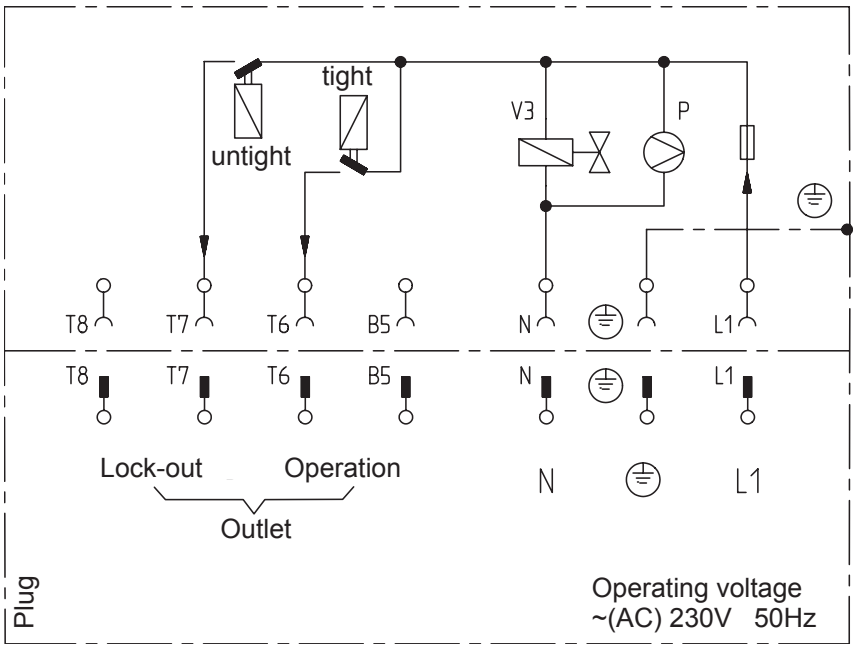
13. LEAKAGE CONTROL, DUNGS VPS 504 SERIES 2

13.3 Program sequence schedule



13.4 Electrical connection VPS 504 Series 02

The VPS 504 is connected in series between the temperature regulator and the control box via a 7-pole plug connector.
See the Bentone wiring diagram.



14. HANDING OVER OF THE INSTALLATION

14.1 Handing over of the installation

- Make repeated start attempts to ensure that the adjustments function.
- Close the ball valve during operation to check that the gas switch switches off at the set value.
- Remove the hose for the air pressure switch to check that the burner locks out.
- Check that all protective covers and measurement nipples are mounted and fastened.
- Fill out necessary test reports.
- Instruct the persons in charge of the operation on the service and maintenance of the installation and what to do should any troubles occur.
- **Inspection and service must be carried out by authorized personnel.**

14.2 Fault location, functional troubles

Trouble free operation is depending on three factors: electricity, gas and air supply. Should there be any changes in the ratio between these three factors, there is a risk of break downs. It has been proved that most break downs are caused by simple faults. Before calling the service engineer, the following should therefore be checked:

- Is the gas cock open?
- Are all fuses in order and the current switched on?
- Are the thermostats correctly set?
- Are pressostats, overheating protection etc. in operating position and not locked-out?
- Is the gas pressure sufficient?
- Is the gas burner control in start position?
- Has the gas control or the motor protector locked out? - Reset.
- Is the circulation pump in operation?
- Is there a supply of fresh air to the installation?

If integral components are of a different make from what is stated in this manual, see the enclosed sheet.

15. FAULT LOCATION GUIDE

15.1 Gas burner

The basis for a trouble free operation can only be ensured by the correct combined effect of the three factors:
electricity, gas flow and combustion air. Should any of these factors change, troubles may arise.

It has been proved that many troubles have rather simple causes. Before calling the serviceman, the following checks should be made:

1. Are the gas cocks of the installation open?
2. Are the fuses in order and the current switched on?
3. Are the controls (room thermostat, boiler thermostat etc.) correctly adjusted?
4. Is the gas pressure to the burner sufficient?
5. Is the gas relay of the burner ready for start and not locked out?
6. Is the air supply to the burner sufficient?

To facilitate fault location we have drawn up a scheme showing the most frequent faults in a gas burner installation and the remedies.

Cause	**Remedy**
The burner does not start	
No gas	Check that all gas cocks are open
No voltage	Check fuses, thermostats and electrical connections.
The burner motor fails to start	The thermal protection has locked out. Motor defective
The gas relay is defective	Replace
Burner motor is running but no ignition after the pre-purge time has elapsed	
No voltage on the terminals	Check the contact. Replace faulty relay
The ignition electrodes in contact with each other or with earth	Adjust
The porcelain of the electrodes is broken	Replace the electrodes
The cable shoes have bad contact	Improve the contact
The ignition cables are damaged	Replace
The ignition transformer is damaged, no voltage on the secondary side	Replace the transformer
The ignition cable and the ionisation cable have been transposed	Change

15. FAULT LOCATION GUIDE

Cause	Remedy
No flame establishment despite a trouble free start	
The gas solenoid valve defective	Replace
The gas solenoid valve does not open despite its obtaining voltage	Replace coil or the whole valve if necessary.
No voltage to the solenoid valve	Check the contact
No electrical connection through the air pressure switch	Test the adjustment and the function of the air pressure switch
The starting load is not correctly adjusted	Reduce or increase the gas supply, reduce the quantity of air.
Gas relay defective	Replace
Air pressure switch incorrectly adjusted or defective	Check the adjustment and re-adjust.
No reponse as the cams of the servomotor are not correctly adjusted or out of position.	Re-adjust the servomotor
The burner locks out after the safety time has el-apsed in spite of flame establishment	
No ionisation current or the UV-cell in wrong position	Adjust the ionisation electrode and the UV-cell, examine cables and connections.
The supervision part of the gas relay is defective	Replace the relay
Voltage lower than 185 V	Contact the electricity authorities.
The ignition electrodes are disturbing the ionisation current	Adjust the ignition electrodes, repole the ignition transformer if necessary
Bad earthing	Arrange for proper earthing
Phase and neutral transposed	See wiring diagram and change
The burner locks out during pre-purge	
Air pressure switch defective or incorrectly adjusted	
The starting load is not correctly adjusted	Reduce or increase the gas supply. Reduce the quantity of air.
The gas pressure is too low	Increase the pressure. Contact the gas supply company if necessary.
Condensation in boiler and chimney	
The flow gas temperature is too low or the quantity of gas is not sufficient	Increase the flue gas temperature by increasingthe gas supply. Insulate the chimney.

15. FAULT LOCATION GUIDE

Cause	Remedy
Pulsations at start	
The ignition electrodes are wrongly adjusted	Re-adjust.
The gas pressure is too high	Check and adjust by means of a pressure gauge and a pressure adjustment valve
The flue gas side is blocked	Check the chimney flue
Pulsations during operation	
The burner is not correctly adjusted	Re-adjust
The burner is dirty	Clean the burner.
Defective chimney	Check and change the dimensions if necessary.
The burner is operating correctly but locking out now and then	
The ionisation current is too low	Check. Must be at least 4 µ A according to the relay manufacturer but should be 8-20 µ A.
The UV-cell is in a wrong position	Adjust.
Voltage drop at certain times	Must not drop more than 15% of the rated current.
Air pressure switch defective or incorrectly adjusted	Contact the electricity authorities if necessary.
Spark-over in ignition electrodes	Replace the electrodes
The ambient temperature of the gas relay is too high	Heat insulate, max. 60° C.
The ignition spark is too weak	Check the transformer
Bad combustion	
Bad draught conditions	Check the chimney
The flue gas temperature is too high	The boiler is overloaded. Reduce the quantity of gas
The CO_2-content is too low	Check the boiler with regard to leaks. Choke the draught if it is too high
The CO-content is too high	
Excess air when using natural gas and gasoil (propane, butane)	Choke the air.
Air shortage	Open the air supply. Check the flue gas damper
The holes in the gas nozzle are clogged	Clean
The fresh air intake is too small	Check and enlarge
The flame is not burning straight because the burner head is out of position	Check the burner head and re-adjust