



Providing sustainable energy solutions worldwide

Installation- and maintenance instruction

## **BG 300 Biogas**

LME11.230C2E

DMV-DLE 512

VPS 504

FRS 515



**-sv**

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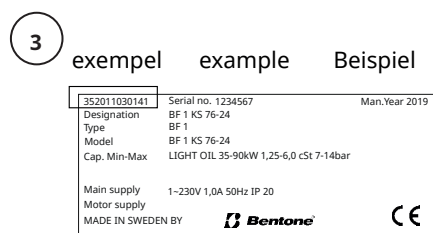
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# 1. General Information

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

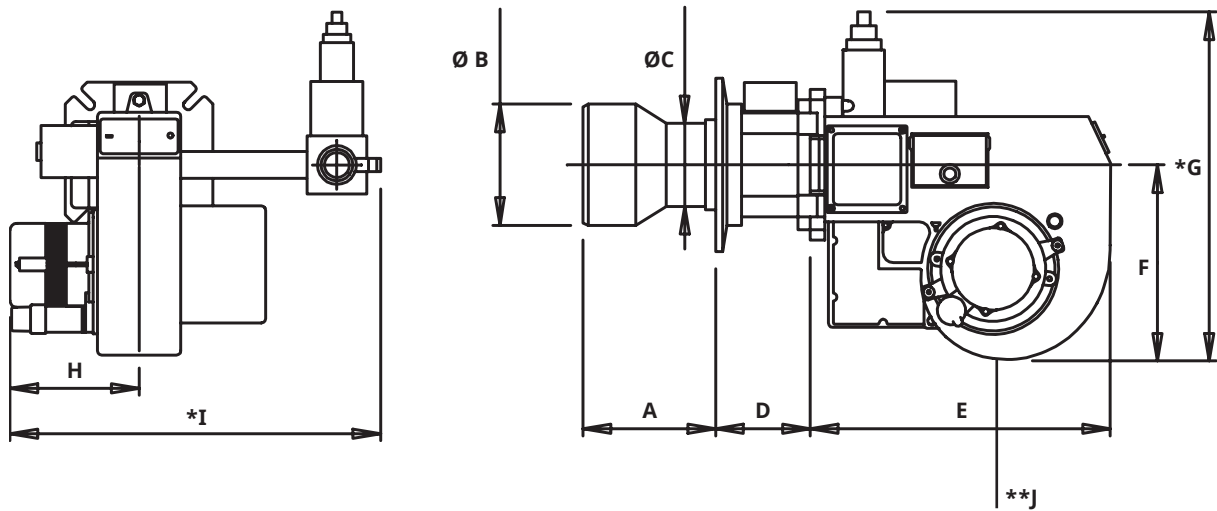
### The burner is intended for:

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

### Fuels:

- Natural gas H, E, L, LL.
- Dry biogas max 0.1 Vol% H<sub>2</sub>S and min 50% CH<sub>4</sub>.

### 2.1 Dimensions BG 300



| Length of burner tube | Burner tube measure A | Burner tube measure B | Burner tube measure C |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 145                   | 125                   | ø120                  | ø110                  |
| 245                   | 225                   | ø120                  | ø110                  |

| D   | E   | F   | G    | H   | I    | J     |
|-----|-----|-----|------|-----|------|-------|
| 100 | 372 | 220 | *475 | 185 | *470 | **200 |

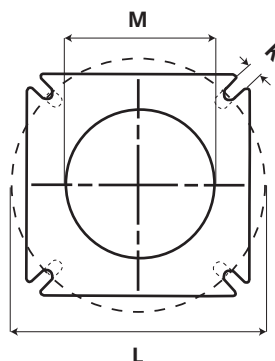
\* The above dimensions are max. measurements. Depending on the components used, the measurements may vary.

\*\* Min. recommended distance to floor.

## 2.1.1 Measurements for connection to the boiler

| K  | L        | M          |
|----|----------|------------|
| 12 | ø175-240 | ø125 (***) |

\*\*\*Dimensions when installing flame tube from the inside of the boiler.



## 2.2 Capacity range

| Capacity kW     | Gas quantity at min. power Nm <sup>3</sup> /h | Gas quantity at max. power Nm <sup>3</sup> /h | Max. connection pressure mbar | Min connection pressure mbar |
|-----------------|---|---|-------------------------------|------------------------------|
| <b>BG 300</b>   |   |   |                               | See data plate.              |
| G20 50 - 200    | 5.3   | 21.2  | 360                           |                              |
| G25 50 - 170    | 6.2   | 20.9  | 360                           |                              |
| Biogas 50 - 150 | 8.3   | 25.0  | 360                           |                              |

160303-614

Gas quantity and capacity vary according to grade of gas and connection pressure.

## 2.3 Gas categories, approved gases

Components are approved for dry biogas with a maximum content of 0.1% H<sub>2</sub>S.

| Category             | Country of destination   | Supply pressure |
|----------------------|--|-----------------|
| II <sub>2R3R</sub>   | 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 <sub>2H3B/P</sub> | AT, CH, CY, DK, FI, LT, RO, SE, SK   | 20 mbar         |
| II <sub>2H3P</sub>   | GB, IE   | 20 mbar         |
| II <sub>2L3B/P</sub> | NL, RO   | 20 mbar         |
| II <sub>2E3B/P</sub> | PL   | 20 mbar         |
| I <sub>2E(R)B</sub>  | BE   | 20 mbar         |
| I <sub>3P</sub>      | BE   | 20 mbar         |

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## 2.4 Technical specification

| BG 300                    |                                |
|---------------------------|--------------------------------|
| Main supply <sup>1)</sup> | 230V, 1~, 2.1/3.0A, 50Hz, IP20 |
| Max fuse rating           | 6.3A                           |
| NO <sub>x</sub> -class    | 2 G20, G25 / 3 G30, G31        |
| Noise level               | 82dBA                          |

<sup>1)</sup> Max operating current, see data plate.

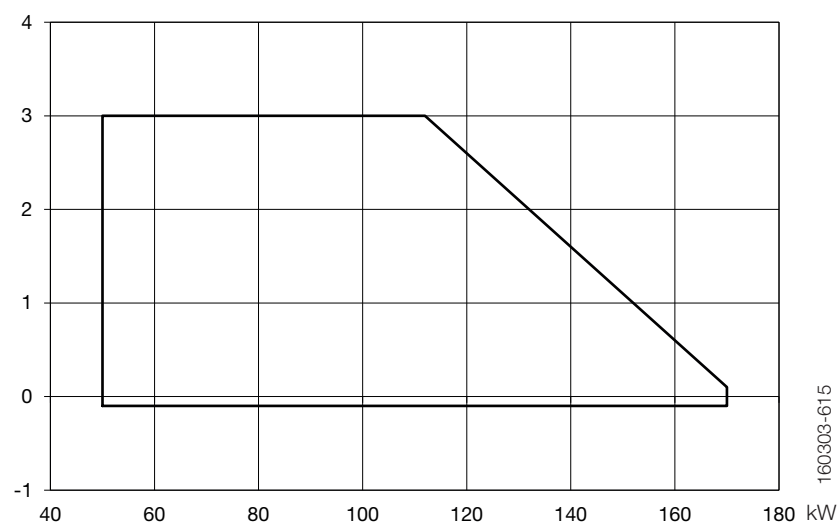
Measurements according to EN 15036-1:2006

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 Working field

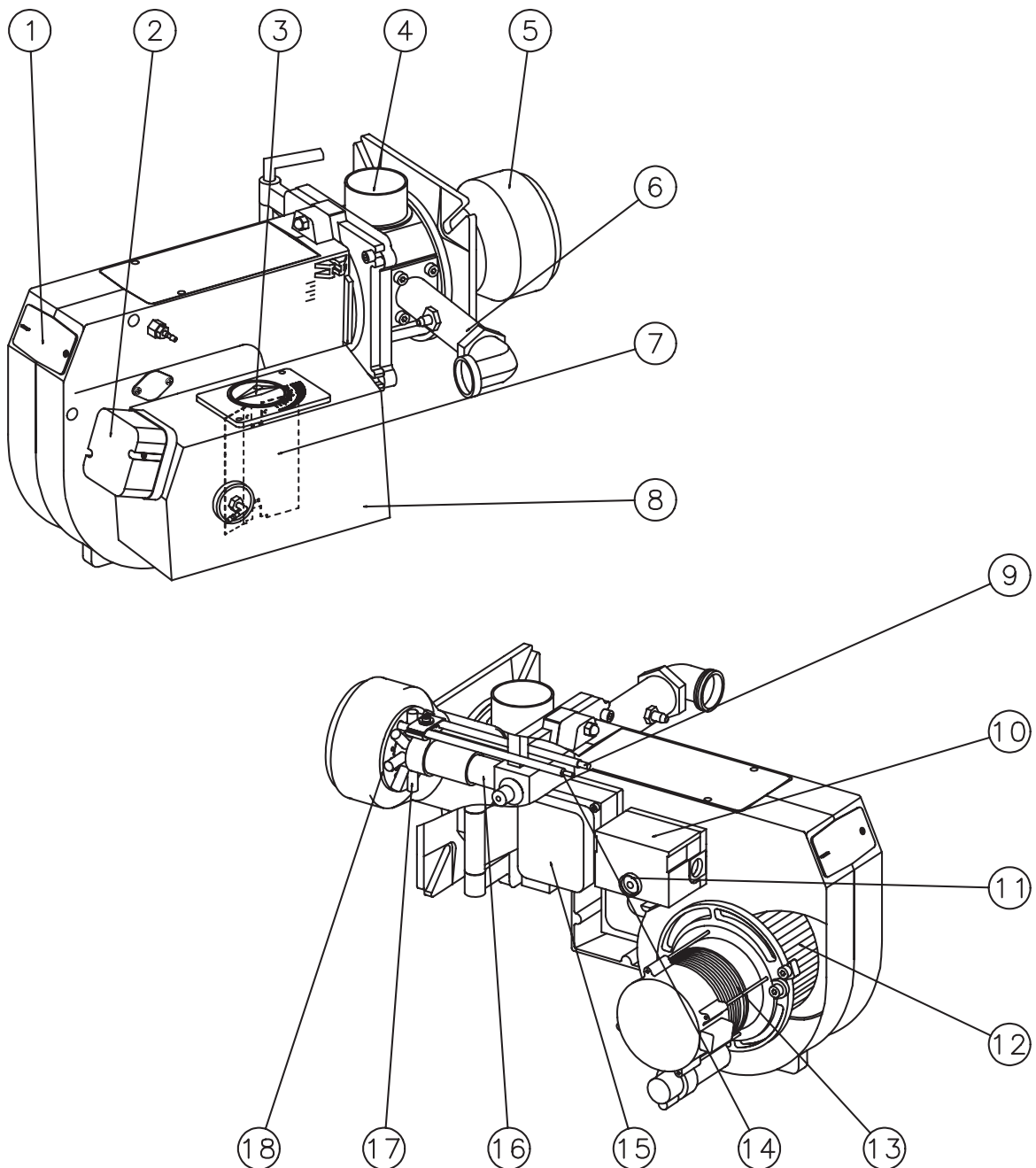
mbar 50-170 kW



**!** Do not exceed working field.

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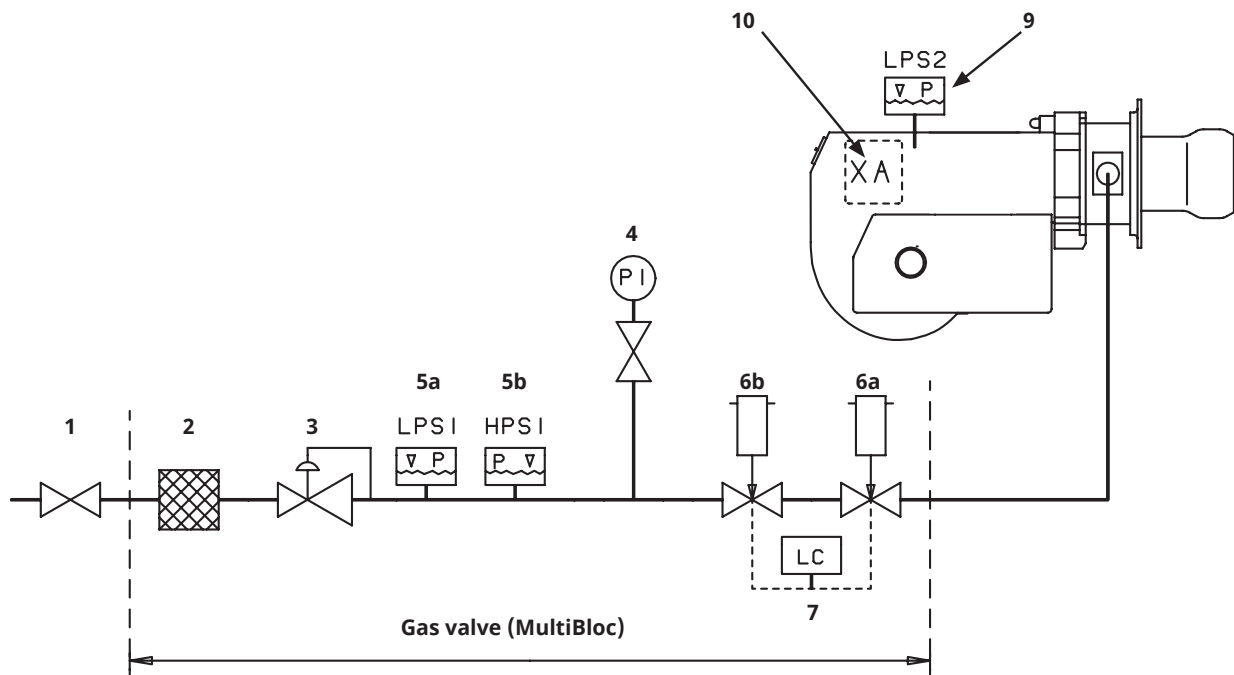
## 2.6 Components



- |                              |                       |                          |
|------------------------------|-----------------------|--------------------------|
| 1. Cover, inspection glass   | 7. Air damper         | 13. Motor                |
| 2. Air pressure switch       | 8. Air intake         | 14. Ionization electrode |
| 3. Air adjustment            | 9. Ignition electrode | 15. Transformer          |
| 4. Inner assembly adjustment | 10. Burner control    | 16. Inner assembly       |
| 5. Flame tube                | 11. Reset button      | 17. Nozzle               |
| 6. Connecting pipe           | 12. Fan wheel         | 18. Brake plate          |



## 2.7 Skeleton diagrams, 1-stage burner

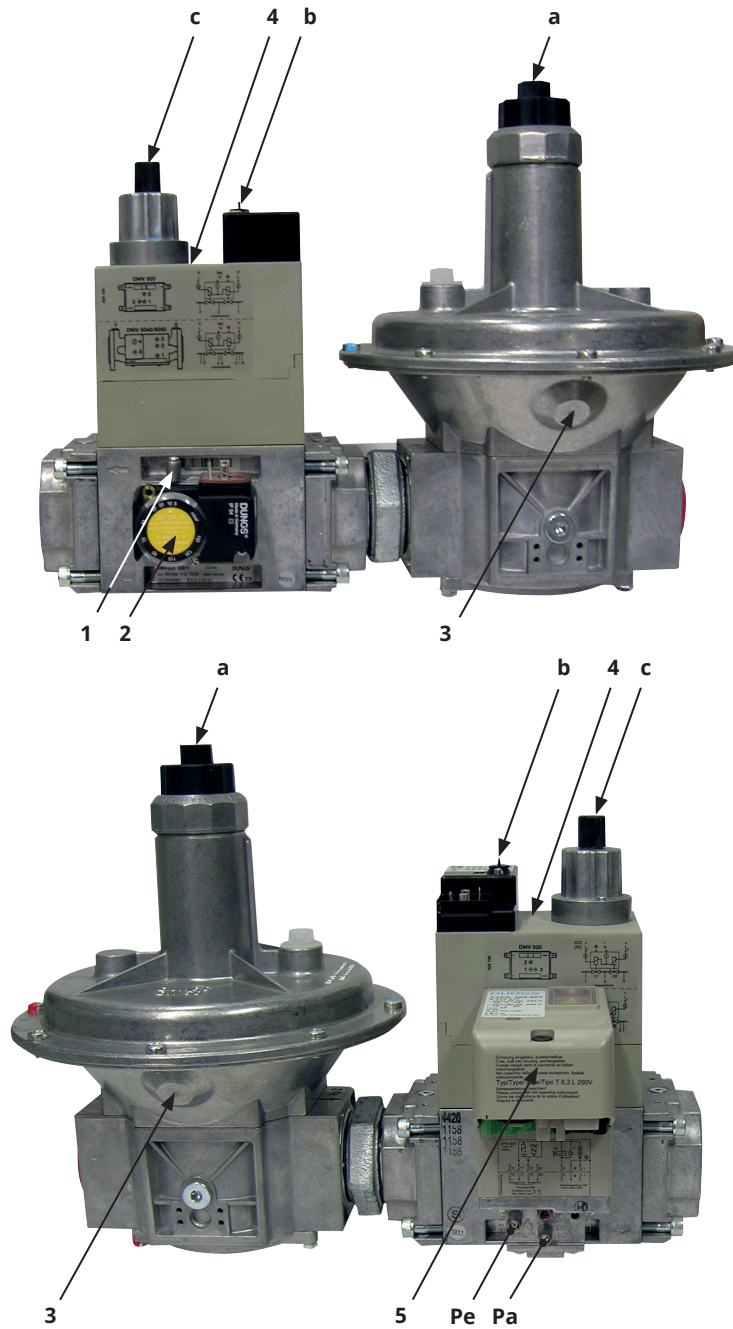


1. Ball valve
2. Filter
3. Pressure regulator
4. Pressure gauge with shut-off cock
- 5a. Gas pressure switch, Min.
- 5b. Gas pressure switch, Max.
- 6a. Main valve
- 6b. Safety valve
7. <sup>1)</sup> Leakage control
9. Air pressure switch
10. Burner control

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

<sup>1)</sup> Required over 1200 kW according to EN 676.hhh

## 2.8 Skeleton diagram, biogas 1-stage burner



- |    |  |     |                         |
|----|--|-----|-------------------------|
| 1. | Pressure outlet  | Pe  | Pressure before valve   |
| 2. | Gas pressure switch  | Pa  | Pressure between valves |
| 3. | Pressure regulator FRS<br>shall be fitted with separate filter |     | Adjusting points        |
| 4. | Twin solenoid valve  | a). | Gas pressure adjustment |
| 5. | Leakage control VPS  | b). | Main flow restrictor    |
|    |  | c). | Hydraulic brake         |

VPS: Standard on burners with an output  $\geq 1200$  kW. Optional on burners with an output  $< 1200$  kW.

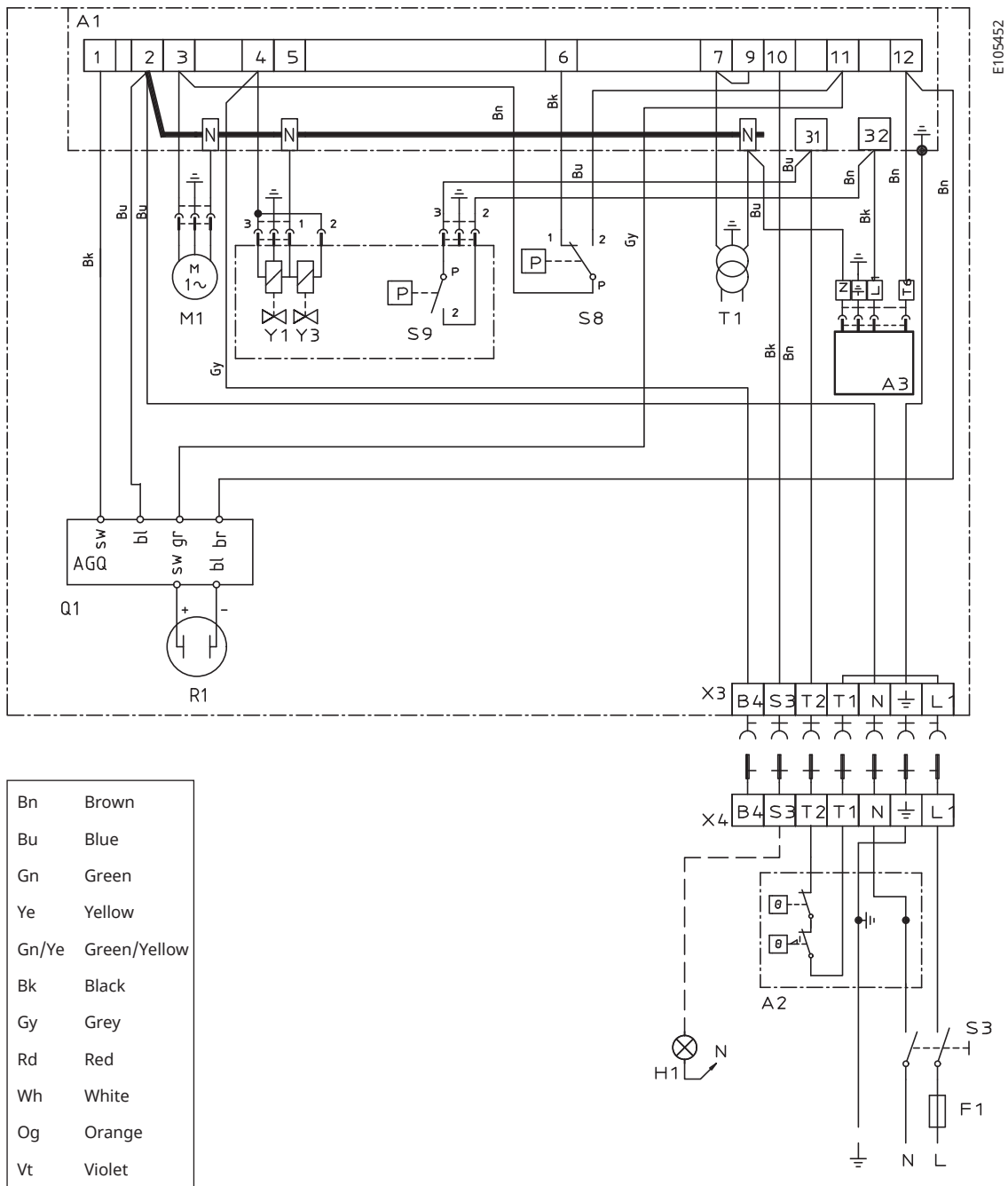
# 3. Electric equipment

## 3.1 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.

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.

## 3.2 Wiring diagram



### 3.2.1 Components

|    |                          |    |                                  |    |                         |
|----|--------------------------|----|----------------------------------|----|-------------------------|
| A1 | Burner control           | Q1 | Signal amplifier AGQ             | S9 | Gas pressure switch     |
| A2 | Twin thermostat          | P1 | Time meter, total operating time | T1 | Ignition transformer    |
| A3 | Leakage control, VPS 504 | R1 | UV-detector                      | X3 | Plug-in contact, burner |
| F1 | Operating fuse           | S3 | Control thermostat               | X4 | Plug-in contact, boiler |
| H1 | Lamp, low capacity       | S8 | Air pressure switch              | Y1 | Solenoid valve 1        |
| M1 | Motor                    |    |                                  | Y3 | Safety solenoid valve   |

### 3.3 Function LME...

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



Mains connection and fuse in accordance with local regulations.

### 3.4 Control program at faults; fault mode indicator LME ....

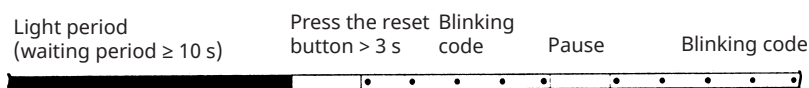
#### 3.4.1 Colour codes

| 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      |

##### 3.4.1.1 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:



##### 3.4.1.2 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.



### 3.4.1.3 Alarm code table

| Red blinking code on signal lamp (LED) | Possible causes  |
|--|--|
| Blinking 2 x<br>..                     | No flame creation at End of "TSA"<br>- defective or fouled flame monitoring<br>- defective or fouled fuel valves<br>- poor burner setting<br>- defective firing device |
| Blinking 3 x<br>...                    | "LP" defective<br>- No air pressure switch signal after "t10"<br>- "LP" is welded in open position   |
| Blinking 4 x<br>....                   | Illegal flame signal during start-up   |
| Blinking 5 x<br>.....                  | Time out "LP"<br>- "LP" is welded in open position   |
| Blinking 6 x<br>.....                  | Free   |
| Blinking 7 x<br>.....                  | Too many flame disappearances during operation<br>- poor burner setting<br>- defective or fouled fuel valves<br>- defective or fouled flame monitoring                 |
| Blinking 8 x<br>.....                  | Free   |
| Blinking 9 x<br>.....                  | Free   |
| Blinking 10 x<br>.....                 | Connection fault or internal fault, outgoing contacts or other faults  |
| Blinking 14 x<br>.....<br>....         | 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

### 3.4.1.4 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.

## 4. Installation

### 4.1 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.

### 4.2 Instructions

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

### 4.3 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.

### 4.4 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.

### 4.5 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.

### 4.6 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.

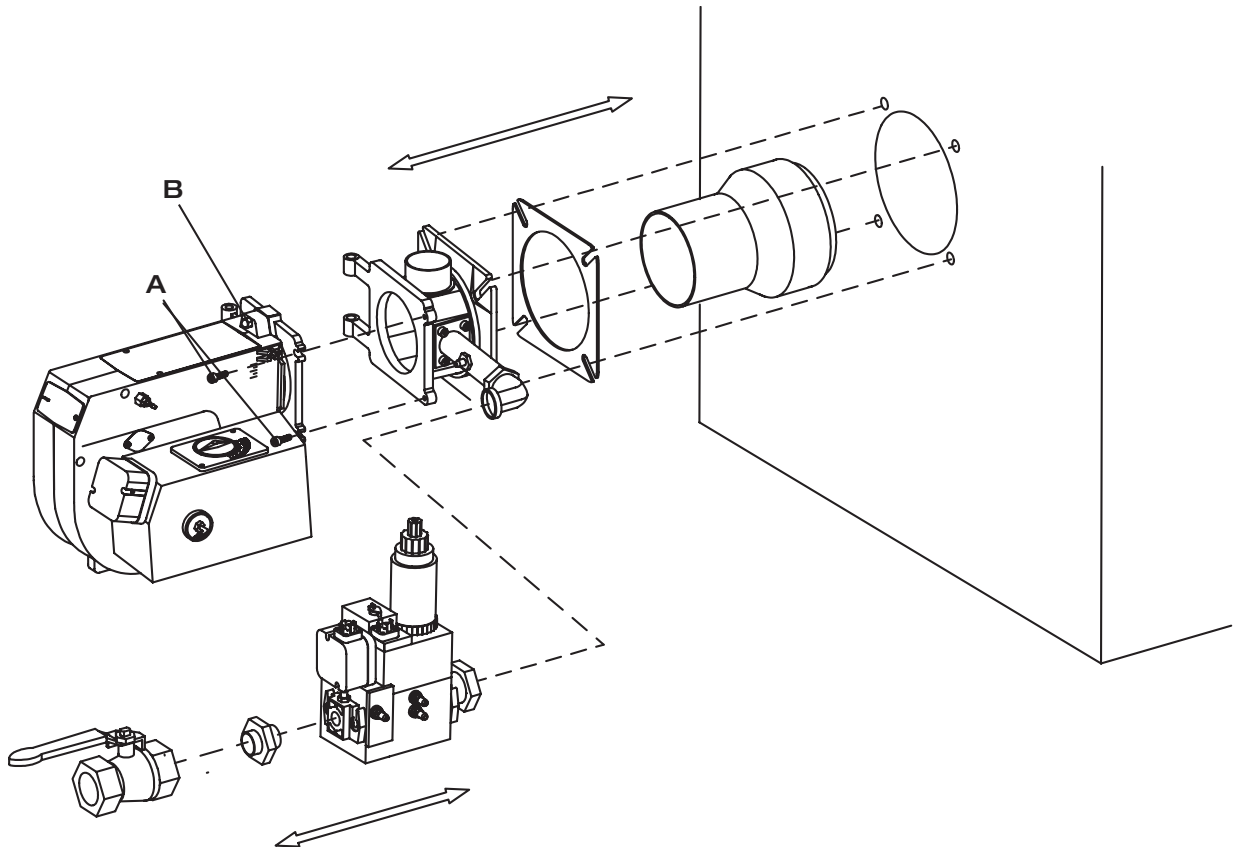
## 5. Mounting

The burner is mounted on the boiler according to the hole pattern on the fixing flange.

1. Remove the gas valve from the burner.
2. Remove fan housing by loosening nut (A), swing out fan housing. Disconnect ionisation and ignition cables from the electrodes. Remove nut (B) on hinged flange and lift fan housing off.
3. Install the fixing flange and the supplied gasket on the boiler. If new mounting holes need to be drilled, use the fixing flange as a template and fasten with M8-M12 screws.
4. Check that the electrodes are correctly set, see chapter Gas nozzle.
5. Mount the fan housing on the fixing flange and fasten with nut (B).
6. Connect the ionisation and ignition cables.
7. Fit the gas valve.
8. Connect the gas with the ball valve provided. Ensure that the pre-screwing, ball valve and tubings are done in such a way that the burner and boiler hatch can be easily used for servicing.
9. Connect the supply cable, operating and safety circuits.



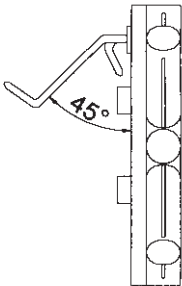
Check for leaks in the gas line.



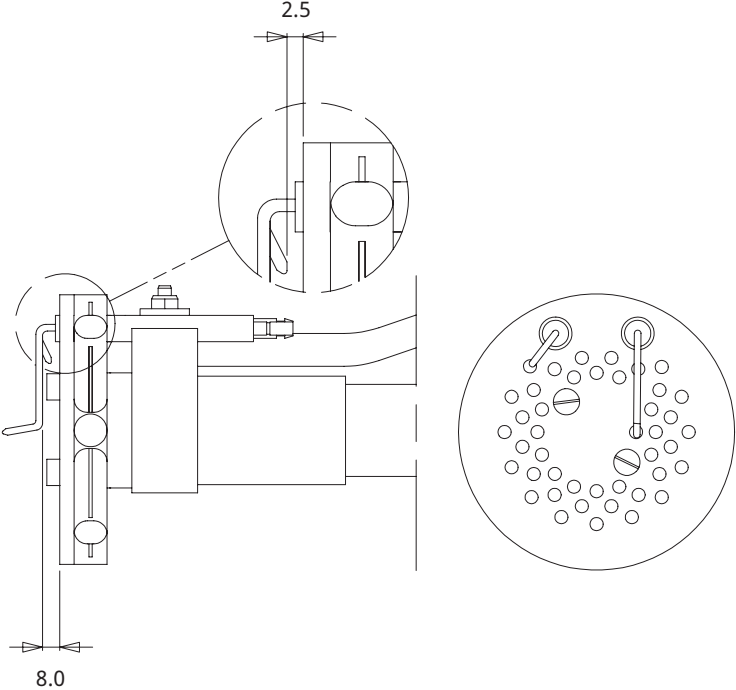
# 5.1 Gas nozzle

Check that the ignition and ionization electrodes are correctly set before mounting on the boiler.

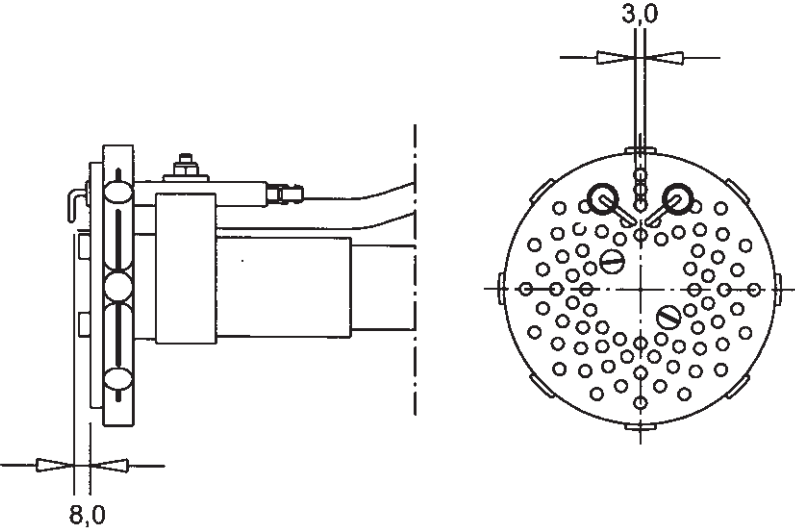
## Propan



## Natural gas



## Biogas (UV detector)



## 5.2 De-aerating

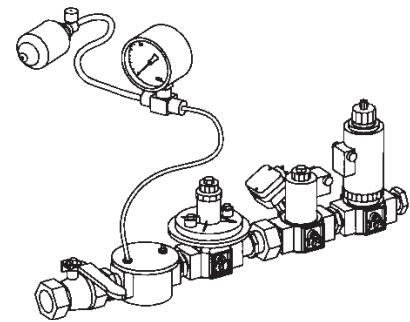
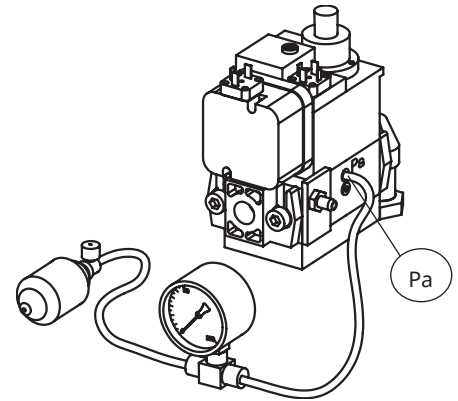
De-aerating the gas line by closing the tap to the gas connection and unscrewing the screw on the measuring nipple for the connection pressure. Connect a plastic hose, open the tap and drain the gas in a safe place. When the de-aerating is completed, be sure to refit the screw on the measuring nipple.

## 5.3 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 system must not be higher than max. connection pressure, see data plate. 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.





## 5.4 Calculation of gas flow

| Formula symbol | Description   | Example values          |
|----------------|---|-------------------------|
| $V_N$          | Standard gas volume [Nm <sup>3</sup> /h]<br>Gas volume at normal condition 15 °C 1013 mbar                        | -                       |
| Q              | Boiler output [kW]  | 140 kW                  |
| $H_i$          | Lower calorific value of gas [kWh/m <sup>3</sup> ]<br>Natural gas under normal conditions 15 °C 1013 mbar, EN 676 | 9.45 kWh/m <sup>3</sup> |
| $\eta$         | 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 <sup>3</sup> /h]  | -                       |
| VG             | Gas flow measured at the gas meter [m <sup>3</sup> ]  | 0.46 m <sup>3</sup>     |
| T              | Measuring time for consumed gas quantity [s]  | 91 s                    |

Calculate standard volume using the following formula:

$$V_N = \frac{Q}{\eta \cdot H_i} \quad V_N = \frac{140 \text{ kW}}{0.9 \cdot 9.45 \text{ kWh/m}^3} = 16.5 \text{ m}^3/\text{h}$$

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:

$$V = \frac{V_N}{f} \quad V = \frac{16.5 \text{ m}^3/\text{h}}{0.90} = 18.2 \text{ m}^3/\text{h}$$

Determine operating volume with the following formula:

$$V = \frac{3600 \cdot V_G}{T} \quad V = \frac{3600 \cdot 0.46 \text{ m}^3}{91 \text{ sek}} = 18.2 \text{ m}^3/\text{h}$$

| 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 <sup>3</sup> | MJ/Nm <sup>3</sup> |
|-------------|-----|---------------------|--------------------|
| Natural gas | G20 | 9.5                 | 34.02              |
| Natural gas | G25 | 8.2                 | 29.25              |

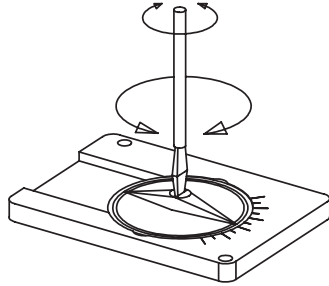
| Gas quality |     | kWh/Nm <sup>3</sup> | MJ/Nm <sup>3</sup> |
|-------------|-----|---------------------|--------------------|
| Butane      | G30 | 32.25               | 116.09             |
| Propane     | G31 | 24.44               | 88.00              |

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 Air adjustment

Loosen the stop screw and turn the knob along the scale to the desired position and tighten the screw. Check the air adjustment by making a flue gas analysis.



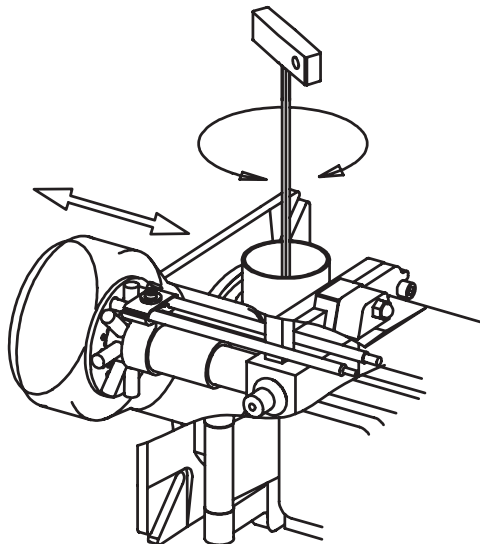
### 6.2 Brake plate adjustment

The position of the brake plate must be adjusted to achieve the most favorable pressure drop across the brake plate.

Loosen the screw on the adjustment device.

- To reduce the opening: turn the knob to the left.
- To increase the opening: turn the knob to the right.

The adjustment of the position of the brake plate affects the air flow. It is therefore always necessary to make a fine adjustment of the air by means of the adjustment device of the burner.



### 6.3 Control of burner head

To check the burner head, brake plate and electrodes, see chapter Service Combustion device.

## 6.4 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 settings of gas valve, damper motor and combustion device before start-up.

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

## 6.5 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 <sub>2</sub> |
|-------------------------|-----------------------|------------------------------|-----------------------|
|                         | % O <sub>2</sub>      | % CO <sub>2</sub> 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                 |                              |                       |

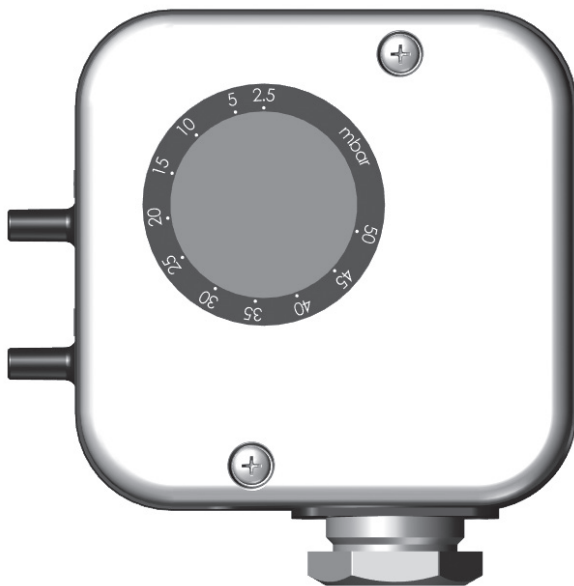
## 6.6 Setting the air pressure switch

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.



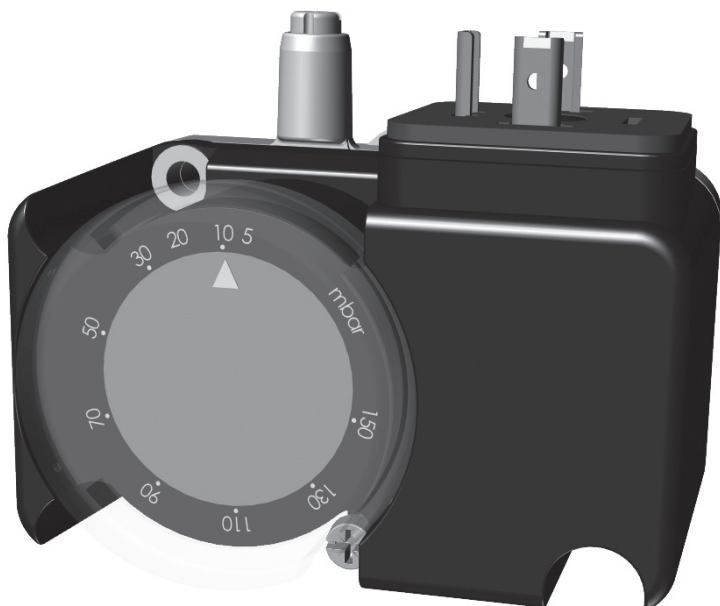
## 6.7 Setting the gas pressure switch min

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<br>Fault output T7: 1A<br>Fault output SO4 1, 2, 3, T7: 1A |
| Release time                            | ≈ | 10 - 30 s<br>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.

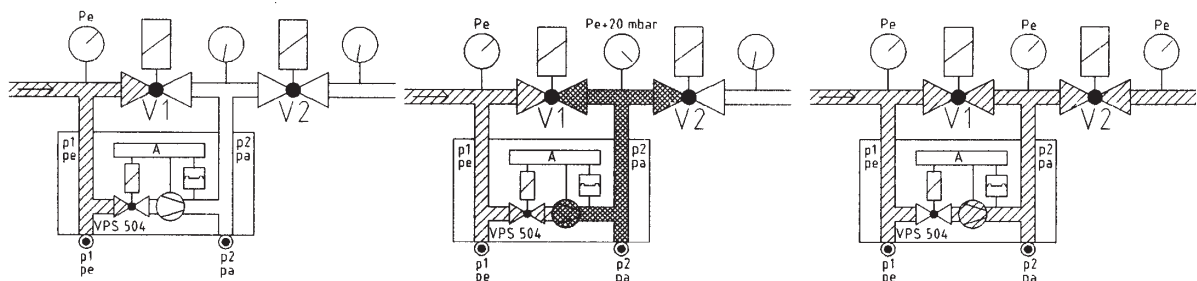
If the test section is leaky or if the pressure increase by + 20 mbar is not attained during the test period (max. 26 s), the VPS 504 generates a fault. The red LED is lit as long as the contact is released by the regulator (heat requirement).

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

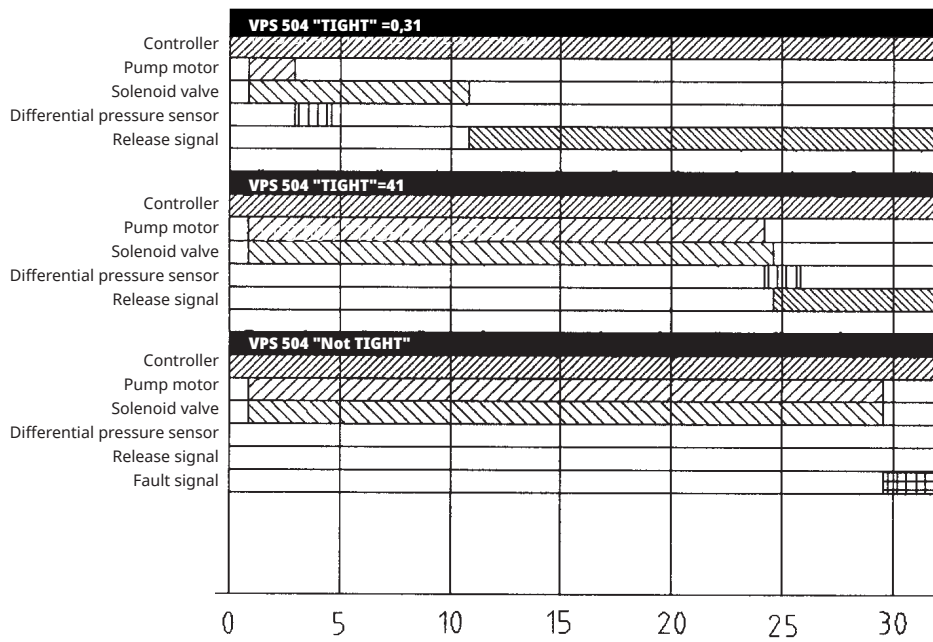
Programmer Idle state

Pressure buildup

Operation



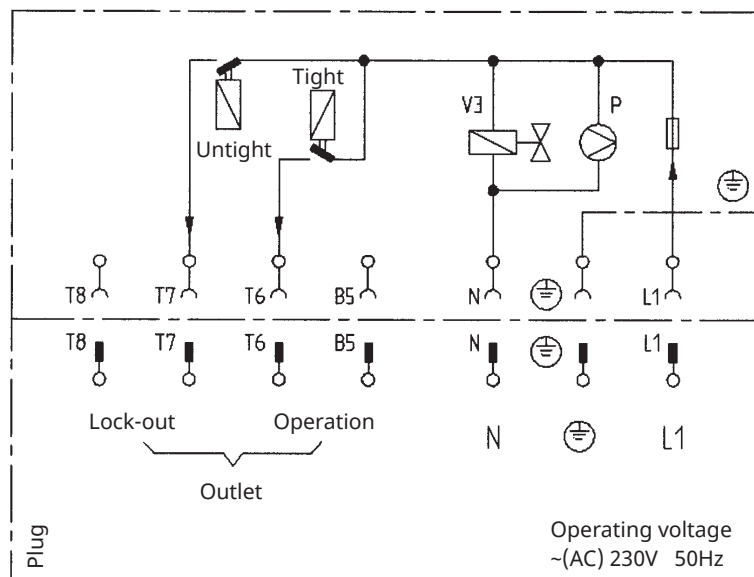
### 7.2.1 Program sequende schedule



### 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

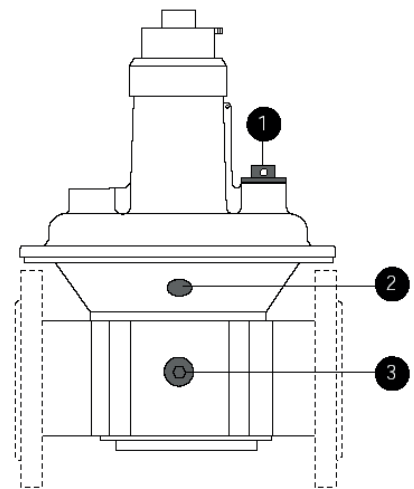
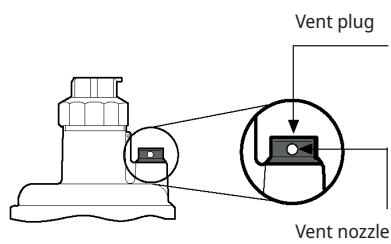
Nominal diameters Rp 3/8 - Rp 2 1/2  
DN 40 - DN 150



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.

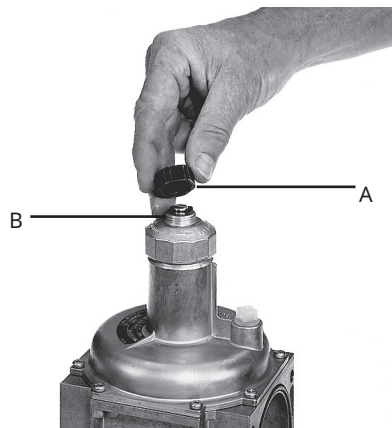
Adjustment (-) Setting spindle B "Turn clockwise" = Reducing outlet pressure (setpoint)

4. Check setpoint

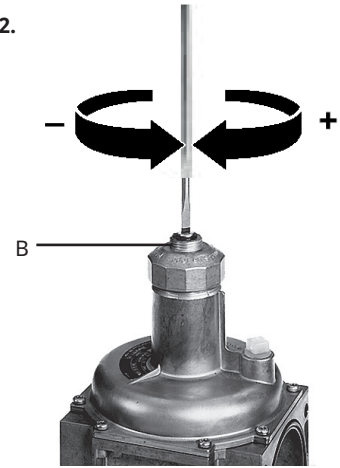
5. Screw on protective cap A.

6. Attach lead seal (Page 5).

1.



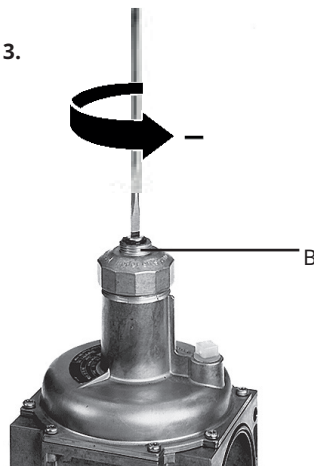
2.



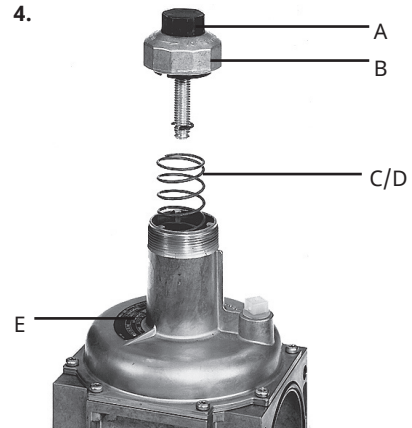
Replace setting spring 3-4

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.

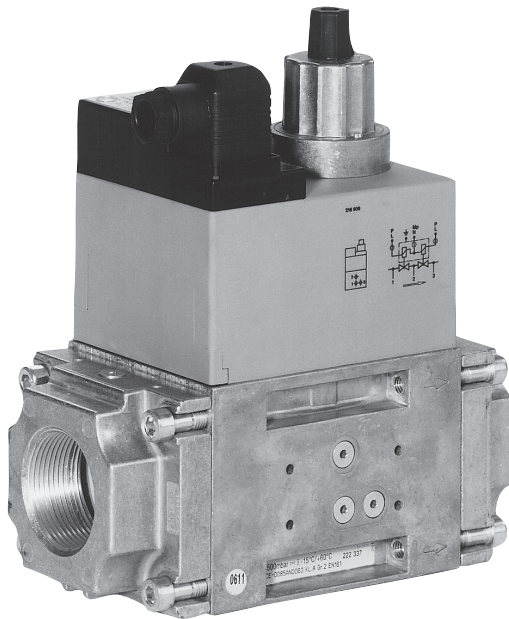
3.



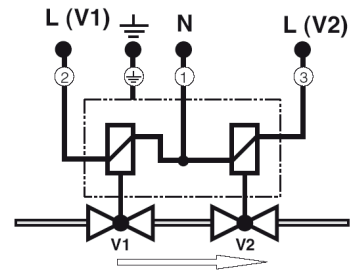
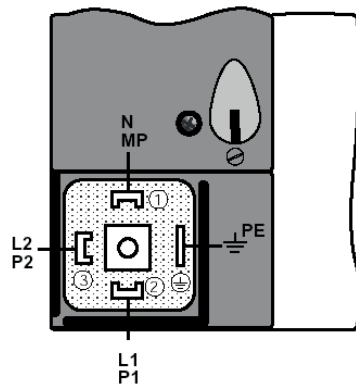
4.



## 9. Double Solenoid Valve DMV-DLE



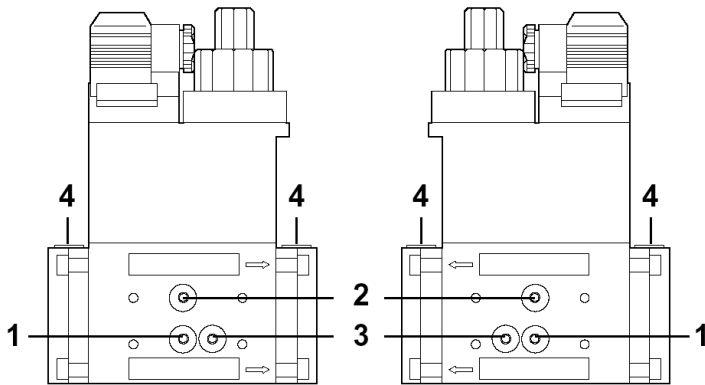
Nominal widths Rp 1/2 - Rp 2  
Electrical connection IEC 730-1  
(VDE 0631 T1)



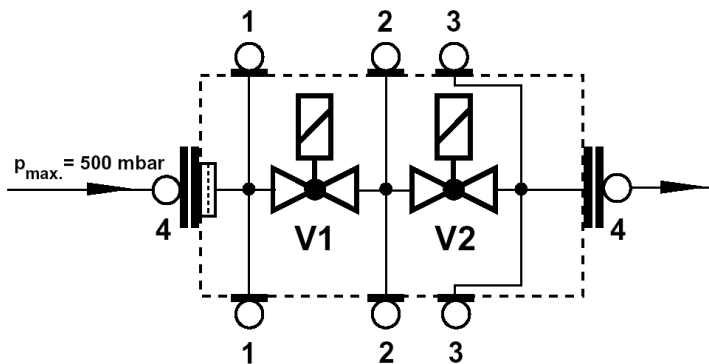
### 9.1 Technical data

|                         |                   |
|-------------------------|-------------------|
| 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          |

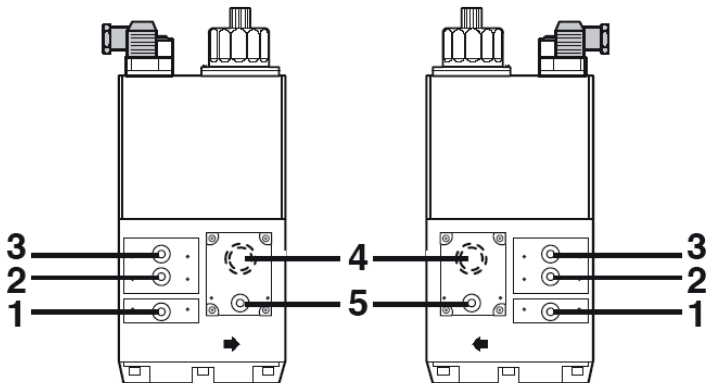
## 9.2 DMV-DLE 512-520/11



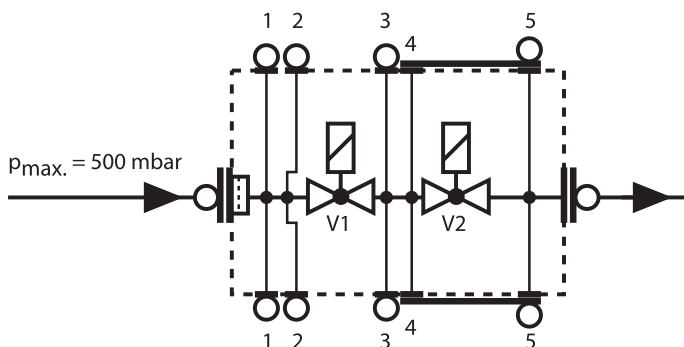
Pressure outlet 1, 2, 3, 4

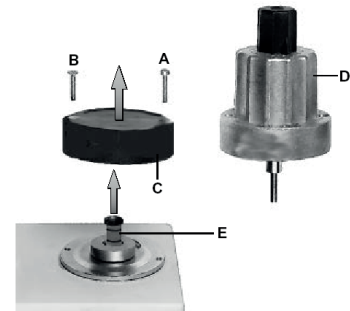
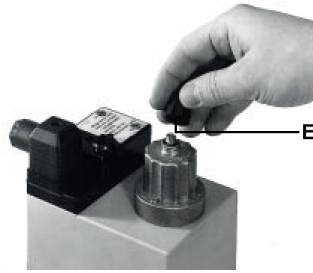
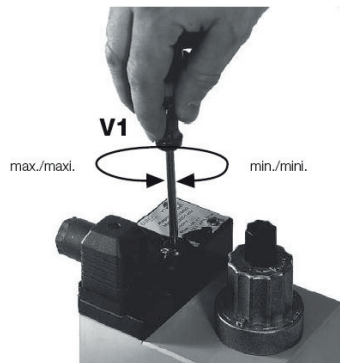


## 9.3 DMV-DLE 525/11



Pressure outlet 1, 2, 3, 5





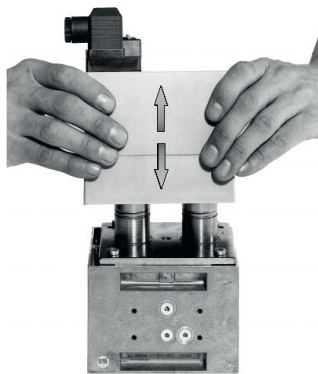
**Main flow setting** only possible at V1! Set main volume on open valve. Set valve V1 during operation. Check setting values continuously. Smallest setting volume flow:

**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 (+).

**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.



**Replacing the solenoid versions with hydraulic brake**

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<br>Replace if need for cleaning/imbalance | 3,000 h<br>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.

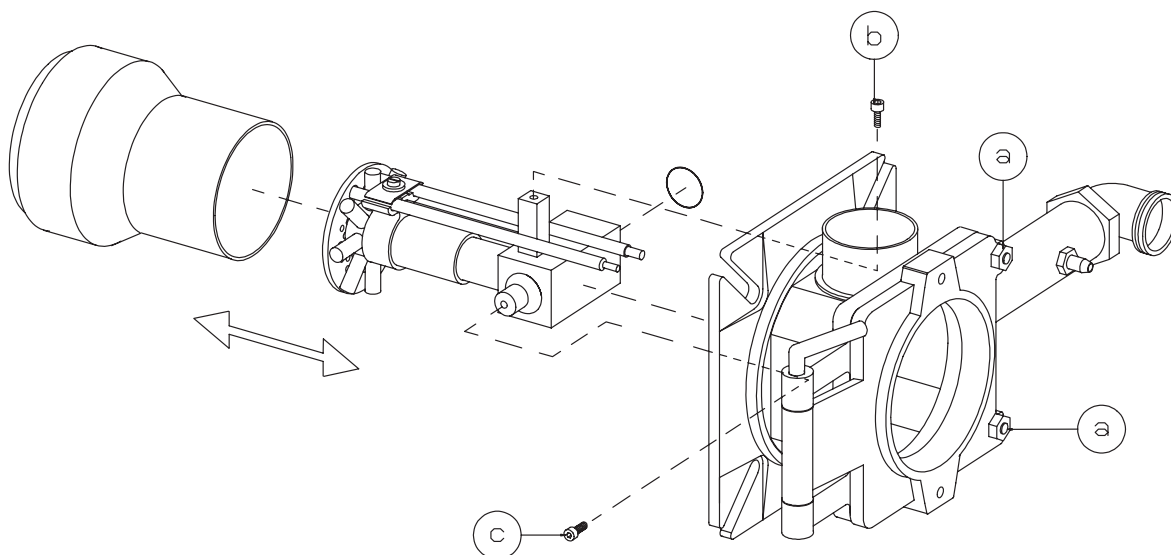


Before obtaining access to electrical and fuel line components all supply circuits must be disconnected.

2. Loosen screws (A) and swing the burner out.
3. Disconnect the ignition and ionisation cables.
4. Check the position of the combustion device. Loosen screw (B) to remove the adjustment device.
5. Loosen screw (C) and remove the combustion device.
6. Check and clean the brake plate and gas inlet, replacing components if necessary.
7. Check the ignition and ionisation electrodes, replace if necessary (see chapter Gas nozzle).
8. Refit the combustion device in reverse order.
9. Press the burner together and lock with screws (A).
10. Turn on the main power and open the fuel supply.
11. Start burner and check/adjust combustion.



Check for leaks in the gas line.



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

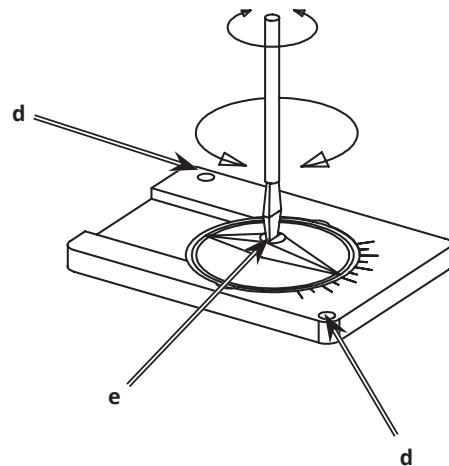
## 10.4 Replacement, Damper motor air

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 intake grille at the air intake.
3. Remove the screws (d) holding the damper plate and screw (e) that secures the damper.
4. Turn the damper and then lift up the damper and damper plate.
5. Clean the air damper and air intake, lubricate the damper shaft if necessary.
6. Refit the damper and damper plate.
7. Adjust the damper before tightening the screws (d).
8. Install the intake grille for the air intake.
9. Switch on the main power and open the fuel supply.
10. Start burner and check/adjust combustion.



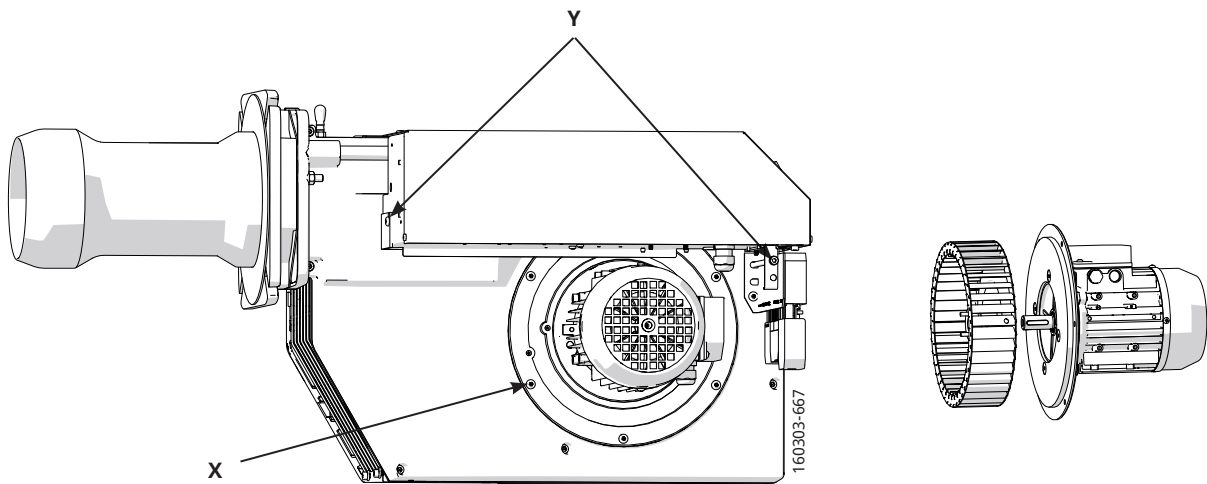
## 10.5 Fan

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 motor electrical connection and screws (X) enough to turn and lift out the motor.
3. Check the fan wheel attachment and any skew, replace if damaged.
4. Clean or replace the fan wheel.
5. Refit the parts.
6. Switch on the main power and open the fuel supply.
7. Start burner and check/adjust combustion.



When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

## 10.6 Replacement of electrical components

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



Before obtaining access to terminals, all supply circuits must be disconnected.

2. Note the connection of the existing component and disassemble.
3. Fit new component with same connection or with specified alternative connection.
4. Switch on the main power and check the operation of the new component.
5. Start burner and check/adjust combustion.



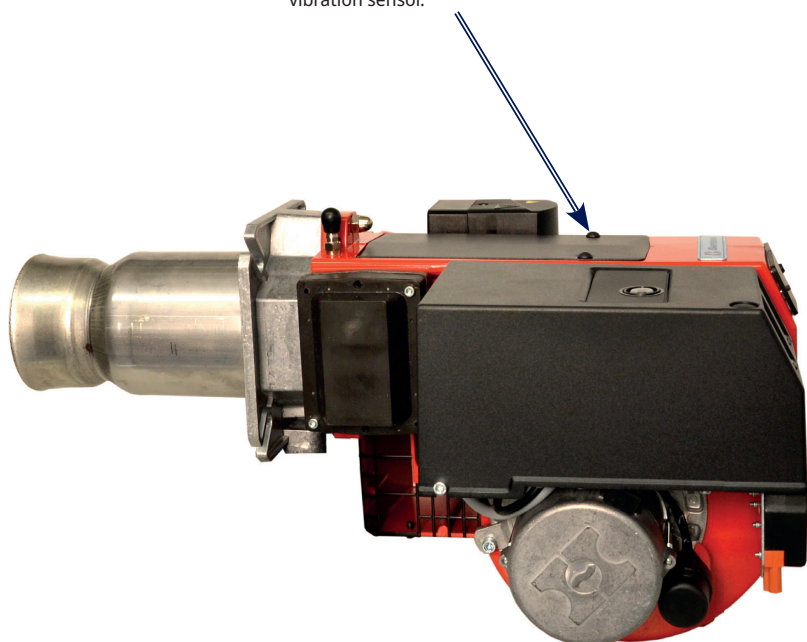
When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

## 10.7 Vibrations

Maximum permitted vibration level is 5.0 mm/s.

- Check tightness of fasteners.
- Check fan wheel for damage and contamination (replace if necessary).
- Check motor shaft and bearings. If they are worn, replace the motor.

Use the screw on the cover to attach the vibration sensor.



## 10.8 Control of flame monitoring and ionization current

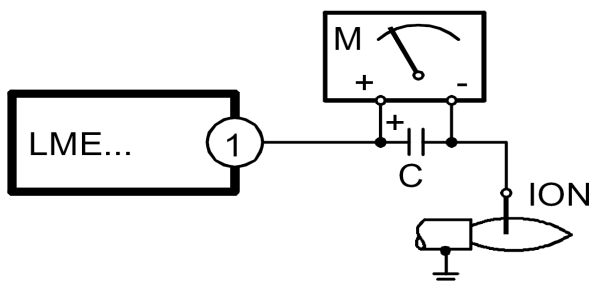
The burner is monitored in the standard version according to the ionization principle. The ionization current must be checked at each service occasion.

The ionization current is measured with a microammeter ( $\mu\text{A}$ ) which is connected in series with the flame electrode and the gas burner control. Connect the  $\mu\text{A}$  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  | $>5\ \mu\text{A DC}$       |

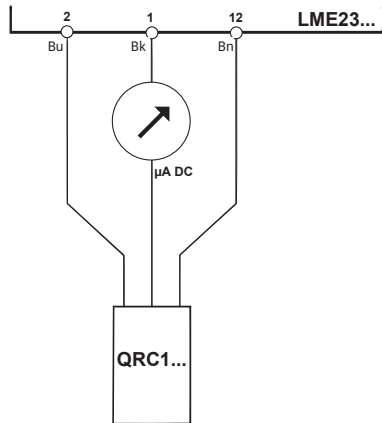
### 10.8.1 Flame monitoring ionisation



## 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  $\mu\text{A}$ . 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 $\mu\text{A}$ |
| Required current to ensure detection     | Min. DC 40 $\mu\text{A}$  |
| Possible detection current               | Max. DC 60 $\mu\text{A}$  |
| Operational indicator lamp flashes green | <45 $\mu\text{A}$ DC      |
| Operational indicator lamp shines green  | >45 $\mu\text{A}$ 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   |
|-------------------------------|--|
| <b>Burner does not start:</b> |  |
| 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.   |

|  |  |
|--|--|
| <b>Burner motor running, no ignition spark at the end of pre-aeration:</b> |  |
| 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.   |

|  |  |
|--|--|
| <b>No flame propagation:</b>   |  |
| 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.                        |

|  |  |
|--|--|
| <b>Burner trips after safety time limit despite flame propagation:</b> |  |
| 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   |
|--|--|
| <b>Burner trips during pre-aeration:</b> |  |
| 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. |

|                                      |   |
|--------------------------------------|---|
| <b>Pulsations at start-up:</b>       |   |
| 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.   |

|  |   |
|--|---|
| <b>Burner pulsates during operation:</b> |   |
| Burner incorrectly set.                  | Adjust.                                   |
| Burner dirty.                            | Clean the burner.                         |
| Incorrect chimney.                       | Check and modify dimensions if necessary. |

|  |  |
|--|--|
| <b>Burner functioning properly but with occasional blockage:</b> |  |
| 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.   |

|                                |   |
|--------------------------------|---|
| <b>Poor combustion:</b>        |   |
| 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. |

|   |   |
|---|---|
| <b>CO content too high:</b>   |   |
| 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.     |

|   |   |
|---|---|
| <b>Condensation build up in boiler and chimney:</b> |   |
| 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

|                      |  |               |                       |
|----------------------|--|---------------|-----------------------|
| <b>Installation</b>  |  | <b>Boiler</b> |                       |
| <b>Name:</b>         |  | <b>Type:</b>  | <b>Efficiency kW:</b> |
| <b>Address:</b>      |  | <b>Burner</b> |                       |
|                      |  | <b>Type:</b>  | <b>Efficiency kW:</b> |
| <b>Installed by:</b> |  | <b>Date:</b>  |                       |

| Date        | Nm <sup>3</sup> gas/h | Governor |       | CO <sub>2</sub> | 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 <sup>3</sup> gas/h | Governor |       | CO <sub>2</sub> | 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 <sup>3</sup> gas/h | Governor |       | CO <sub>2</sub> | 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](http://www.bentone.com)**

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Notified Body: TUV SÜD Product Service GmbH  
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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:

|                |               |               |               |
|----------------|---------------|---------------|---------------|
| <b>BFG 1</b>   | <b>BG 300</b> | <b>BG 550</b> | <b>BG 800</b> |
| <b>STG 120</b> | <b>BG 400</b> | <b>BG 650</b> | <b>BG 950</b> |
| <b>STG 146</b> | <b>BG 450</b> | <b>BG 700</b> |               |

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:

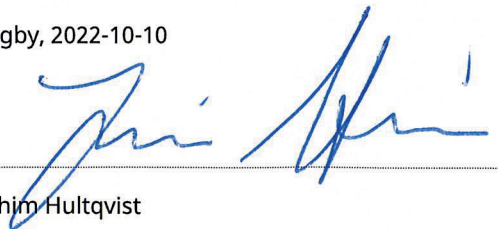
**BS EN 676:2020** Excluding the requirements of Annex J/K.  
Automatic forced draught burners for gaseous fuels.

**Additional information can be downloaded at: [www.bentone.com](http://www.bentone.com)**

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