



Providing sustainable energy solutions worldwide

Installation- and maintenance instruction

BFG 1 H2 Biogas

LME23.331C2

DMV-DLE 507

FRS 510

VPS 504



-sv

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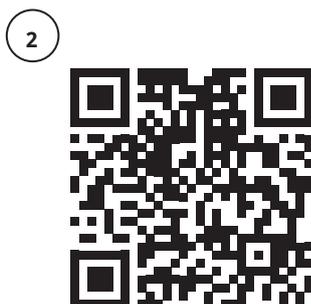
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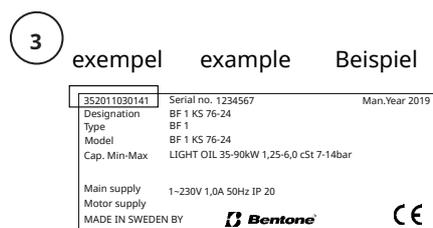
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exempel example Beispiel

352011030141	Serial no. 1234567	Man.Year 2019
Designation	BF 1 KS 76-24	
Type	BF 1	
Model	BF 1 KS 76-24	
Cap. Min-Max	LIGHT OIL 35-90kW 1,25-6,0 cSt 7-14bar	
Main supply	1-230V 1,0A 50Hz IP 20	
Motor supply		
MADE IN SWEDEN BY		

-da

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1. General Information

The burner may only be used for its intended purpose in accordance with the product's technical data.

We reserve the right to make design changes and cannot be held liable for any misprints or typographical errors.

Modifying the design or using accessories or components that have not been approved by Enertech in writing is strictly prohibited.

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site.
- must be read prior to installation.
- is intended for use by authorised personnel.

1.1 Delivery inspection

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

1.2 Safety

- before installation:

- Installation and work on the burner and associated system components may only be carried out by persons who have undergone relevant training.
- The product is packaged to prevent damage from occurring when handled – Handle the product with care! Lifting equipment must be used to lift larger packages.
- The products must be transported/stored on a level surface in a dry environment, max. 80% relative humidity, no condensation. Temperature -20 to +60 °C.



- installation:

- The burner must be installed in accordance with local regulations for fire safety, electrical safety, and fuel distribution.
- The premises must comply with local regulations pertaining to use of the burner and must have adequate air supply.
- The installation site must be free of chemicals.
- Fire extinguisher with Class BE recommended.
- Make sure when installing the burner that there is enough space to service the burner.
- The electrical installation must be professionally carried out in accordance with current mains electricity regulations and in a professional manner.
- Make sure that the burner is suitable for the application (see Technical Data).
- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces that affect components.

- Care must be taken by the installer to ensure that no electrical cables or fuel lines are pinched or otherwise damaged during installation or service.
- Sharp edges can occur on, for example: flame tube, fan wheel and air damper.
- The gas outlet from the pressure regulator must be configured in accordance with applicable regulations and lead to a safe area.

- before first start:

- The burner must not be put into operation without proper safety and protection devices.
- Permitted ambient temperature during operation -10 to +60 °C. Max. 80% relative humidity, no condensation.
- The surface temperature of the burner's components may exceed 60 °C.
- Handle with caution – the burner has moving parts, and there is risk of crushing injuries.
- Seal inspections must be performed during installation and servicing to prevent leakage.
- Fitting and installation work has been completed and approved.
- Electrical installation has been correctly performed.
- Flue gas ducts and combustion air ducts are not blocked.
- All actuators and control and safety devices are in working order and correctly set.
- If the boiler is equipped with an access hatch, this must be equipped with a hatch opening switch connected to the burner's safety system.
- When in operation, the burner's noise level can exceed 85 dBA – use hearing protection!

- Operation:

- Carry out all stipulated settings, service and inspection work within the set time.

1.3 What to do if you smell gas

- Turn off the fuel supply.
- Turn off the device and remove the boiler from operation.
- Open windows and doors.
- Prevent open flames or sparking, e.g. do not turn lights on or off, do not use any electrical appliances or mobile phones.
- Evacuate the building.
- Notify the installer or gas supplier of the problem so that it can be rectified.



2. Technical data

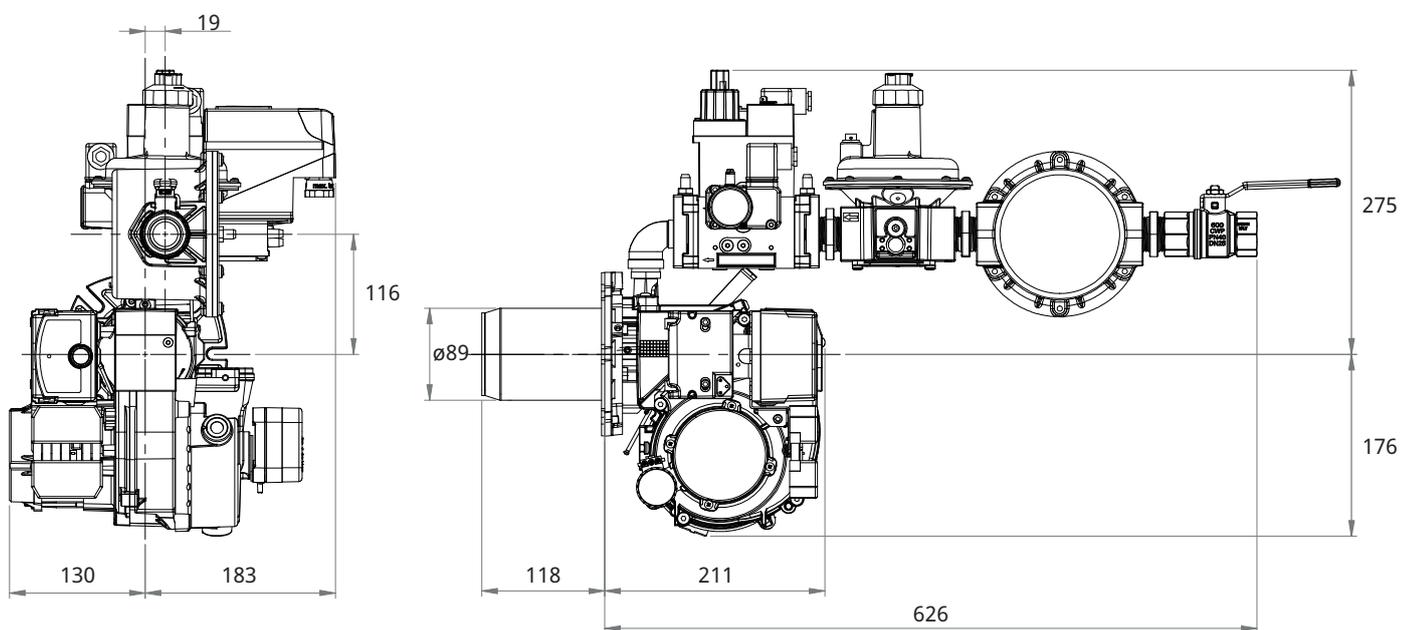
The burner is intended for:

- Operation in installations according to EN 303 and EN 676.

Fuels:

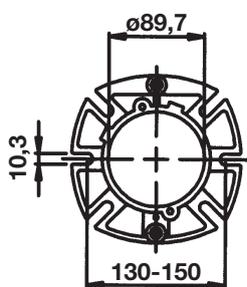
- Natural gas H, E, L, LL.
- Dry biogas max 0.1 Vol% H₂S and min 50% CH₄.

2.1 Dimensions BFG 1 H2

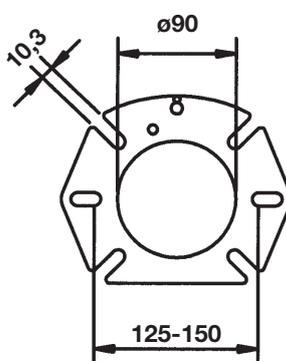


2.1.1 Dimensions flanges

Flange 1



Flange 2



2.2 Capacity range

Capacity		Gas quantity at min. power Nm ³ /h	Gas quantity at max. power Nm ³ /h
BFG 1 H2			
G 20	15-65 kW	1.6	6.9
G 25	15-65 kW	1.8	8.0
Biogas	15-50 kW	2.5	8.3

Gas valve MultiBloc	Max. connection pressure mbar	Min connection pressure mbar
DMV-DLE 507	360	See data plate

2.3 Gas categories, approved gases

Components are approved for dry biogas with a maximum content of 0.1% H₂S.

Category	Country of destination	Supply pressure
II _{2R3R}	AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, TR	20 mbar
II _{2H3B/P}	AT, CH, CY, DK, FI, LT, RO, SE, SK	20 mbar
II _{2H3P}	GB, IE	20 mbar
II _{2L3B/P}	NL, RO	20 mbar
II _{2E3B/P}	PL	20 mbar
I _{2E(R)B}	BE	20 mbar
I _{3P}	BE	20 mbar

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2.4 Technical specification

	BFG 1
Main supply ¹⁾	230V, 1~, 1.1/1.5A, 50/60Hz, IP20
Max fuse rating	6.3A
NO _x -class	2 G25 / 3 G20, G30, G31
Noise level	75dBA

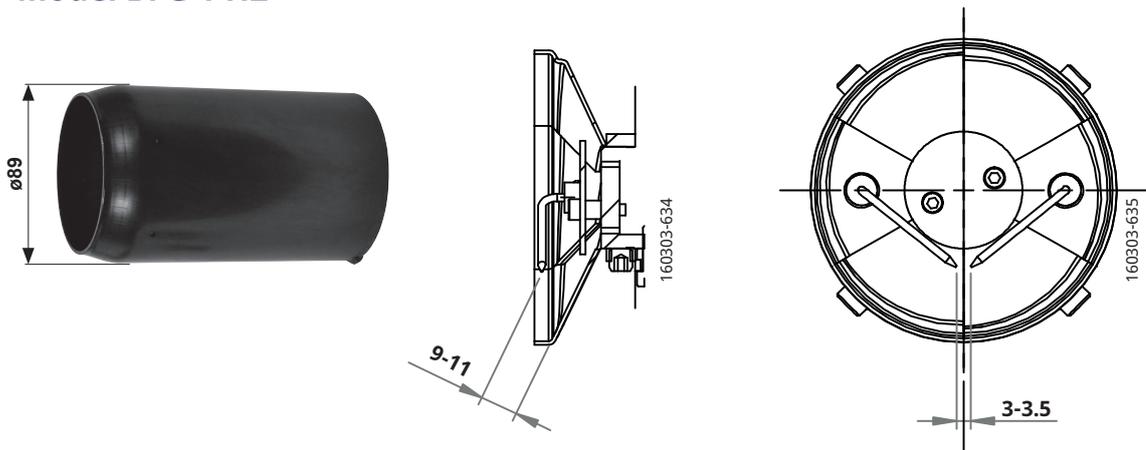
¹⁾ Max operating current, see data plate.

Measurements according to EN 15036-1:2006

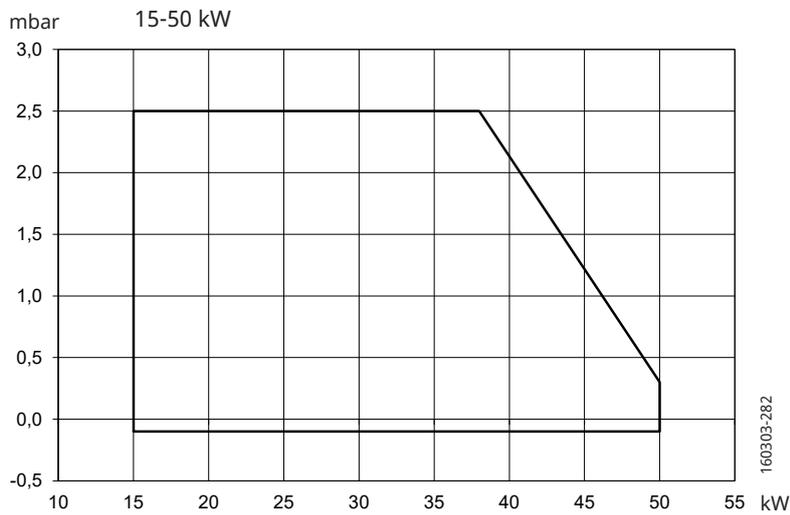
Alt.1 The noise level of the burner can be reduced by equipping the burner with silencer. Installation must be done so it does not prevent air supply to the burner.

Alt.2 The burner's noise level can be reduced by connecting the burner's air intake to the air duct that opens into an appropriate location. Installation must be done so it does not prevent air supply to the burner.

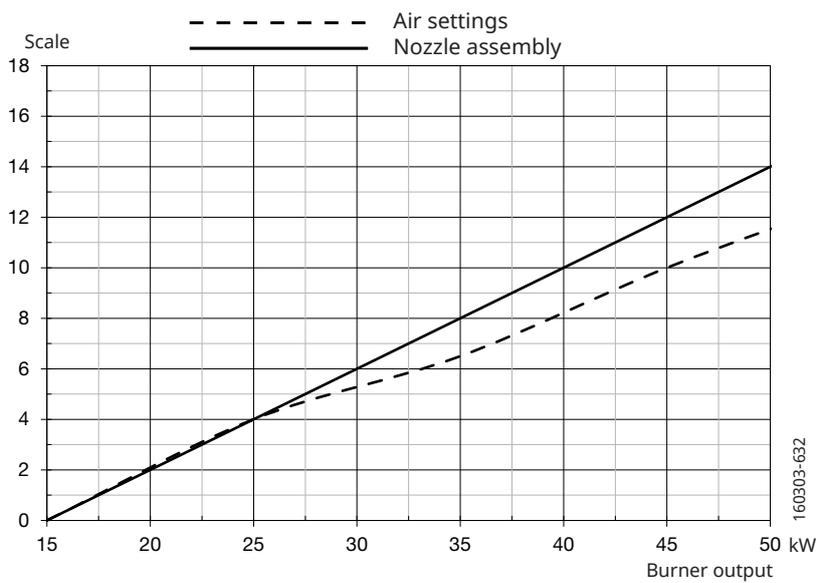
2.5 Model BFG 1 H2



2.5.1 Burner output/Basic settings



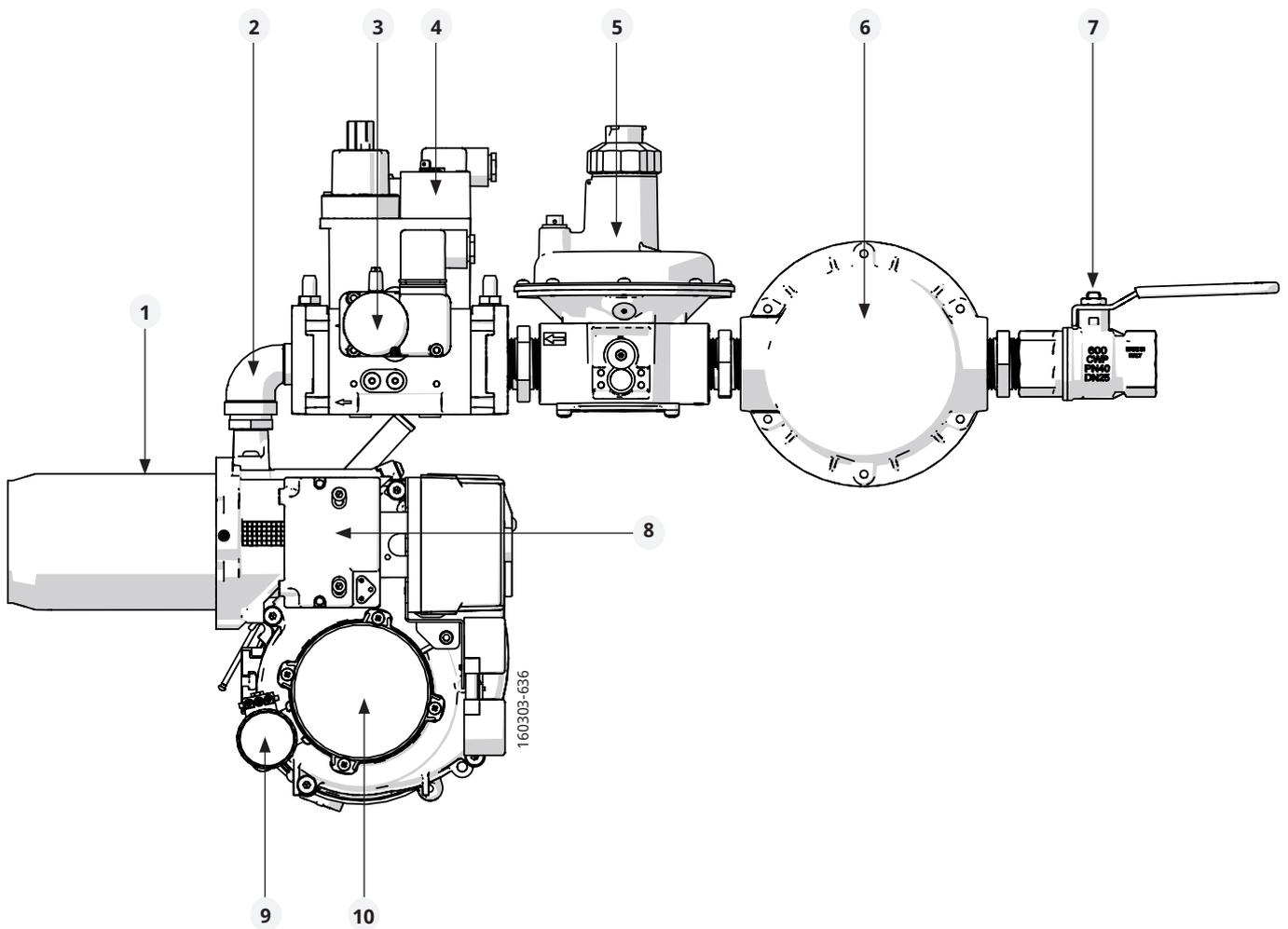
! Do not exceed working field.

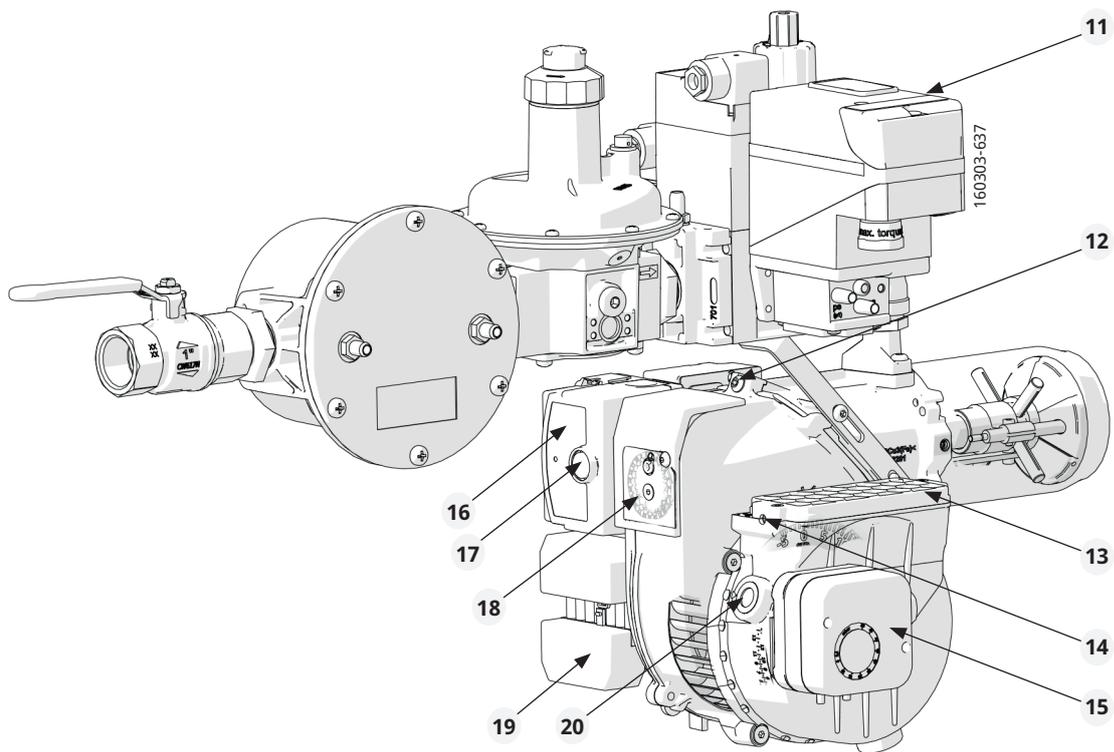


! Scale value valid at 0 mbar in furnace pressure.

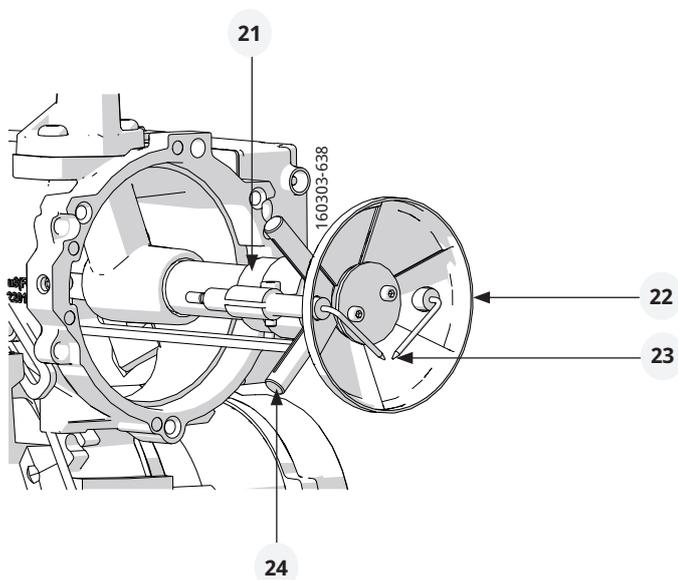
2.6 Components

1. Flame tube
2. Connection gas valve
3. Gas pressure switch
4. Gas valve
5. Pressure regulator
6. Filter
7. Ball valve
8. Ignition transformer
9. Capacitor
10. Motor

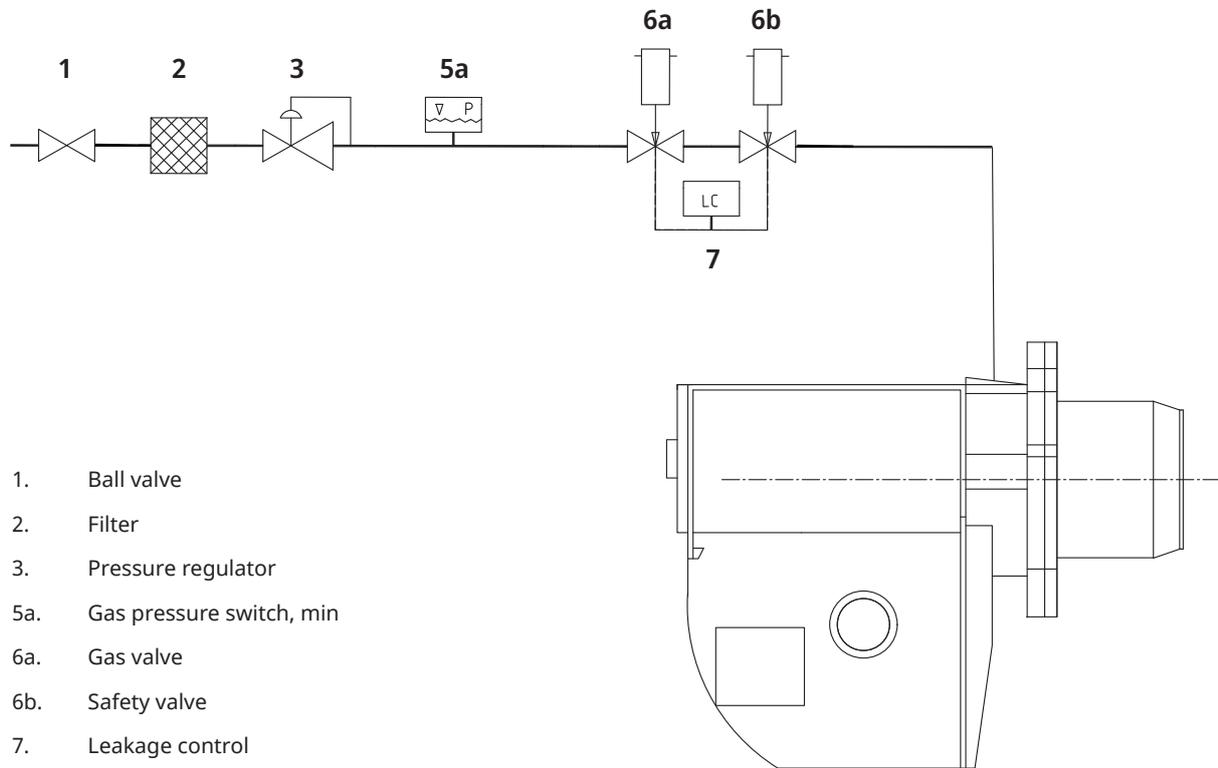




- | | |
|-----------------------------------|--------------------------------|
| 11. Leakage control (VPS) | 18. Nozzle assembly adjustment |
| 12. Screw for dividing the burner | 19. Electric connection |
| 13. Air intake | 20. Air flow indicator |
| 14. Air regulation | 21. Nozzle assembly |
| 15. Air pressure switch | 22. Brake plate |
| 16. Gas burner control | 23. Ignition electrodes |
| 17. Reset button | 24. Nozzle |



2.7 Skeleton diagrams



3. Installation

3.1 General instructions

Installation must be carried out in accordance with current regulations and instructions.

The supplier/installer of the facility is obliged to familiarize himself with all regulations so that the installation meets the requirements of the local authorities.

Installation, assembly and settings must be performed to obtain the best possible function. Only gas intended for the gas burner may be used.

3.2 Instructions

It is the installer's responsibility to instruct the user in detail in the functions of the gas burner and the entire system.

3.3 Inspection and maintenance

The system must be maintained at the interval specified in the service schedule. If the burner is in a dirty environment, service should be done at more frequent intervals.

3.4 Preparation for assembly

Check that the burner's dimensions and capacity range match the current boiler. The power information on the type plate refers to the burner model's min. and max. effect.

3.5 Gas supply

In order to obtain good operational safety, it is important that the installation of the gas distribution system is carried out correctly, considering the following:

- Check that the burner is approved for the gas quality of the installation.
- Check that the burner gas components are approved for the specified gas pressure, see type plate.
- Installation must be carried out in accordance with current standards.
- Pipe lines should be assembled so that service can easily be performed on the boiler and burner.
- Pipe lines should be assembled so that any contaminants do not come into contact with the gas components.

3.6 Electric connection

- Before work on the electrical connection, the current must be disconnected so that the installation is isolated.
- Connection must be done in accordance with the applicable regulations.
- Connection must conform to the wiring diagram.



If any electrical connection other than that recommended by Enertech is used, there is a risk of property damage and personal injury.

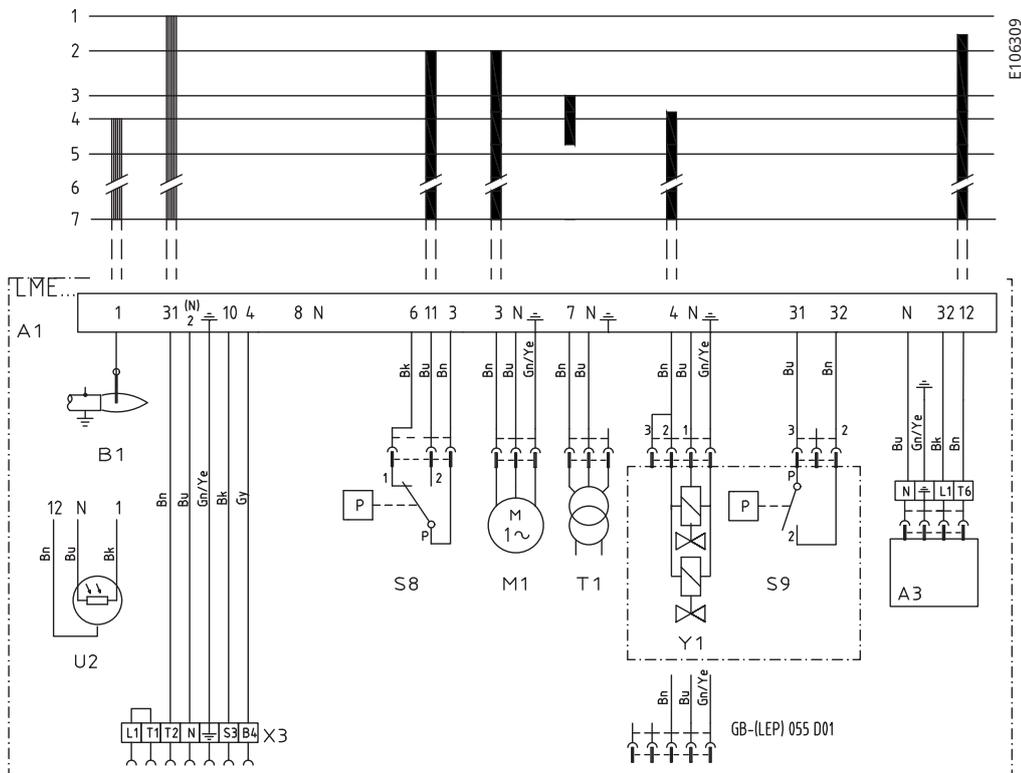
4. Electric equipment

4.1 Safety system

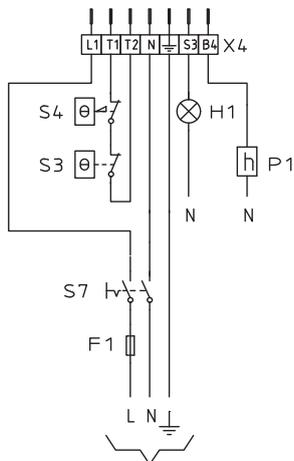
The safety system (safety switch for hatches, doors, water level, pressure, temperature and other safety devices) must be installed in the safety circuit in accordance with current regulations for the system. If these safety requirements are met by other means, safety circuits must be bypassed/jumpered. This can differ between different systems in which the burner is installed, see rules and regulations that apply.

The cables of the safety system must be separated so that the outgoing signal is not placed in the same cable as the incoming signal.

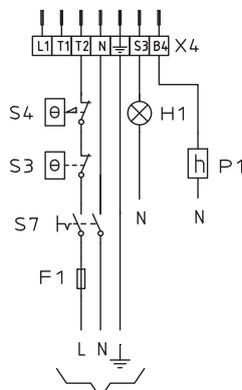
4.2 Wiring diagram



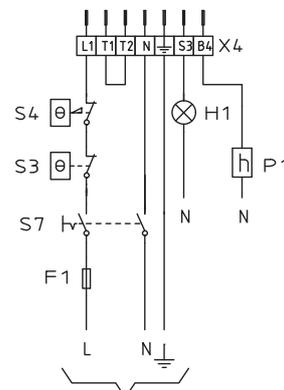
E106309



Alt. 1
Acc. to DIN 4791



Alt. 2



Alt. 3

Bn	Brown
Bu	Blue
Gn	Green
Ye	Yellow
Gn/Ye	Green/Yellow
Bk	Black
Gy	Grey
Rd	Red
Wh	White
Og	Orange
Vt	Violet

4.2.1 List of components

A1	Gas burner control	S4	Temperature limiter
A3	Leakage control VPS 504	S7	Main switch
B1	Ionisation electrode	S8	Air pressure switch
U2	UV-detector QRC	S9	Gas pressure switch, min
F1	Fuse	T1	Ignition Transformer
H1	Operating lamp	Y1	Solenoid valve
M1	Motor	X3	Plug-in contact, burner
P1	Timer total operating time	X4	Plug-in contact, boiler
S3	Control thermostat		

4.3 Function LME...

<p>1. Operating switch ON-Thermostat ON-Gas pressure switch ON</p> <p>A check that the air pressure switch does <u>not</u> indicate fan pressure is carried out.</p>
<p>2. Burner motor starts</p> <p>A check that the air pressure switch indicates sufficient fan pressure is carried out.</p>
<p>3. The ignition spark is created</p>
<p>4. The gas solenoid valve is open</p> <p>The gas is ignited. The ionisation electrode now indicates a flame.</p>
<p>5. The safety time expires</p> <p>The ignition spark ceases. The safety period ceases. If the spark is missing or it disappears after this time limit, the gas burner control is blocked.</p>
<p>6. Operating position</p>
<p>7. Stop</p> <p>The operation of the burner can now be stopped with the control switch or thermostat.</p>
<p>If the gas burner control is blocked</p> <p>Red light in the gas burner control is lit. The burner is restarted by pushing the reset button.</p>

 Mains connection and fuse in accordance with local regulations.

4.3.1 Technical data

LME23.331C2	
Preignition time	3 s
Prepurge time	30 s
Postignition time	2.5 s
Safety lockout time	< 3 s
Reset time after lockout	< 1 s
Reaction time on flame failure	< 1 s
Min. ionisation current at flame	5 µA
Max. ionisation current	20 µA

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4.4 Control program at faults; fault mode indicator LME

4.4.1 Colour codes

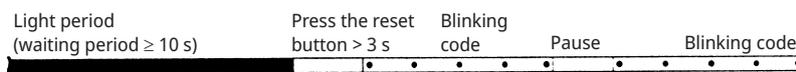
Table colour codes for multi-coloured signal light (LED)		
Status	Colour codes	Colours
Waiting period «tw», other waiting periods	○.....	Off
Ignition phase, ignition controlled	●●○●●○●●	Blinking yellow
Normal operation	□.....	Green
Operation, poor flame signal	□○□○□○□○	Blinking green
Illegal flame signal during start-up	□▲□▲□▲□▲	Green-Red
Undervoltage	●▲●▲●▲●▲	Yellow-Red
Fault, alarm	▲.....	Red
Blinking code for fault codes	▲○▲○▲○▲○	Blinking red
Interface diagnostics	▲▲▲▲▲▲▲▲	Red flicking

.....	Continuous
○	Off
▲	Red
●	Yellow
□	Green

4.4.1.1 Diagnosing alarm causes

After alarm disconnection, the red alarm signal light is lit continuously.

The diagnosing of the alarm cause can be read according to the following sequence:



4.4.1.2 Limiting of starting repetitions

LME 11... has a function with start repetition if the flame is not created at start or disappears during operation.. LME 11... allows max. three repetitions during continuous starting cycle.

4.4.1.3 Alarm code table

Red blinking code on signal lamp (LED)	Possible causes
Blinking 2 x ..	No flame creation at End of "TSA" - defective or fouled flame monitoring. - defective or fouled fuel valves. - poor burner setting. - defective firing device.
Blinking 3 x ...	"LP" defective - No air pressure switch signal after "t10". - "LP" is welded in open position.
Blinking 4 x	Illegal flame signal during start-up.
Blinking 5 x	Time out "LP" - "LP" is welded in open position.
Blinking 6 x	Free
Blinking 7 x	Too many flame disappearances during operation. - poor burner setting. - defective or fouled fuel valves. - defective or fouled flame monitoring.
Blinking 8 x	Free
Blinking 9 x	Free
Blinking 10 x	Connection fault or internal fault, outgoing contacts or other faults.
Blinking 14 x	CPI contact not closed.

During the diagnosing of the alarm cause, the control outputs are voltage-free.

- The burner is disconnected
- Exception, alarm signal «AL» at board 10
- Reconnection of the burner happens after resetting only.
- Press the reset button 0.5...3 s

4.4.1.4 Interface diagnostics

To change to interface mode, press and hold the reset button longer than 3 s. To go back to the normal position, press and hold the reset button longer than 3 s. If the gas burner control is in the alarm position, it is reset by pressing the reset button 0.5...3 s.

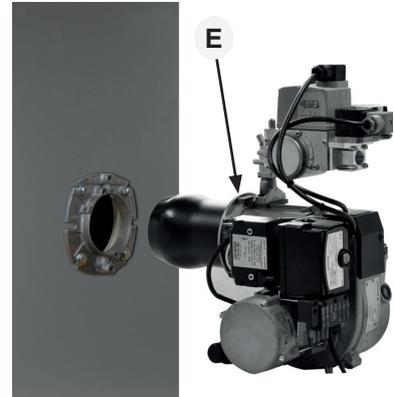
5. Mounting

5.1 Hole pattern

Check that the hole pattern on the boiler matches that of the flange, (see Technical data).

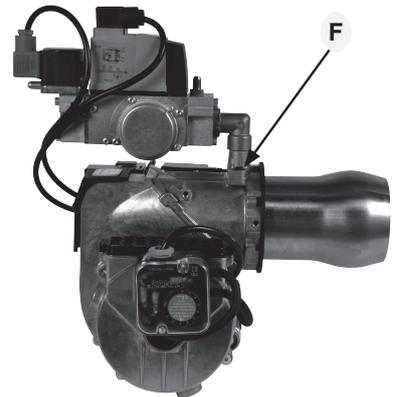
5.2 Burner installation

1. Install the flange with gasket on the boiler.
2. Insulate between the blast tube and the boiler door to minimize heat radiation.
3. Check the ignition electrode and ionisation electrode. (Refer to Technical data).
4. Install the burner on the boiler and lock into the flange (E).
5. Install the gas line on the burner. Check that the O-ring has not been damaged during installation, fasten with the screws (F).
6. Where support for the multiblock is included, this should be installed.



5.3 Gas connections

1. Check the gas pipe dimensions. (According to local regulations).
2. Connect the gas pipe to the gas flange of the multiblock.
3. A manual gas valve should be installed in the vicinity of the burner.
4. No mechanical stresses/forces should exist in the gas connection.
5. Check the sealing of the gas connections, including the multiblock and flanges.



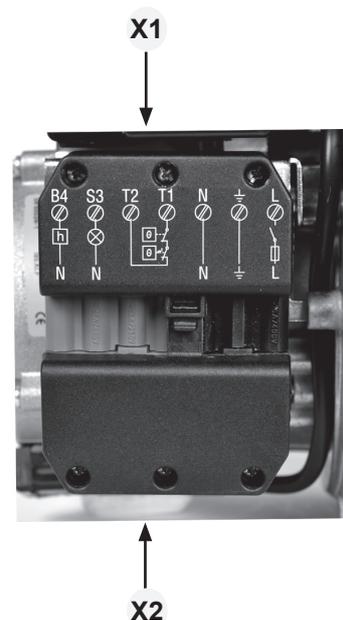
NOTE!

If the gas connection is via a hose, the support for the multiblock that is supplied with the burner should be mounted (F). Install the support so that the underneath of the multiblock rests on it.

5.4 Electric connection

If the boiler does not have a pre-wired connector, connect in the included connector, X2 according to the wiring diagram.

1. Turn off the main switch.
2. Connect the Eurostecker X2 acc. to Alt. 1 - 3, (see Electric equipment).
3. Install the Eurostecker X2 on the burner.
4. Turn on the main switch.



5.5 Gas quality

Check that the combustion head is intended for the gas quality to be used, (see Technical data).

5.6 De-aerating

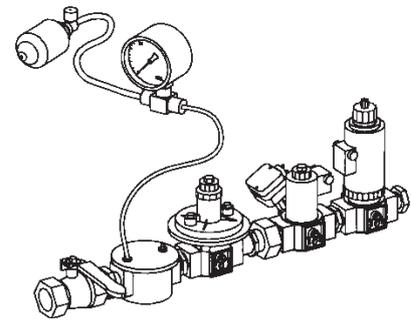
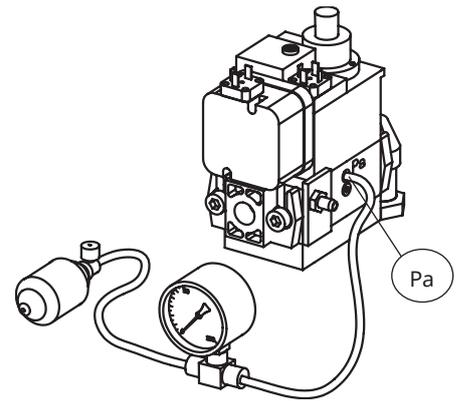
De-aerating the gas line by closing the tap to the gas connection and unscrewing the screw on the measuring nipple for the connection pressure. Connect a plastic hose, open the tap and drain the gas in a safe place. When the de-aerating is completed, be sure to refit the screw on the measuring nipple.

5.7 Tightness control

When checking for leakage, the solenoid valve must be closed. A pressure gauge is connected to the measuring nipple "Pa", see picture. The test pressure in the fittings should be 1.5 x max inlet pressure or min. 150 mbar. If leaks are found during measurement, locate the source using soapy water or leak detection spray. After sealing: check the tightness of the gas fixture again.



Check the gas tightness.



5.8 Calculation of gas flow

Formula symbol	Description	Example values
V_N	Standard gas volume [Nm ³ /h] Gas volume at normal condition 15 °C 1013 mbar	-
Q	Boiler output [kW]	46 kW
H_i	Lower calorific value of gas [kWh/m ³] Natural gas under normal conditions 15 °C 1013 mbar, EN 676	9.45 kWh/m ³
η	Boiler efficiency (e. g. 90%)	0.9
f	Conversion factor (pressure and temperature compensation)	-
t_{Gas}	Gas temperature at gas meter [°C]	15 °C
P_{Baro}	Barometric air pressure [mbar]	945 mbar
P_{Gas}	Pressure of gas at the gas meter [mbar]	20 mbar
V	Operating volume [m ³ /h]	-
VG	Gas flow measured at the gas meter [m ³]	0.15 m ³
T	Measuring time for consumed gas quantity [s]	90 s

Calculate standard volume using the following formula:

$$V_N = \frac{Q}{\eta \cdot H_i} \quad V_N = \frac{46 \text{ kW}}{0.9 \cdot 9.45 \text{ kWh/m}^3} = 5.4 \text{ m}^3/\text{h}$$

Calculate conversion factor using the following formula:

$$f = \frac{273}{273 + t_{Gas}} \times \frac{P_{Baro} + P_{Gas}}{1013} \quad f = \frac{273}{273 + 15} \cdot \frac{945 + 20}{1013} = 0.90$$

Calculate gas volume using the following formula:

$$V = \frac{V_N}{f} \quad V = \frac{5.4 \text{ m}^3/\text{h}}{0.90} = 6.0 \text{ m}^3/\text{h}$$

Determine operating volume with the following formula:

$$V = \frac{3600 \cdot V_G}{T} \quad V = \frac{3600 \cdot 0.15 \text{ m}^3}{90 \text{ sek}} = 6.0 \text{ m}^3/\text{h}$$

Height above sea level [m]	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
P_{Baro} [mbar]	1013	1001	989	977	966	954	943	932	921	910	899	888	877

Calorific value of the gas

Gas quality		kWh/Nm ³	MJ/Nm ³
Natural gas	G20	9.5	34.02
Natural gas	G25	8.2	29.25

Gas quality		kWh/Nm ³	MJ/Nm ³
Butane	G30	32.25	116.09
Propane	G31	24.44	88.00

Lower calorific value H_i at normal conditions 15 °C and 1013 mbar, EN 676.
For exact calorific value of the gas, contact the gas distributor.

6. Settings

6.1 Brake plate adjustment

The burner is equipped with a control which changes the position of the brake plate in the blast tube. This is used to set the correct pressure differential across the combustion device and thereby get a good combustion without pulsations. The setting to be used depends on the set effect and the overpressure in the boiler. (For basic setting, see Technical data).

Brake plate settings

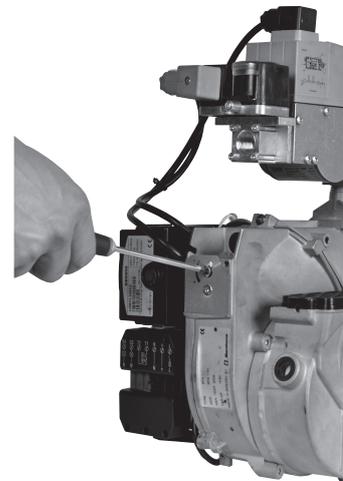
H1 och H2

- Smaller gap: turn the screw to the left
- Larger gap: turn the screw to the right

H3

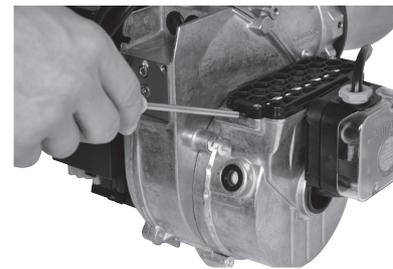
- Smaller gap: turn the screw to the right
- Larger gap: turn the screw to the left

The setting of the brake plate position affects the air flow. Therefore, the air must always be readjusted with the air regulation device of the burner.



6.2 Air adjustment

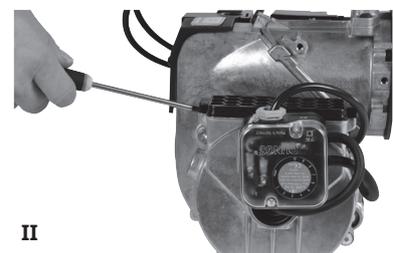
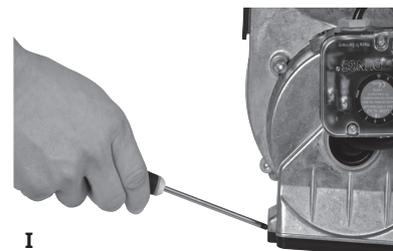
The air setting is very important to get good combustion with neither too much nor too little air. The air flow for combustion is adjusted by turning the air adjusting screw with an Allen key. How open the air control should be is determined by the fired-in effect and overpressure in the boiler, as well as other settings on the burner such as the position of the brake plate. (For basic setting, see Technical data).



6.2.1 Air volume

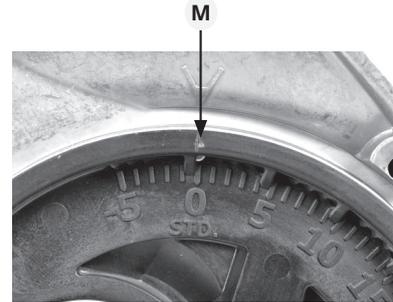
The setting of the air control depends on how the screw, with which the air adjustment is done, is installed. If the air intake is pointing downwards as in Fig. I, a clockwise turn gives a decrease in the air flow and a counter-clockwise turn an increase in the air flow.

If the air intake is pointing upwards as in Fig. II, a clockwise adjustment increases the air flow and a counter-clockwise adjustment decreases the air flow.



6.2.2 Inlet cone, air control

The air flow is also affected by the position of the intake cone. This rarely needs adjustment, however, and should be maintained in the standard position "STD" for good operation and starts. (A cast-in arrow on the fan housing indicates the position of the inlet cone. In addition to the scale on the inlet cone casting, there is also a mark (M) indicating the factory setting.)

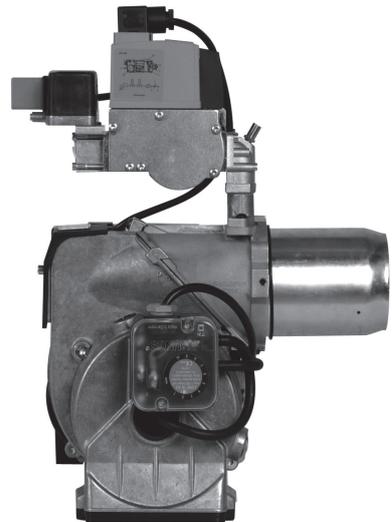


6.2.3 Rotation of air intake

The air intake can be rotated in order to fit the burner into different environments. The intake can be rotated into various positions, not just the ones shown to the left.

To rotate the air intake, loosen the three screws securing the air intake and the two screws fastening the air pressure switch. Then rotate the air intake to the desired position and tighten the screws.

The air intake position does somewhat affect the air flow through the burner. The position giving the largest flow is with the air intake downwards.



6.2.4 Air duct

A hose connection via an air duct is available in three different dimensions, 48, 68 and 78 mm outer diameter "D". The air duct is installed on the air intake at the place where the grid is installed in the standard design.



6.3 Startup

After the burner has been mounted on the boiler and the electrical connection, de-aeration and tightness control have been performed, the burner is ready to start-up.

Read the sections dealing with gas valve and pressure switch settings before start-up.

Open the ball valve and turn on the main switch, start the burner and begin setting up the system.

6.4 Control of combustion

Check combustion using flue gas analysis instruments. Set the burner to about 20% excess air and check that good combustion is obtained. Check the actual gas flow on the gas meter to ensure that the correct input power is achieved.

Recommended air excess at basic setting

Gas quality	Excess air flue gases		Max % CO ₂
	% O ₂	% CO ₂ Lambda 1.2	
Natural gas	3 - 5	≈10	11.9
Propane	3 - 5	≈11.5	13.9
Butane	3 - 5	≈11.5	14.1
Liquefied petroleum gas	3 - 5	≈11	13.8
Biogas	3 - 5		

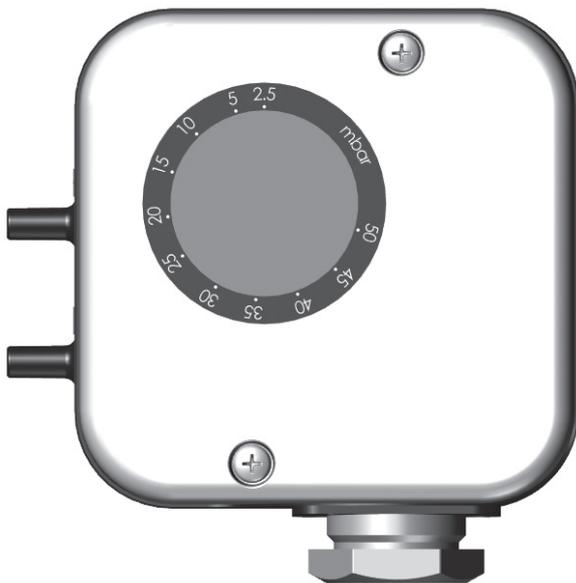
6.5 Setting the air pressure switch

The air pressure switch must block the burner if the amount of air for combustion becomes too low. The air pressure switch must be set so that in the event of a lack of air supply at the burner's max. or min. capacity reacts before the monitored pressure drops so much that poor combustion occurs.

1. Remove protective cover.

! Be careful when adjusting the air pressure switch; it contains a live component.

2. Start the burner.
3. Carefully turn the scale on the air pressure switch clockwise until the air pressure switch stops the burner.
4. Measure and note the lowest air pressure in the entire work area.
5. Set the air pressure switch to about 10-15% lower than the lowest noted pressure.
6. Test run the burner and check the function in the entire work area.
7. Refit protective cover.



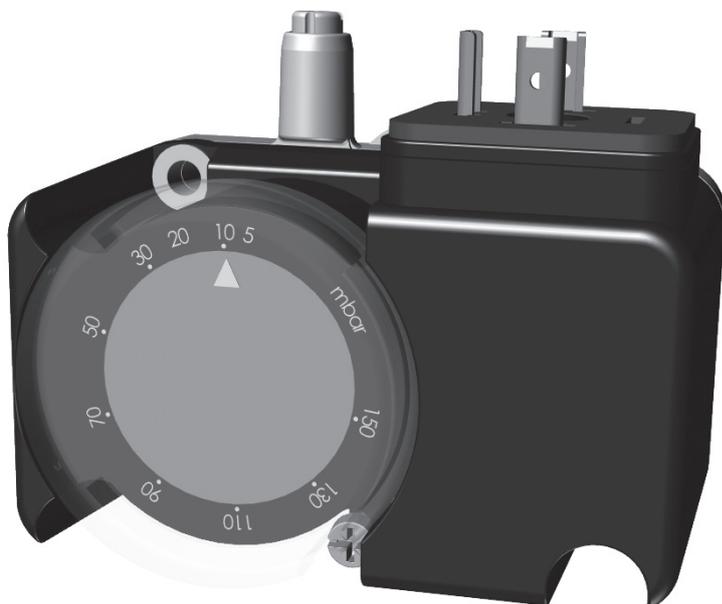
6.6 Setting the gas pressure switch, min.

The gas pressure switch must react to too low a connection pressure to the burner, prevent the burner from starting and stop the burner during operation. The burner may start again when the connection pressure has risen above the set pressure on the gas pressure switch.

1. Remove protective cover.
2. Open measuring socket and connect a manometer for measuring connection pressure.
3. Start the burner.
4. Measure and note the connection pressure to the burner at the highest input power.
5. Set the gas pressure switch to a value 10-15% lower than the noted pressure.
6. Check the setting by carefully closing the ball valve and at the same time measuring the connection pressure.
7. When the gas pressure switch stops the burner, the measured value must approximately correspond to the setting on the gas pressure switch.
8. Open ball valve.
9. Remove manometer and close measuring socket.
10. Refit protective cover.



Check gas tightness.



7. Leakage control VPS 504

7.1 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 Fault output T7: 1A Fault output SO4 1, 2, 3, T7: 1A
Release time	≈	10 - 30 s Dependent on test volume and input pressure.
Sensitivity limit		50 l/h
Max. number of test cycles		20 /h

7.2 Program sequence

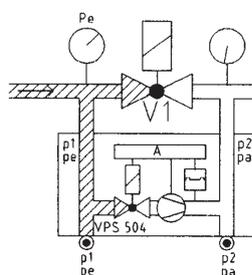
Idle state: Valves 1 and 2 are closed. Pressure buildup: The internal motor pump increases the gas pressure p_e in the section by approx. 20 mbar compared with the input pressure at valve V1. During the test time, the integrated differential pressure sensor monitors the test section for leaks. When the test pressure is attained, the motor pump switches off (end of test period). The release time (10-30 s) is dependent 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.

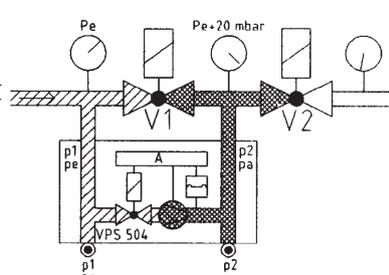
If the test section is leaky or if the pressure increase by + 20 mbar is not attained during the test period (max. 26 s), the VPS 504 generates a fault. The red LED is lit as long as the contact is released by the regulator (heat requirement).

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

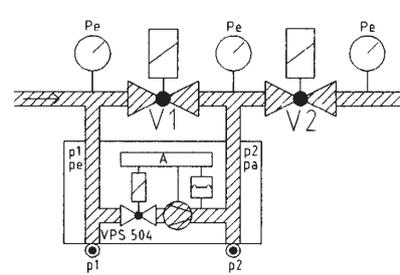
Programmer Idle state



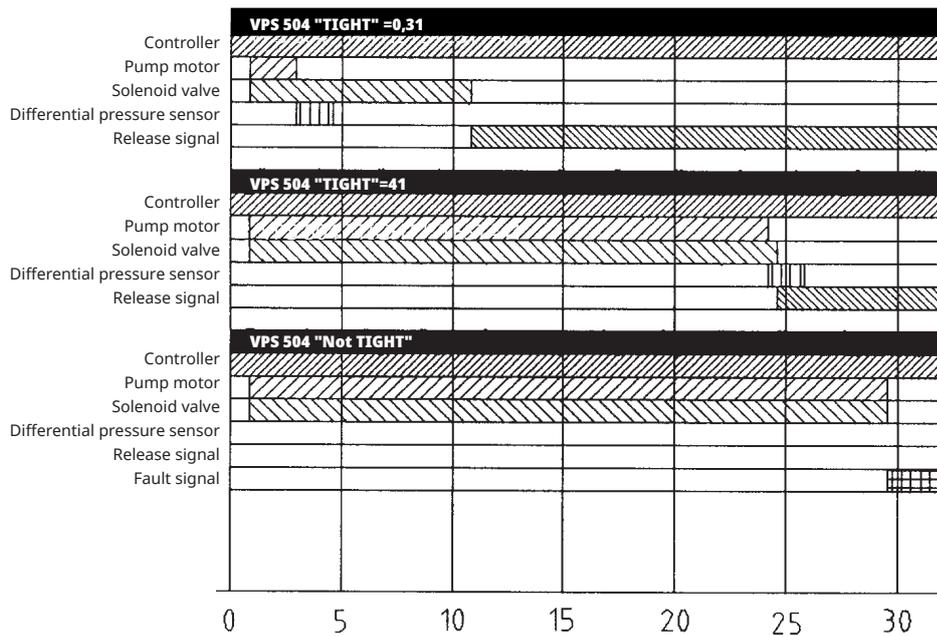
Pressure buildup



Operation



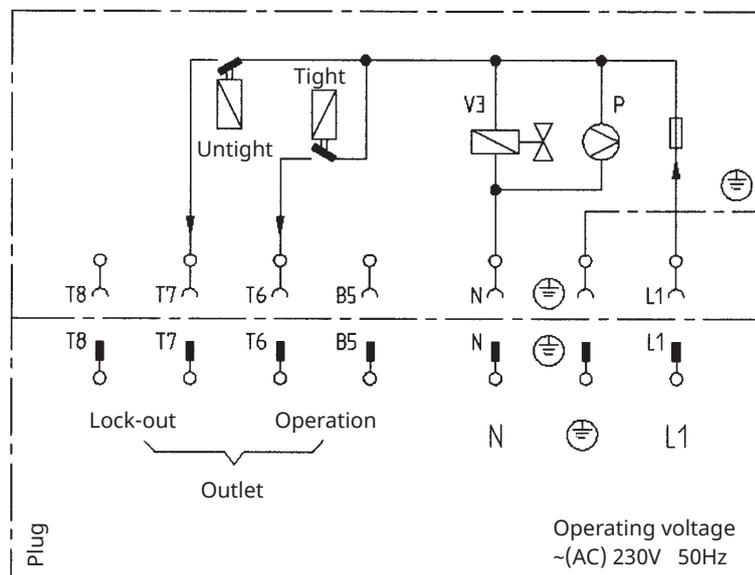
7.2.1 Program sequende schedule



7.3 Electrical connection

The VPS 504 is connected in series between the temperature regulator and the control box via a 7-pin plug connector.

See wiring diagram!



8. Gas pressure regulator

Type FRS

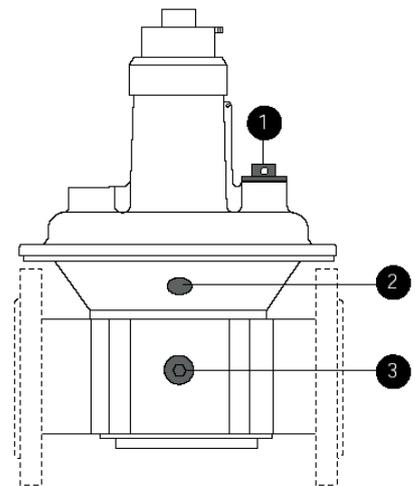
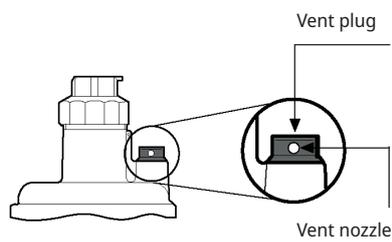
Nominal diameters Rp 3/8 - Rp 2 1/2
DN 40 - DN 150



Never close vent nozzle!

Pressure taps

1. Vent plug
2. Connection for external pulse G 1/4 screw plug ISO 228, on both sides, optional.
3. G 1/4 screw plug ISO 228, in inlet pressure range, on both sides



Max. operating pressure	500 mbar
Pressure regulator	Class A
Ambient temperature	-15 °C ... +70 °C
Inlet pressure range	5 - 500 mbar
Family	1 + 2 + 3
Outlet pressure range	2,5 - 200 mbar

Adjustment of outlet pressure
(setpoint adjustment)
Factory setting: Standard spring p 2
10-30 mbar

1.

1. Unscrew protective cap A.
2. Adjustment (+) Setting spindle B "Turn counter-clockwise" = Increasing outlet pressure (setpoint)

or

2.

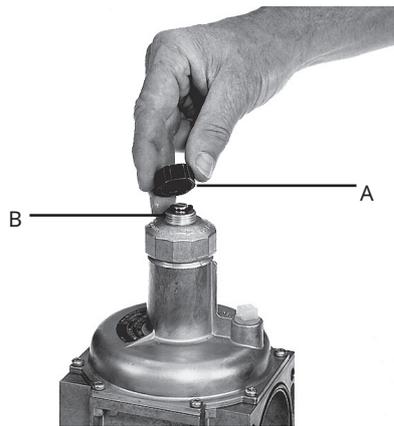
Adjustment (-) Setting spindle B "Turn clockwise" = Reducing outlet pressure (setpoint)

4. Check setpoint

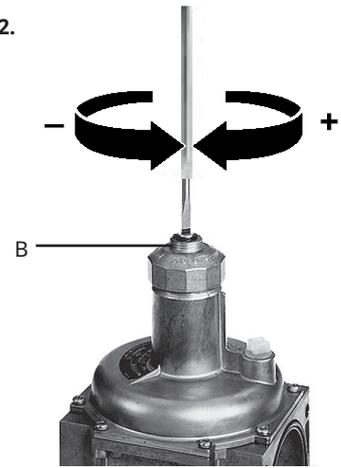
5. Screw on protective cap A.

6. Attach lead seal (Page 5).

1.



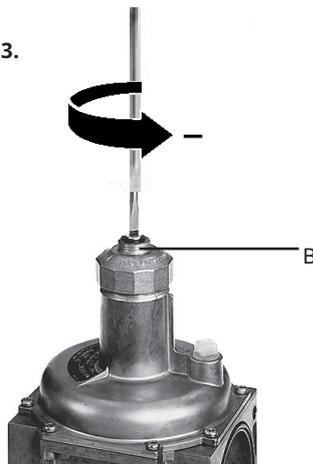
2.



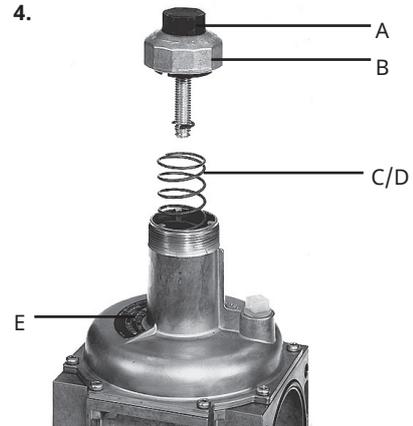
Replace setting spring 3-4

1. Remove protective cap A. Release spring by turning adjustment spindle B counter clockwise. Turn spindle to stop.
2. Unscrew complete adjustment device B and remove spring C.
3. Insert new spring D.
4. Assemble complete adjustment device and adjust desired off-set.
5. Screw on protective cap A. Stick adhesive label E onto typeplate.
6. Attach lead seal.

3.



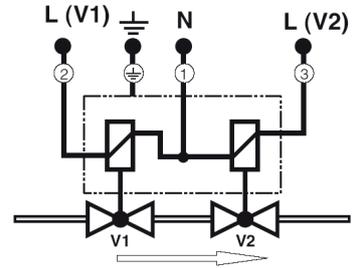
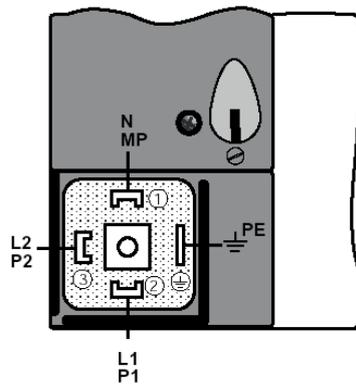
4.



9. Double Solenoid Valve

Type DMV-D.../11 / DMV-DLE.../11

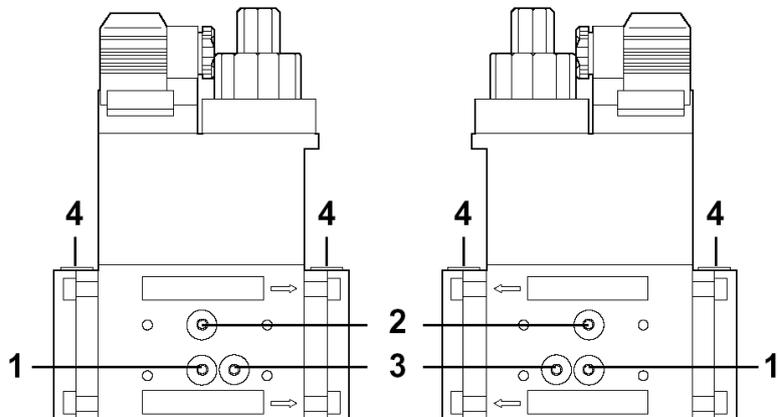
Nominal widths Rp 1/2 - Rp 2
 Electrical connection IEC 730-1
 (VDE 0631 T1)



Volt	U _n ~ (AC) 230 V
Valve	2 x Class A
Ambient temperature	-15 °C ... +60 °C
IP	54
Family	1 + 2 + 3
Max. operating pressure	500 mbar

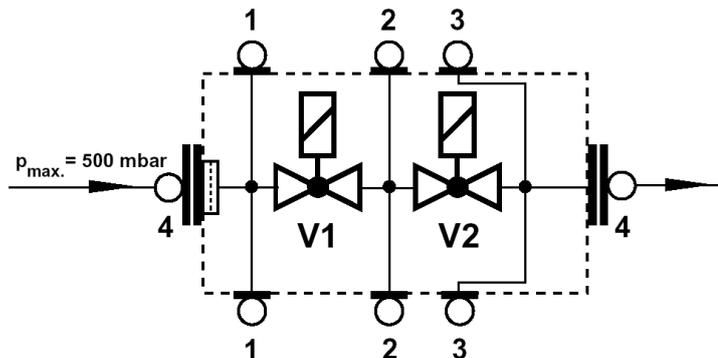
DMV 505-520/11

Pressure taps 1, 2, 3, 4 Sealing plug



Screw plugs 1,2,3 may also be replaced by a measuring socket G 1/8 DIN ISO 228.

Concealed connecting bore for system accessories.

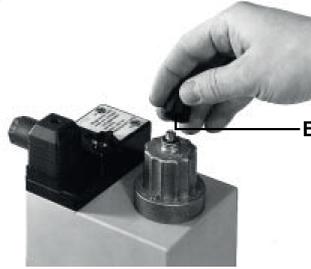


6.



6. DMV - D 507/11 - 525/11
DMV-DLE 507/11 - 525/11
Main flow setting only possible at V1! Set main volume on open valve. Set valve V1 during operation. Check setting values continuously. Smallest setting volume flow:

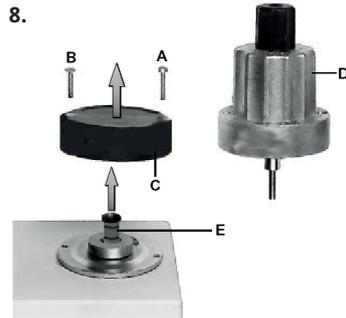
7.



7. DMV-DLE
Rapid stroke adjustment V start
Factory setting DMV-DLE: Rapid stroke not adjusted

1. Unscrew the adjustment cap E from the hydraulic brake.
2. Turn the adjustment cap and use as a tool.
3. Turn a-clockwise = increase rapid stroke (+).

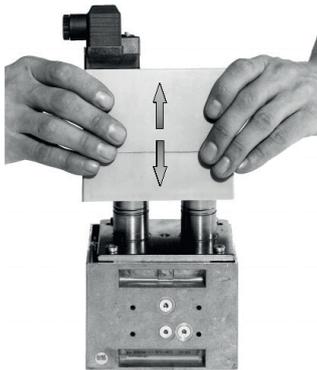
8.



8. Replacing hydraulic brake unit or adjustment plate

1. Switch off firing system.
2. Remove locking varnish from countersunk screw A.
3. Unscrew countersunk screw A.
4. Unscrew socket head screw B.
5. Raise adjustment plate C or hydraulic brake D.
6. Remove sealing plug E
7. Exchange adjustment plate C or hydraulic brake D
8. Screw in countersunk and socket head screw. Only tighten socket head screw so that hydraulic brake can just be turned.
9. Coat countersunk screw A with locking varnish.
10. Leakage test: Pressure tap at sealing plug 2: DMV 507-520/11 Pressure tap at sealing plug 3: DMV 525/11 p max. = 500 mbar.
11. Perform functional test.
12. Switch on firing system.

9.



9. Replacing the solenoid Versions with adjusting plate DMV-D 5.../11 or hydraulic brake DMV-DLE 5.../11

1. Remove hydraulic brake or adjusting plate as described on page 6: "Replacing the hydraulic brake or adjusting disk", steps 1 - 5.
2. Replace solenoid
Important: Make sure that the solenoid no. and voltage are correct!
3. Remount hydraulic brake or adjusting plate as described on page 6. "Replacing the hydraulic brake or adjusting plate", steps 7 - 11.

10. Service

Service and maintenance work may only be performed by qualified personnel. Perform operational check of all safety systems and components at each service. Only Enertech original parts should be used when replacing components.



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



10.1 Burner Service Schedule, Gas

Servicing must be carried out once a year or after 3,000 hours of operation.

Burner	1 year	3,000 h
Inspection of electrical installation	1 year	3,000 h
Leak check	1 year	3,000 h
Filter	1 year, replacement at $\Delta p > 10$ mbar	3,000 h, replacement at $\Delta p > 10$ mbar
Electrodes	Replacement/cleaning 1 year	Replacement/cleaning 3,000 h
Brake plate	Replacement/cleaning 1 year	Replacement/cleaning 3,000 h
Motor	1 year	3,000 h
Fan wheel	1 Year Replace if need for cleaning/imbalance	3,000 h Replace if need for cleaning/imbalance

10.2 Component replacement intervals

Components	Service life - Recommended replacement	Service life - Recommended replacement Operating cycles
Control system	10 years	250,000 starts
Valve control system	10 years	250,000 starts
Pressure switch	10 years	250,000 starts
Ignition system with flame guard	10 years	250,000 starts
UV flame sensor	10,000 h	N/A
Gas pressure controls	15 years	N/A
Gas valve without leak testing	10 years	250,000 starts
Gas valve with leak testing	Replacement upon fault detection	N/A
Gas pressure switch	10 years	250,000 starts
Safety blow-off system	10 years	N/A
Damper motor	N/A	500,000 starts
Contactors	10 years	500,000 starts



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

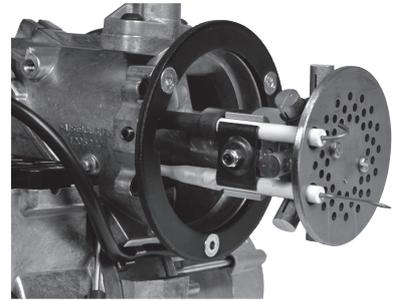
10.3 Combustion device

1. Disconnect the main power and shut off the fuel supply.



Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Remove the gas pipe after ensuring that the gas is turned off.
3. Remove the burner from the burner flange. Pull out the burner. Disconnect the blast tube and remove it.
4. If necessary, clean the brake plate and nozzle.
5. Check the ignition electrode and ionisation electrode. Replace if necessary. (Refer to Technical data for setting of electrodes)
6. Install on the blast tube and fasten the burner on the burner flange.
7. Install the gas pipe.
8. Check the gas pipe for leakage.
9. Switch on the main power and open the fuel supply.
10. Start burner and check/adjust combustion.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

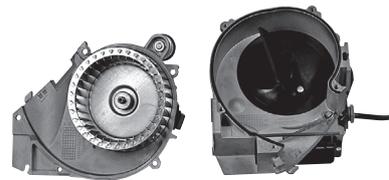
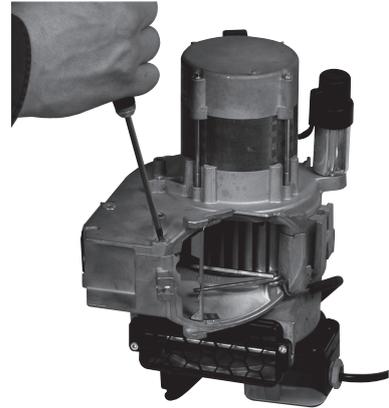
10.4 Fan motor replacement

1. Disconnect the main power and shut off the fuel supply.



Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
3. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
4. Disconnect the electric bracket to the motor.
5. Loosen the screw holding the electrical bracket.
6. Remove the cable conduit for the ignition electrode and ionisation electrode.
7. Loosen the screws (H) holding the motor flange, 5 pcs.
8. Lift off the motor.
9. Disconnect and remove the fan wheel.
10. Install the fan wheel on the new motor and tighten the locking screw. The fan wheel should be installed in the bottom position against the motor shaft.
11. Fit in the motor flange against the fan housing.
12. Assemble the motor flange and the fan housing. Tighten the screws alternatively and not one at a time.
13. Place the cable conduit and the hose for the air pressure switch in position.
14. Install the screws in the electrical bracket.
15. Connect the motor cable. Connect the ignition electrode and ionisation electrode.
16. Assemble the fan housing and the front piece.
17. Switch on the main power and open the fuel supply.
18. Start burner and check/adjust combustion.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

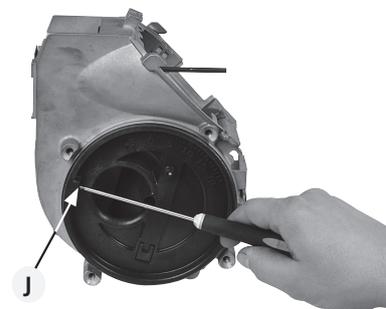
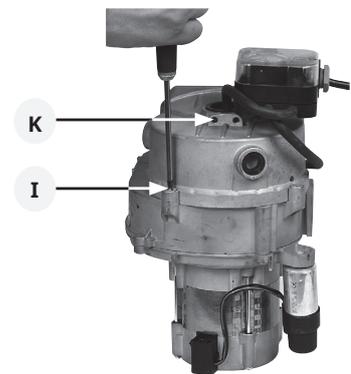
10.5 Air intake and suction cone

1. Disconnect the main power and shut off the fuel supply.



Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
3. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
4. Loosen the screws (K) holding the air switch, 2 pcs. Remove the air switch.
5. Loosen the screws (I) holding the air intake, 3 pcs.
6. Remove the air intake.
7. Loosen the screw (J) holding the inlet cone and note the inlet cone position.
8. Remove the inlet cone from the fan housing.
9. Check the function and appearance of the different components in the air regulation. Clean and replace the components as needed.
10. Assemble the burner. Be careful when installing the inlet cone - install it in the same position as it was before being removed.
11. Fit the O-ring in the groove between the fan housing and inlet cone. Ensure that it is properly located in the groove and is not damaged when the air intake is fitted.
12. Switch on the main power and open the fuel supply.
13. Start burner and check/adjust combustion.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

10.6 Fan wheel

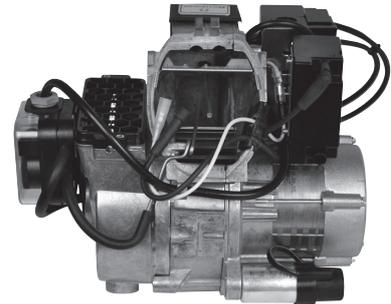
10.6.1 Inspection

1. Disconnect the main power and shut off the fuel supply.



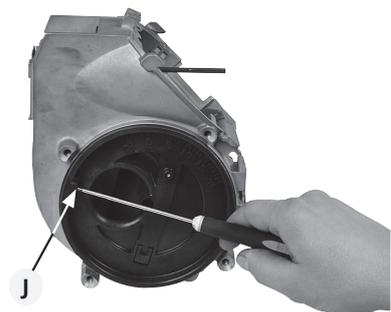
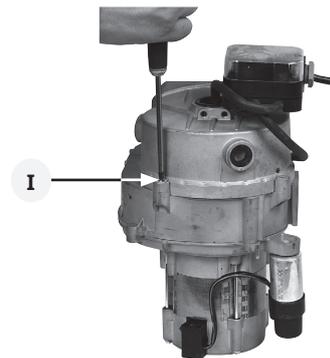
Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
3. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
4. Visually check the fan wheel. Carefully rotate the fan wheel with your fingers or a tool.
5. If possible, carefully clean the fan wheel if it is not heavily soiled.
6. If thorough cleaning is deemed necessary, proceed to Fan wheel Service. If cleaning is not necessary, assemble the burner.
7. Switch on the main power and open the fuel supply.
8. Start burner and check/adjust combustion.



10.6.2 Service

9. Disconnect the main power and shut off the fuel supply.
10. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
11. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
12. Loosen the screws (I) holding the air intake, 3 pcs.
13. Remove the air intake.
14. Loosen the screw (J) holding the inlet cone and note the inlet cone position.
15. Remove the inlet cone from the fan housing.
16. Clean the fan wheel. If necessary, disconnect and remove the fan wheel for more thorough cleaning of the fan and fan housing.
17. Install the fan wheel and tighten the screw. The fan wheel should be installed in the bottom position against the motor shaft.
18. Assemble the burner. Be careful when installing the inlet cone – install it in the same position as it was before being removed.
19. Fit the O-ring in the groove between the fan housing and inlet cone. Ensure that it is properly located in the groove and is not damaged when the air intake is fitted.
20. Switch on the main power and open the fuel supply.
21. Start burner and check/adjust combustion.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

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10.7 Electrical package

Check that the screw holding the electrical bracket is tightened so that good earth connection between the package and the burner body is obtained.

Use only electric components recommended by Enertech.



10.6.3 Complete electrical package replacement

1. Disconnect the main power and shut off the fuel supply.



Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
3. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
4. Disconnect the electric contact to the motor and the multiblock.
5. Open the air pressure switch and disconnect the cables. Note how the air pressure switch is connected.
6. Loosen the screw holding the electrical bracket.
7. Disconnect the ignition electrode and ionisation electrode cables from the electrical package.
8. Attach the new electrical package.
9. Connect the ignition electrode and ionisation electrode in the new electrical package.
10. Install the screws in the electrical bracket.
11. Connect the cables to the air pressure switch and install the cover. Ensure correct connection.
12. Connect the motor cable and multiblock.
13. Assemble the fan housing and front piece.
14. Switch on the main power and open the fuel supply.
15. Start burner and check/adjust combustion.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

10.7.1 Single electrical package component replacement

1. Disconnect the main power and shut off the fuel supply.



Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
3. Remove the fan housing from the front piece and pull it backwards until the cables to the ignition electrode and ionisation electrode can be loosened.
4. Remove the gas burner control.
5. Remove the cable of components to be replaced. Disconnect the cable in the terminal board.
6. Insert the new cable.
7. Check that all wires enter the terminal board and that they are securely fastened.
8. Switch on the gas burner control.
9. Assemble the fan housing and front piece.
10. Switch on the main power and open the fuel supply.
11. Start burner and check/adjust combustion.

When the ignition transformer, air switch, gas switch and gas burner control contained in the electrical package are being replaced, no work needs to be done in the socket.



When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

10.8 Control of flame monitoring and ionization current

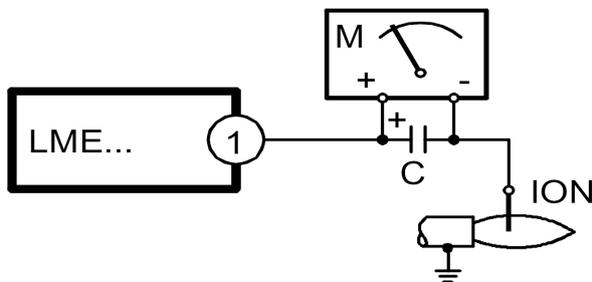
The burner is monitored in the standard version according to the ionization principle. The ionization current must be checked at each service occasion.

The ionization current is measured with a microammeter (μA) which is connected in series with the flame electrode and the gas burner control. Connect the μA meter as shown below. The minimum required ionization current is shown in the table. During normal operation, this current must be significantly higher, preferably more than $10\ \mu\text{A}$.

The reason for too low ionization current can be creep current, poor connection to earth, dirt or that the flame electrode may need to be adjusted. The wrong gas/air mix can also cause too low ionization current.

Technical data	
Idle voltage at ION-terminals	AC 115-230V
Short-circuit current	Max. AC 100-300 mA
Min. current for flame detection	Min. DC $1.5\ \mu\text{A}$
Required current to ensure detection	Min. DC $3\ \mu\text{A}$
Possible detection current	Max. DC $20\ \mu\text{A}$
Operational indicator lamp flashes green	$<5\ \mu\text{A DC}$
Operational indicator lamp shines green	$>5\ \mu\text{A DC}$

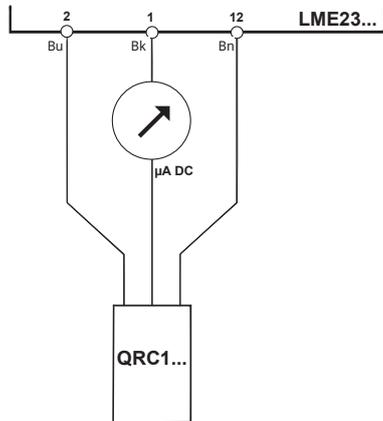
10.8.1 Flame monitoring ionisation



10.8.2 UV -detector (QRC)

The UV sensor should not be exposed to temperatures higher than 60 °C. The current passing through the UV sensor when it is lighted must be at least 70 μA . The current can be measured using a rotary coil instrument. A check is necessary only if a malfunction is suspected.

10.8.3 Flame monitoring UV-detector (QRC)



Technical data	
Idle voltage at ION-terminals	AC 115-230V
Short-circuit current	Max. AC 100-300 mA
Max. current for flame detection	Max. DC 5.5 μA
Required current to ensure detection	Min. DC 40 μA
Possible detection current	Max. DC 60 μA
Operational indicator lamp flashes green	<45 μA DC
Operational indicator lamp shines green	>45 μA DC

11. 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.



Review and service should be performed by authorised personnel only.

12. Troubleshooting

Conditions favourable to trouble-free operation of the system can only be guaranteed through the interaction between three factors: electricity, gas flow and combustion air. If any of these factors change, it may cause a malfunction.

Before requesting servicing, check the following points:

1. Are the system's gas taps open?
2. Are the fuses intact and is the power on?
3. Are control devices (room thermostat, boiler thermostat, etc.) correctly set?
4. Is there sufficient gas pressure to the burner?
5. Are the burner controls on standby and not locked?
6. Is there sufficient air supply to the burner?

Cause of fault	Action
Burner does not start:	
No gas.	Make sure all gas taps are open.
No power.	Check the fuse, thermostat and electrical connections.
Burner motor does not start.	Motor protection has tripped. Motor faulty.
Burner control faulty.	Replace.

Burner motor running, no ignition spark at the end of pre-aeration:	
No power in the terminals.	Check the connector. Replace faulty burner controls.
Ignition electrodes in contact with each other or earth.	Adjust.
Ignition electrode porcelain damaged.	Replace the electrodes.
Poor connection to cable connectors.	Adjust connection.
Ignition cables damaged.	Replace.
Transformer damaged, no power to secondary winding.	Replace the transformer.
Ignition cable and ionisation cable swapped around.	Reconnect.

No flame propagation:	
Gas solenoid valve faulty.	Replace.
Gas solenoid valve does not open despite having power.	Replace solenoid valve terminals, or entire valve.
No power to solenoid valve.	Check the connection.
No electrical connection through air pressure gauge.	Check the air pressure gauge's settings and functions.
Ignition load incorrectly set.	Increase/decrease gas supply Reduce airflow.
Burner control faulty	Replace
Air pressure gauge incorrectly set or faulty	Check the settings and reset, or replace
No acknowledgement signal due to incorrect adjustment or misalignment of the control motor cams.	Check the settings and realign.

Burner trips after safety time limit despite flame propagation:	
No ionisation current or UV cell incorrectly positioned.	Adjust ionisation electrode and UV cell Check cables and connectors.
Burner control monitor faulty.	Replace burner control.
Voltage lower than 185V.	Contact an electrician.
Ignition electrodes disrupting ionisation current.	Adjust ignition electrodes. Re-polarise the transformer.
Poor earth connection.	Ensure adequate earth connection.
Phase and neutral swapped around.	Check wiring diagram and change accordingly.

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Cause of fault	Action
Burner trips during pre-aeration:	
Air sensor faulty or incorrectly set.	Increase/decrease air setting. Reduce air volume.
Ignition load incorrectly set.	Increase/decrease gas supply Reduce airflow.
Gas pressure too low.	Increase pressure. If necessary, contact gas supplier.

Pulsations at start-up:	
Ignition electrodes incorrectly set.	Adjust .
Gas pressure too high.	Check and adjust using pressure gauge and pressure control valve.
Flue gas side blocked.	Check the chimney flue.

Burner pulsates during operation:	
Burner incorrectly set.	Adjust.
Burner dirty.	Clean the burner.
Incorrect chimney.	Check and modify dimensions if necessary.

Burner functioning properly but with occasional blockage:	
Ionisation current too low.	Check. Must be at least 6µA, but should ideally lie between 8-20µA.
UV cell incorrectly positioned.	Adjust.
Voltage drop at certain times.	Must not drop below 15% of rated voltage. Contact an electrician if necessary.
Incorrectly set or faulty air sensor.	Check the settings and reset, or replace.
Ignition electrode overload.	Replace.
Burner control ambient temperature too high.	Insulate for heat, Max. 60 °C.
Ignition spark too weak.	Check the transformer.

Poor combustion:	
Poor draught conditions.	Check the chimney.
Flue gas temperature too high.	Boiler overloaded Decrease the gas volume, sweep the chimney if necessary.
CO2 content too low.	Choke the air supply. Check the boiler for any leakages. Choke the draught if too high.

CO content too high:	
Surplus air when using natural gas and liquefied petroleum (propane, butane).	Choke the air supply.
Poor air supply.	Open the air supply. Check flue gas damper.
Holes in gas nozzle clogged.	Clean.
Poor fresh air intake.	Check and increase.
Flame at incorrect angle due to combustion head out of position.	Check the combustion head and readjust.

Condensation build up in boiler and chimney:	
Flue gas temperature too low or gas volume too low.	Raise the flue gas temperature by increasing gas volume Insulate the chimney.

13. Service- and inspection protocol

Installation		Boiler	
Name:		Type:	Efficiency kW:
Address:		Burner	
		Type:	Efficiency kW:
Installed by:		Date:	

Date	Nm ³ gas/h	Governor		CO ₂	CO	Fluegas temp	Ionisation current	Pressure		Efficiency
		Before	After					Fire room	Chimney	
Measurement				%	%	°C	µ A	mbar	mbar	%
	Small Flame									
	Large Flame									
	Measures									

Date	Nm ³ gas/h	Governor		CO ₂	CO	Fluegas temp	Ionisation current	Pressure		Efficiency
		Before	After					Fire room	Chimney	
Measurement				%	%	°C	µ A	mbar	mbar	%
	Small Flame									
	Large Flame									
	Measures									

Date	Nm ³ gas/h	Governor		CO ₂	CO	Fluegas temp	Ionisation current	Pressure		Efficiency
		Before	After					Fire room	Chimney	
Measurement				%	%	°C	µ A	mbar	mbar	%
	Small Flame									
	Large Flame									
	Measures									



EU Declaration of conformity

Bentone Gas Burners

Type:	Certificate No.	Type:	Certificate No.
BFG 1	CE-0123CT1269	BG 550	CE-0123CT1326
STG 120	CE-0123CT1270	BG 650	CE-0123CT1348
STG 146	CE-0123CT1281	BG 700	CE-0123CT1359
BG 300	CE-0123CT1292	BG 800	CE-0123CT1360
BG 400	CE-0123CT1304	BG 950	CE-0123CT1371
BG 450	CE-0123CT1315		

This declaration of conformity is issued under the sole responsibility of the manufacturer.
The object of the declaration described above is in conformity with:

- **Gas Appliance Regulation 2016/426/EU**
- **Machinery Directive 2006/42/EC**
- **EMC 2014/30/EU**
- **The Restriction of the Use of Certain Hazardous Substances (RoHS) Directive 2011/65/EU**

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

EN 676:2020 Excluding the requirements of Annex J/K.
Automatic forced draught burners for gaseous fuels.

Additional information can be downloaded at: www.bentone.com

Manufacturer: Enertech AB
Näsvägen 8
SE-341 34 LJUNGBY
Sweden

Notified Body: TUV SÜD Product Service GmbH
Ridlerstraße 65
D-80339 München, Germany
Notified Body Number: 0123

Ljungby, 2022-10-10

Joachim Hultqvist

Technical Manager
Enertech AB

Ola Karlsson

Quality Manager
Enertech AB

UK Declaration of conformity

Bentone Gas Burners

Type:

BFG 1	BG 300	BG 550	BG 800
STG 120	BG 400	BG 650	BG 950
STG 146	BG 450	BG 700	

This declaration of conformity is issued under the sole responsibility of the manufacturer.
The object of the declaration described above is in conformity with:

- **Gas Appliances (Enforcement) and Miscellaneous Amendment Regulations 2018**
- **Supply of Machinery (Safety) Regulations 2008**
- **Electromagnetic Compatibility Regulations 2016**
- **The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

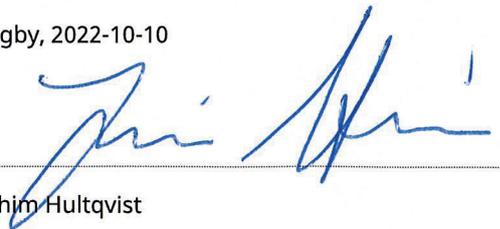
BS EN 676:2020 Excluding the requirements of Annex J/K.
Automatic forced draught burners for gaseous fuels.

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Manufacturer: Enertech AB
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Approved Body: TUV SÜD BAPT Unlimited
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PO 15 5RL, United Kingdom
Approved Body Number: 0168

Ljungby, 2022-10-10



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