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Installation- and maintenance instruction

BFG1

2-stage

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1. General Information

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site
- is intended for use by authorised personnel
- must be read prior to installation
- must be observed by all who work with the burner and associated system components
- work with the burner may only be carried out by certified installers/ personnel

Enertech AB is not liable for any typographical errors and reserves the right to make design changes without prior notice.

Safety instructions

- The burner may only be used for its intended purpose in accordance with the product's technical data.
- The burner may only be installed and operated by authorised personnel.
- The product is packaged to prevent damage from occurring during handling. 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.
- Check that the burner is compatible with the boiler's output range.
- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces which can affect the components.
- The burner must be installed so that it complies with local regulations for fire safety, electrical safety, and fuel distribution.
- The gas outlet from the pressure regulator shall be configured in accordance with applicable regulations and lead to a safe area.
- Make sure when installing the equipment that there is enough space to service the burner.
- Permitted temperature during operation -10 to +60 °C. Max 80% relative humidity, no condensation.
- The installer must ensure that the room has adequate air supply.
- The room must comply with local regulations pertaining to its intended use.
- The installation site must be free of chemicals.
- Burner pipes, fan wheels and air dampers may contain sharp edges.
- The surface temperature of the burner's components can exceed 60 °C.
- Caution: The burner has moving parts, and there is risk of crushing injuries.



- The electrical installation must be professionally carried out in accordance with applicable high voltage regulations, as per Enertech's recommendations.
- Before servicing, shut off the fuel supply and turn off the power to the burner.
- Seal inspections must be performed during installation and servicing to prevent gas leakage.
- Care should be taken by the installer to ensure that no electrical cables or fuel lines are crushed or otherwise damaged during installation or servicing.
- 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.
- The burner must not be put into operation without proper safety and protection devices.
- A Class BE fire extinguisher is recommended.
- It is forbidden to alter the design or use accessories which have not been approved by Enertech in writing.
- Prior to operation, the following points must be checked:
 - 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



Actions to take if you smell gas

Turn off the equipment and the boiler. Open windows and doors. Prevent open flames or sparking, e.g. do not turn lights on or off, do not use any electrical appliances, do not use mobile phones. Open windows and doors. Close the gas ball valve. Warn residents; do not use doorbells. Evacuate the building. Notify the installer or gas supplier once the building has been evacuated.

Burner servicing schedule

Servicing must be carried out once a year or after 3000 hours of operation

Burner	1 year	3000 hrs
Inspection of electrical installation	1 year	3000 hrs
Leakage check	1 year	3000 hrs
Filter	1 year replacement at $\Delta p > 10$ mbar	3000 hrs replacement at $\Delta p > 10$ mbar
Electrodes	Replacement/Cleaning 1 year	Replacement/Cleaning 3000 hrs
Brake disc	Replacement/Cleaning 1 year	Replacement/Cleaning 3000 hrs
Motor	1 year	3000 hrs
Fan wheel	1 Year Replacement when cleaning needed/ imbalance	3000 h Replacement when cleaning needed/ imbalance

Component replacement intervals

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	10000 hrs	N/A
Gas pressure regulators	15 years	N/A
Gas valve without seal testing	10 years	250,000 starts
Gas valve with seal 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.

Delivery check

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

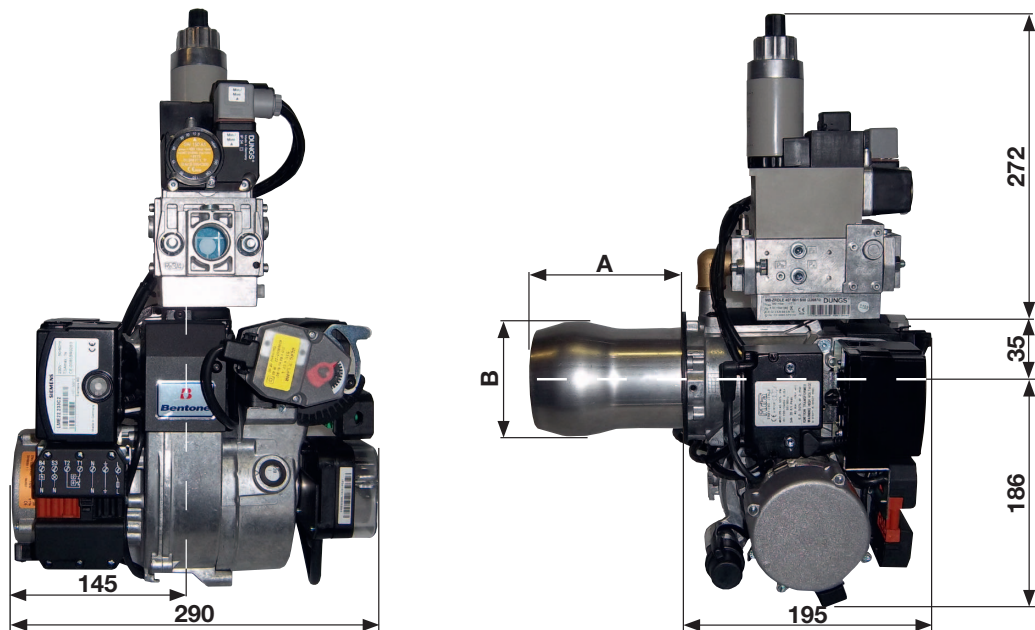
2. Technical data

2.1 Burners are intended for use at:

- Hot water boilers in intermittent operation

2.2 Dimensions

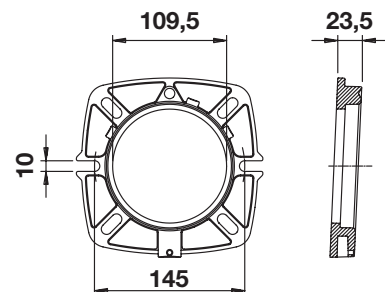
- Gas connection $\frac{3}{4}$ -1 $\frac{1}{4}$ "



The above-mentioned measurements are maximum measurements. They can vary, depending on which components are used.

1.0.1 Dimensions flanges

Flange 3
BFG1 H3



2.3 Capacity range BFG1 H3

Capacity	Gas quantity at min. power Nm ³ /h ¹⁾	Gas quantity at max. power Nm ³ /h ¹⁾
BFG1 H3 25 - 100 kW		
G 20	2,65	10,58
G 25	3,10	12,41
G 30	0,75	3,10
G 31	1,02	4,09

MB-Bloc	Max. connection pressure mbar	Min connection pressure mbar
GB-LD 055	65	25
MBC 65	200	25
MBC 120	360	20
MB 403	200	20
MB 405	360	20
MB 407	360	20

Lower heat value Hu at normal state 15°C and 1013.25 mbar EN676				
Grade of gas		kWh/Nm ³	MJ/Nm ³	kcal/Nm ³
Natural gas	G20	9.5	34.02	8126
Natural gas	G25	8.2	29.25	6986
Propane	G31	24.6	88.00	21019
Butane	G30	32.5	116.09	27728

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

2.3.1 Gas categories, approved gases

Only dry gas is permitted for use

Gerätekatategorien appliance categories	Versorgungsdrücke supply pressures	Bestimmungsländer countries of destination	Bemerkungen remarks
II2H3B/P	20:30/360 mbar	AT,CH,CZ,DK,EE,FI,GR,HU IS,IT,LT,NO,SE,SK,SI,TR	
II2E3B/P	20:30/360 mbar	LU,PL	
II2H3P	20:30/360 mbar	ES,GB,IE,PT	
II2ELL3B/P	20:25:30/360 mbar	DE	
II2Er3P	25:30/360 mbar	FR	
II2L3B/P	25:30/360 mbar	NL	
II2E(R)I3P	20:30/360 mbar	BE	
I3B/P	30/360 mbar	CY,MT	
II2R3R	20:30/360 mbar	FOR ALL OTHER COUNTRIES	

2.3.2 Electric Specification EN 60335-2-102

Burner correspond to IP20

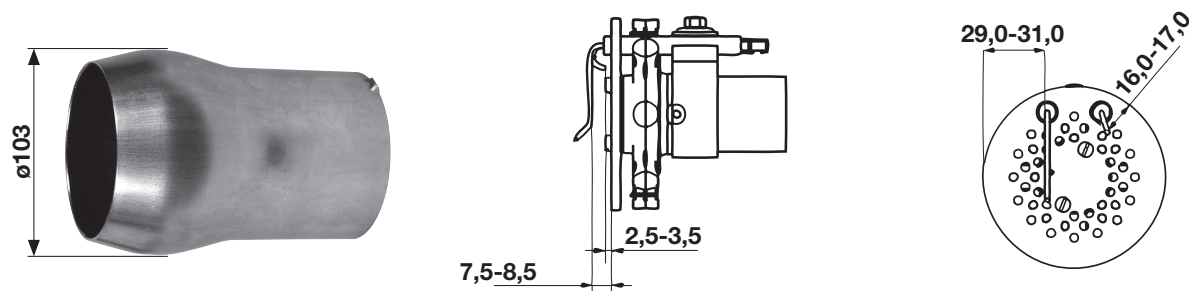
Type	BFG1
Motor	110W 0,9A 230V 50Hz 4μF
The recommended main fuse motor	6,3 A
Control power	1N230V 0,8A 50Hz IP 20
Sound	79 dBA ± 0,5 dBA

Measurements according to EN 3746: 2010

Alt.1 The sound 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.

2.4 Model BFG1-2 H3



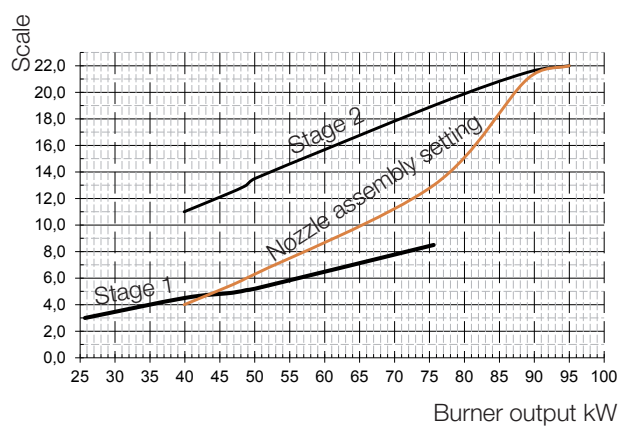
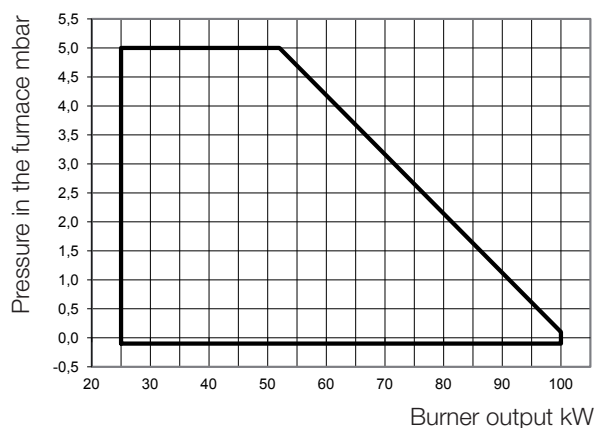
Blast tube length mm	Blast tube Dimension A mm	Flange Dimension B ø
145	121,5	103
245	221,5	103

The above-mentioned measurements are maximum measurements. They can vary, depending on which components are used.

2.4.1 Burner output/ Basic settings

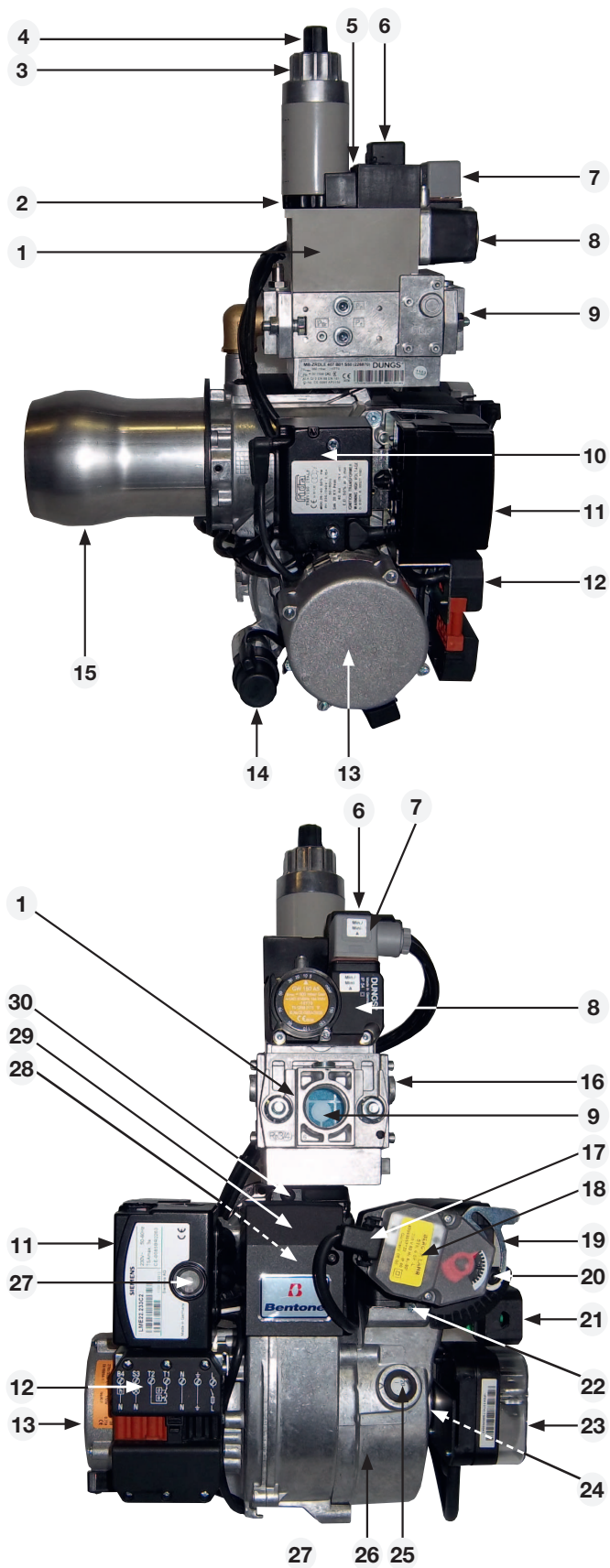
25 - 100 kW

! Do not exceed working field



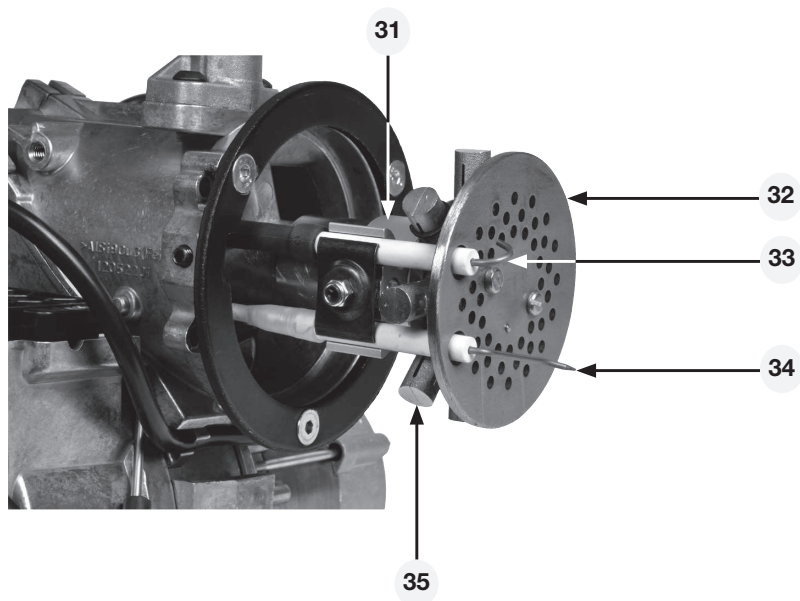
Scale value valid at 0 mbar in furnace pressure.

2.5 Description



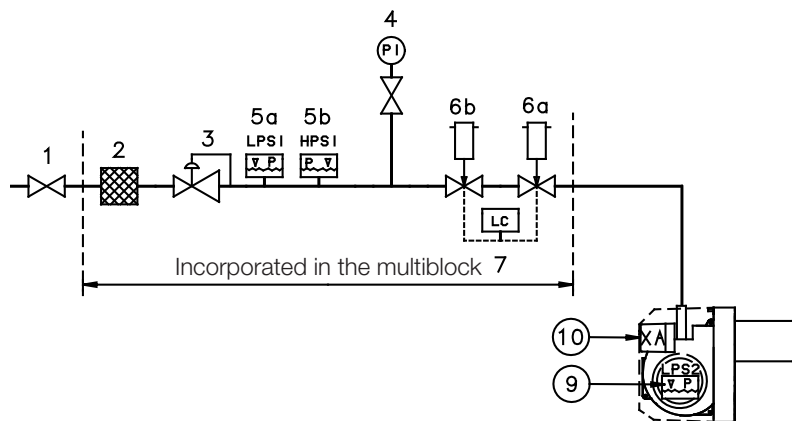
2.5.1 Components

1. Multiblock
2. Adjustment gas valve, first stage
3. Adjustment gas valve, second stage
4. Protective cover start gas adjustment
5. Adjustment regulator pressure
6. Electrical contact, Multiblock
7. Electrical contact, gas pressure switch S9
8. Gas pressure switch
9. Connection multiblock
10. Ignition transformer
11. Gas burner control
12. Electrical contact, X3 (see wiring diagram)
13. Motor
14. Capacitor
15. Blast tube
16. Measuring point regulator pressure
17. Electrical contact, damper motor M2 (see wiring diagram)
18. Damper motor
19. Air regulator, first stage
20. Screw lock adjustment, first stage
21. Electrical contact, second stage X5 och X6 (see wiring diagram)
22. Air regulator, second stage
23. Air pressure switch
24. Measuring point for the air pressure switch on the low-pressure side
25. Air flow indicator (indicates the air setting)
26. Air intake
27. Reset button
28. Nozzle assembly adjustment under cover plate
29. Cover plate
30. Screw for division of burner in front and rear part
31. Nozzle assembly
32. Brake plate
33. Ignition electrode
34. Ionisation electrode
35. Nozzle



3. Installation

3.1 Skeleton diagrams



- 1. Ball valve
- 2. Filter
- 3. Pressure regulator
- 4. Outlet for gas pressure measuring
- 5a. Gas pressure switch, min.
- 5b. Gas pressure switch, max.
- 6a. Main valve
- 6b. Safety valve
- ¹⁾7. Leakage control
- 9. Air pressure switch
- 10. Gas burner control

Pos. 5b: Components not required acc. to EN 676.

¹⁾Required above 1200 kW acc. to EN 676.

3.2 Delivery check

Check that all has been delivered and that the goods have not been damaged during transport. If that is not the case, please notify the delivery company. Transport damages should be reported to the forwarding agency.

3.3 Preparations for installation

Check that the measurements and capacity range of the burner are compatible with the boiler. The power ratings on the type plate refer to the min. and max. power of the burner.

3.4 Gas supply

For good operating safety, it is important that the gas supply system is installed correctly.

Consider the following:

1. Check that the burner is approved for the gas quality of the installation. If not, please contact the supplier.
2. Check that the gas components of the burner are approved for indicated gas pressure.
3. The gas supply system should be installed in accordance with current standards.
4. Pipe lines should be run so that service on boiler and burner is facilitated.
5. Pipe lines should be run so that eventual contaminants cannot come into contact with the gas components.

3.5 Electric connection

Before starting the electric installation, the main switch must be turned off. If the boiler has a 7-pole and a 4-pole Eurostecker connector, these usually fit directly to the burner. If not, use the connectors included.
(Refer to connection under Electric equipment)



If an electric connection other than the one recommended by Enertech is used, a risk of damage and injury can arise.

3.6 Setting brake plate and air flow

Before the placing into service, the burner should be initially set according to diagram.

(Refer to Basic settings). Note that it is only a question of a basic setting which should be adjusted once the burner has been started.

3.7 Burner installation

3.7.1 Hole pattern

Check that the hole pattern on the boiler matches that of the flange.
(Refer to Technical data.)

3.7.2 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.

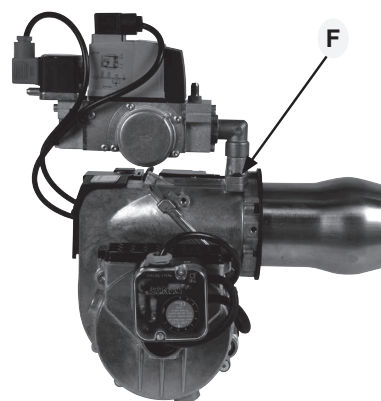


3.7.3 Gas connections

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!

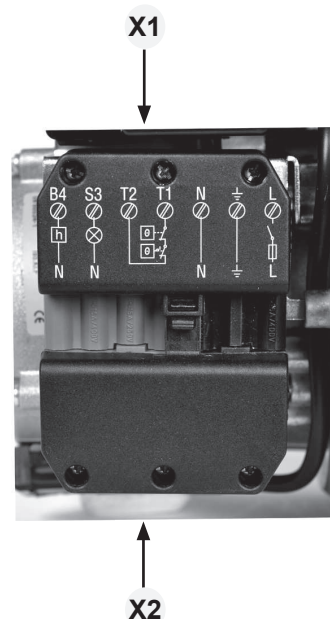
If the gas connection is via a hose, the support for the multiblock that is supplied with the burner should be mounted (F). Install the support so that the underneath of the multiblock rests on it.



3.7.4 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 (Refer to Electric equipment).
3. Install the Eurostecker X2 on the burner.
4. Turn on the main switch.



3.8 Control measures

3.8.1 Gas quality

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

3.8.2 Bleeding

Bleeding of the gas pipe can be achieved by removing the screw on the test nipple for the inlet pressure. Connect a plastic hose and lead out the gas into nature. When the bleeding is completed,

don't forget to install the screw in the test nipple again.

3.8.3 Function test

The electric function test can be done as follows:

When connecting to the mains, check that the phase and zero are not switched. The gas tap should be closed. To prevent the gas pressure switch from blocking, it should be bridged temporarily.

After the main switch has been turned on and the max. and control thermostats have been set, the prepurging period lasts for 30-35 secs. After this, the pre-ignition is started (0.5-2.5 secs. depending on the design of the gas burner control). The ignition spark should then be able to operate faultlessly at the required quantity of air for combustion. The gas valve is energized and opens. After the end of the safety period (2-3 secs.), the gas burner control blocks.

The solenoid valve and motor become de-energized. Remove the bridge after completed testing.

Check that no safety functions are disconnected before placing the burner into service.

3.8.4 Leakage testing

When leakage testing the gas fittings with test points between the valves, the solenoid valve should be closed. A pressure gauge should be connected to the test nipple Pa. The test pressure in the fittings should be 1.5 x max inlet pressure or min. 150 mbar. If leakage is observed when measuring, localise the leaking site with soapy water or leak detection spray. After sealing, leak test the fittings again. After completed trimming, all joints, branching points and outlets on the gas line should be tested for leaks.

3.9 Recommended excess air when using default setting

Grade of gas	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 (LPG)	3-5	≈11	13,8

3.10 Determining the gas quantity for the system

The heat values indicated are normal values; the heat value varies according to the origin of the gas. For more exact information on values, contact the gas distributor.

Lower heat value Hu at normal state 15°C and 1013.25 mbar EN676

Grade of gas		kWh/Nm ³	MJ/Nm ³	kcal/Nm ³
Natural gas	G20	9.5	34.02	8126
Natural gas	G25	8.2	29.25	6986
Propane	G31	24.6	88.00	21019
Butane	G30	32.5	116.09	27728

3.10.1 Example of how to calculate the gas quantity (natural gas G20):

$V_0 =$	Desired quantity of gas	[Nm ³ /h]
$Q =$	Boiler output	[kW]
$H_u =$	Gas heat value	[kWh/Nm ³] or [MJ/Nm ³] or [kcal/Nm ³]
$\eta =$	Boiler efficiency	[%]

Calculation example:

$Q =$ 50 kW

$H_u =$ Example A: 34020 MJ/Nm³

Example B: 9.5 kWh/Nm³

Example C: 8126 kcal/Nm³

$\eta =$ 90%

$$\begin{aligned}
 \text{Example A} \quad V_{0A} &= \frac{Q \cdot 3600}{H_u \cdot \eta} = \frac{50 \cdot 3600}{34020 \cdot 0.90} \approx 5.9 \text{ Nm}^3/\text{h} \\
 \text{Example B} \quad V_{0B} &= \frac{Q}{H_u \cdot \eta} \approx \frac{50}{9.5 \cdot 0.90} \approx 5.8 \text{ Nm}^3/\text{h} \\
 \text{Example C} \quad V_{0C} &= \frac{Q}{H_u \cdot 0.00116 \cdot \eta} = \frac{50}{8126 \cdot 0.00116 \cdot 0.90} \approx 5.9 \text{ Nm}^3/\text{h}
 \end{aligned}$$

If the barometer reading (altitude), pressure and temperature of the gas deviate significantly from normal values, this must be taken into account as follows:

$T =$	Temperature of gas at the gas meter	[°C]
$B =$	Barometer reading	[mbar]
$P =$	Pressure of gas at the gas meter	[mbar]
$f =$	Factor calculated for multiplication with flow in Nm ³ /h to arrive at actual flow in Nm ³ /h.	
$V =$	Actual flow	[m ³ /h]

$$f = \frac{273}{273+T} \cdot \frac{B+P}{1013.25}$$

Calculation example:

$$T = 15^{\circ}\text{C}$$

$$B = 945 \text{ mbar}$$

$$P = 15 \text{ mbar}$$

$$f = \frac{273}{273+15} \cdot \frac{945+15}{1013.25} \approx 0.90 \text{ Nm}^3/\text{h}$$

This means that the quantity of gas read from the gas meter should actually be read off as 1.11 . the calculated flow in a normal state.

$$\begin{aligned} V &= V_0 \cdot f \\ V_A &= V_{0A} \cdot f = 5.9 \cdot 0.90 \approx 5.2 \text{ m}^3/\text{h} \\ V_B &= V_{0B} \cdot f = 5.8 \cdot 0.90 \approx 5.2 \text{ m}^3/\text{h} \\ V_C &= V_{0C} \cdot f = 5.9 \cdot 0.90 \approx 5.3 \text{ m}^3/\text{h} \end{aligned}$$

3.11 Calculating the quantity of gas supplied

The quantity of gas supplied can be calculated if the system is equipped with a gas flow meter of some type. The procedure here is usually to measure how long it takes for the burner to consume a certain quantity of gas.

To measure:

t = Time for a certain quantity of gas consumed by the burner. [h]

M = Quantity of gas consumed. [m³]

V = Actual gas flow [m³/h]

$$V = \frac{M}{t} \text{ [m}^3/\text{h]}$$

Calculation example:

$$t = 1 \text{ min } 10 \text{ s}$$

$$M = 100 \text{ dm}^3 \text{ (litre)}$$

$$\begin{aligned} M &= \frac{100}{1000} = 0.1 \text{ m}^3 \\ t &= \frac{1}{60} + \frac{10}{3600} = 0.0194 \text{ h} \\ V &= \frac{M}{t} = \frac{0.1}{0.0194} \approx 5.1 \text{ m}^3/\text{h} \end{aligned}$$

3.11.1 Nozzle assembly adjustment

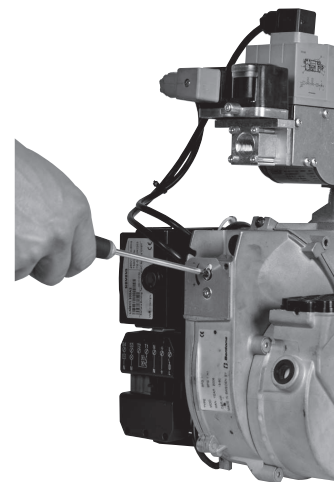
The burner is equipped with a control which changes the position of the brake plate in the blast tube. This is used to set the correct pressure differential across the combustion device and thereby get a good combustion without pulsations. The setting to be used depends on the set effect and the overpressure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

Setting brake plate

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.



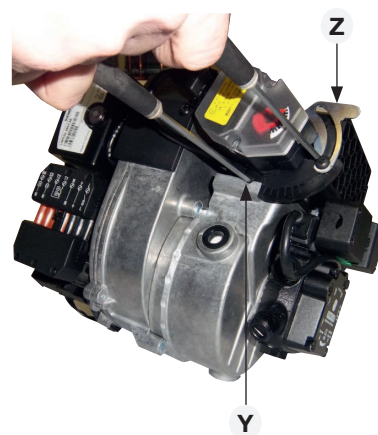
3.11.2 Air intake adjustment

For two-stage burners, the amount of air is set in two different positions. When performing adjustments, the maximum load must always be adjusted first. This is because adjusting the air damper for the maximum load may affect the air quantity for the minimum load. The maximum load is adjusted by turning the air regulator (Y). The air setting at maximum load will then operate so that when the boiler is calling for the maximum load, the damper motor opens completely and the amount of air for combustion is controlled by the air regulator (Y). Minimum load is set by loosening the screw (X) and adjusting the control plate (Z) for the damper powered by the damper motor.

3.11.3 Procedure for setting the amount of air

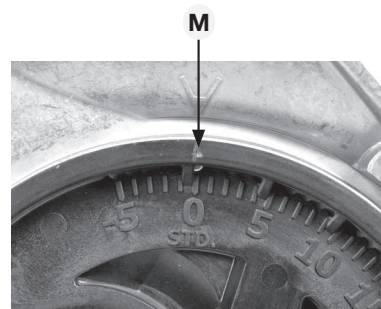
The air quantity setting for the maximum load is adjusted by turning screw (Y) with an Allen key. How open the damper must be is determined by the heat output and overpressure in the boiler as well as other settings on the burner such as the position of the brake plate. To adjust the burner as quickly and as easily as possible, adjustments should always start with the maximum load, as adjustments here also affect the minimum load.

Set the minimum load by adjusting the control plate (Z). By changing settings on the control plate towards the higher values on the scale, the opening of the damper powered by the damper motor increases, thus increasing the amount of air for the combustion process. To reduce the amount of air, perform the opposite adjustment. When adjusting the minimum load, you should always make sure that the damper for maximum load is open far enough so that it has no significant effect on the amount of air for the minimum load. The adjustment should be performed alternately: first adjustment of the minimum load followed by adjustment of the maximum load and then repeat the procedure unless acceptable combustion is achieved.



3.11.4 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.)



3.11.5 Rotation of the air intake

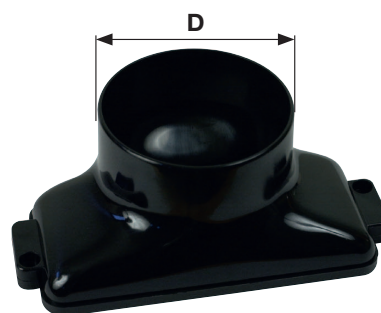
The air intake of the burner can be rotated, although the rotation options are limited due to the two-stage control. In principle it is possible to install the air intake pointing upwards. It is also possible to rotate the air intake so that the burner can be adapted to different environments.

To rotate the air intake, loosen the three screws holding the air intake and the two screws holding the pump. Depending on how much the air intake is to be rotated, cabling will be required and the two-stage control must be removed. Then rotate the air intake to the desired position and tighten the screws. Where appropriate, fit the cabling and two-stage control in a position which allows for adjustment. When changing to certain positions on the air intake, the screw for the air control must be removed and then fitted in a position which allows the air to be adjusted.

The position of the air intake affects the air flow through the burner somewhat. The position that provides maximum flow is with the air intake pointing downwards.

3.11.6 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.



4. Burner Service

4.1 Service

Service should be performed after approx. 3000 working hours, but no less than once a year.

Only authorized personnel should perform the service.

Before any kind of service is performed, switch off the current with the line breaker and turn off the gas supply.

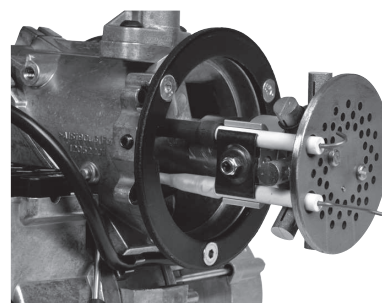
Be careful: certain parts exposed after the separation of the burner can be warmer than 60°C.

Be careful not to pinch or damage any electric cables or gas pipes during installation or service.



4.1.1 Combustion device service

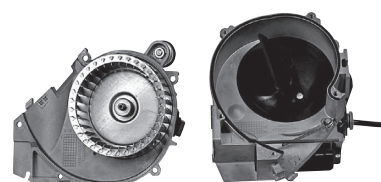
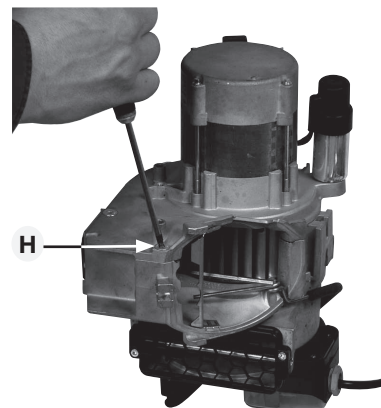
1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
2. Remove the gas pipe after ensuring that the gas is turned off.
3. Remove the burner from the burner flange. Pull out the burner. Disconnect the blast tube and remove it.
4. If necessary, clean the 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. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
10. Start the burner and check the combustion.



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

4.1.2 Fan motor replacement

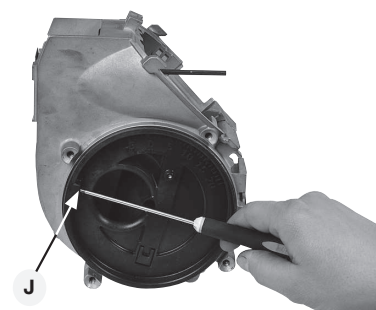
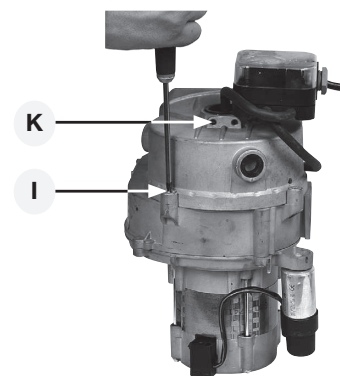
1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
2. Loosen the screw assembling the front piece of the burner and the fan housing, but not more than that the fan housing can be removed from the front piece. Disconnect the cables to the multiblock.
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. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
18. Start the burner and check the combustion.



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

4.1.3 Air intake and inlet cone service

1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
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 cable to the damper motor, the cable to the second-stage thermostat.
5. Unscrew the cover of the 4-pole Euro plug to the second-stage thermostat and remove it from its attachment.
6. Loosen the screws (K) holding the air switch, 2 pcs. Remove the air switch.
7. Loosen the screws (I) holding the air intake, 3 pcs.
8. Remove the air intake.
9. Loosen the screw (J) holding the inlet cone and note the inlet cone position.
10. Remove the inlet cone from the fan housing.
11. Check the function and appearance of the different components in the air regulation. Clean and replace the components as needed.
12. Assemble the burner. Be careful when installing the inlet cone - install it in the same position as it was before being removed.
13. 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.
14. Connect the 4-pole Euro plug to the second-stage thermostat.
15. Connect the connectors to the damper motor, second-stage thermostat.
16. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
17. Start the burner and check the combustion.

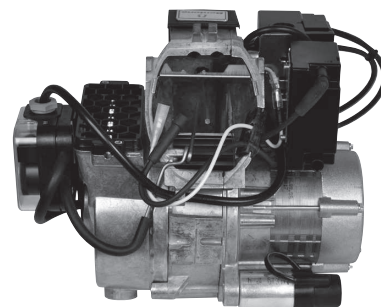


When servicing/replacing components which affect the combustion, gas side leakage analysis and check should be performed on the system.

4.1.4 Fan wheel check

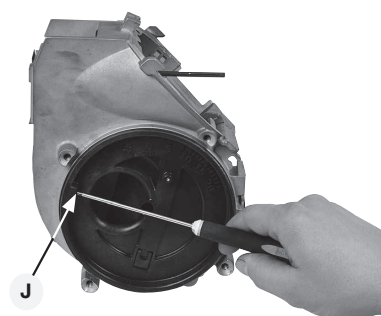
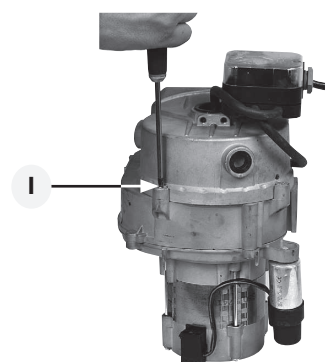
4.1.4.1 Inspection

1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
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 point 4.1.5.
7. If cleaning is not necessary, assemble the burner.
8. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
9. Start the burner and check the combustion.



4.1.5 Fan wheel service

1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
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 (I) holding the air intake, 3 pcs.
5. Remove the air intake.
6. Loosen the screw (J) holding the inlet cone and note the inlet cone position.
7. Remove the inlet cone from the fan housing.
8. Clean the fan wheel. If necessary, disconnect and remove the fan wheel for more thorough cleaning of the fan and fan housing.
9. Install the fan wheel and tighten the screw. The fan wheel should be installed in the bottom position against the motor shaft.
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. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
13. Start the burner and check the combustion.



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

4.1.6 Electrical package

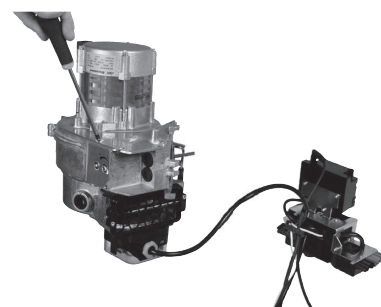
Check that the screw holding the electrical bracket is tightened so that good earth connection between the package and the burner body is obtained.

Use only electric components recommended by Enertech.



4.1.6.1 Complete electrical package replacement

1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
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, damper motor, multiblock and the 4-pole Euro plug to the second-stage thermostat.
5. Remove the cover of the 4-pole Euro plug to the second-stage thermostat and remove it from its attachment.
6. Open the air pressure switch and disconnect the cables. Note how the air pressure switch is connected.
7. Loosen the screw holding the electrical bracket.
8. Disconnect the ignition electrode and ionisation electrode cables from the electrical package.
9. Attach the new electrical package.
10. Connect the ignition electrode and ionisation electrode in the new electrical package.
11. Install the screws in the electrical bracket.
12. Fit the 4-pole Euro plug to the second-stage thermostat in its attachment and fit the cover to it.
13. Connect the cables to the air pressure switch and install the cover. Ensure correct connection.
14. Connect the motor cable, damper motor, multiblock and the 4-pole Euro plug to the second-stage thermostat.
15. Assemble the fan housing and front piece.
16. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
17. Start the burner and check the combustion.



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

4.1.6.2 Single electrical package component replacement

1. Switch off the main current, disconnect the 7-pole Euro plug from the burner and turn off the gas.
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. Install the 7-pole Euro plug, switch on the main current and open the gas flow.
11. Start the burner and check the 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.

4.1.6.3 Replacing the damper motor

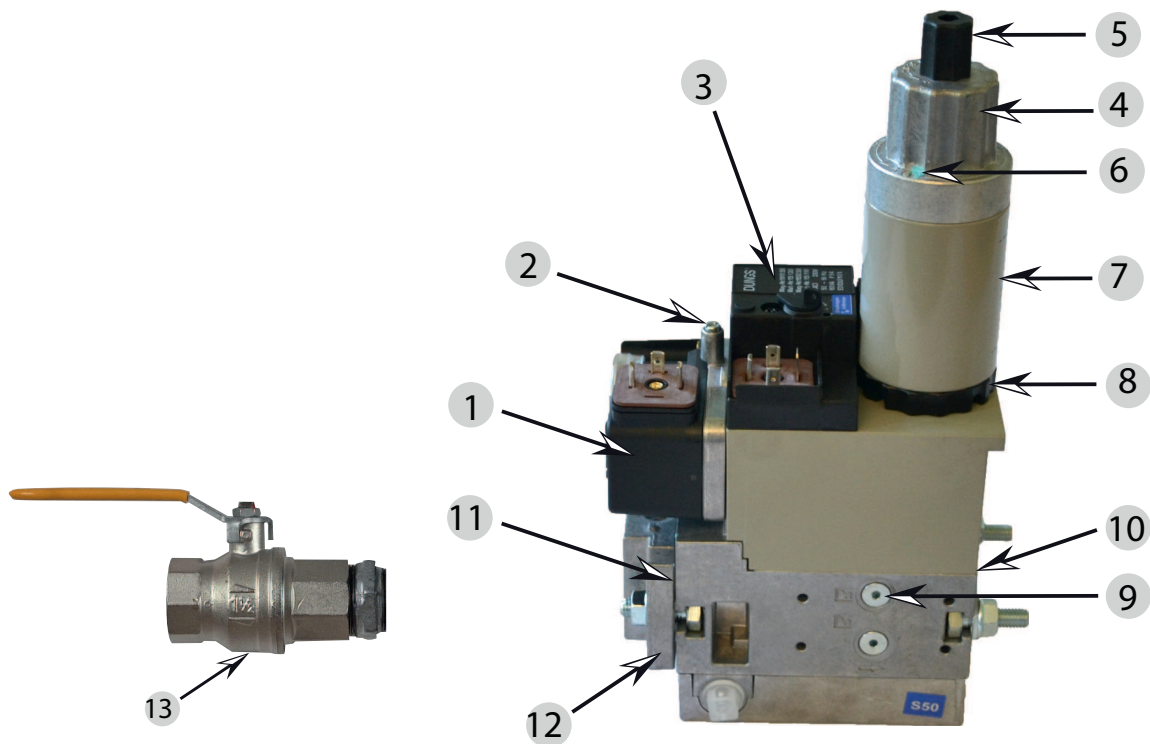
1. Switch off the main current and disconnect the 7-pole Euro plug from the burner.
2. Disconnect the electrical contact from the damper motor.
3. Unscrew the two screws that hold the damper motor. Remove the motor.
4. Fit the new motor. Ensure that the flat surface of the motor shaft is fitted against the corresponding surface in the damper hole.
5. Connect the electrical contact to the damper motor.
6. Connect the 7-pole Euro plug and turn on the mains power.
7. Start the burner and check the combustion.



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

4.2 Multiblock MB-ZRDLE 405-412

! All gasline components shall be assembled and mounted without bending, torque and other mechanical or thermal stress.



1. Gas pressure switch
2. Inlet pressure
3. Governor with pressure adjustment
4. Hydraulic device, adjustment of stage 2
5. Protective cover, start gas adjustment
6. Lock screw for flow adjustment
7. Main valve
8. Knob for adjustment of stage 1
9. Test nipple, pressure after governor
10. Test nipple for nozzle pressure
11. Filter
12. Fixing flange
13. Ball valve

Max. inlet pressure: 360 mbar.
Adjustable governor pressure:
405 - 412 S50 = 4 - 50 mbar
415 - 420 S20 = 4 - 20 mbar
415 - 420 S50 = 20 - 50 mbar

Solenoid valve: Slow opening valves with adjustable start load, stage 1 and stage 2.

Turn to the left = the start gas flow is increased.

Flow adjustment 2-stage design

For stage 1, loosen the lock screw a. Turn the hydraulic device e:

to the right = the gas flow is reduced

to the left = the gas flow is increased

For stage 2, turn the hydraulic device b:

to the right = the gas flow is reduced

to the left = the gas flow is increased

Do not forget to tighten the lock screw again.

Adjustment of governor

Adjust outlet pressure from governor by means of a screw driver. Min. and max. outlet pressures correspond to appr. 60 turns of the spring. It is not possible to change pressure springs in order to change the outlet pressure.

Turn to the right = the outlet pressure is increased

Turn to the left = the outlet pressure is reduced

Adjustment of start gas flow

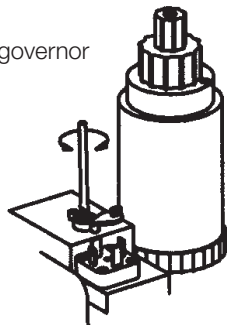
Remove the protective cover c.

Turn the adjustment knob d (use the protective cover as a tool) to the desired start gas flow.

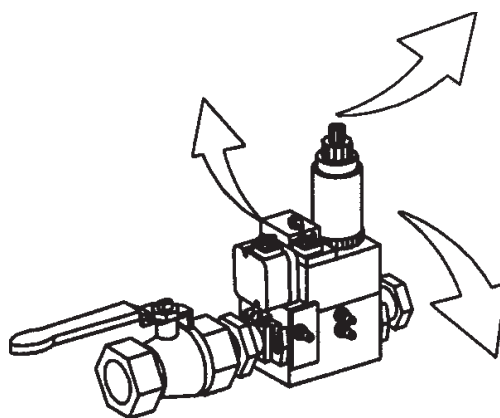
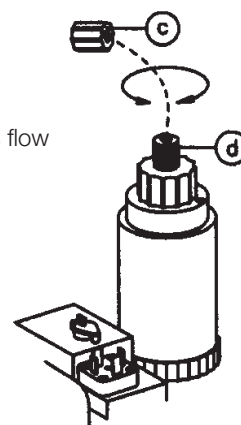
Turn to the right = the start gas flow is reduced

Turn to the left = the start gas flow is increased

Adjustment of governor

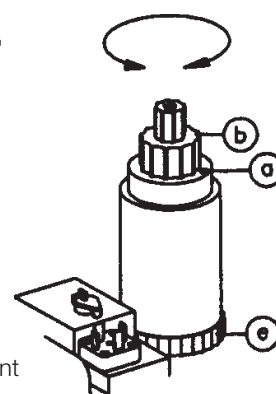


Adjustment of start gas flow



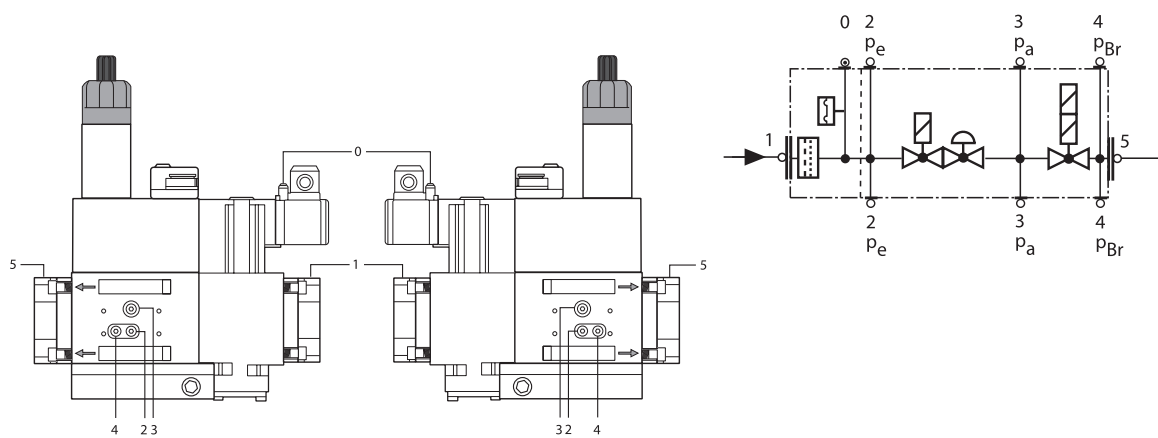
Multi-bloc MB-ZRDLE 405-420

Flow adjustment



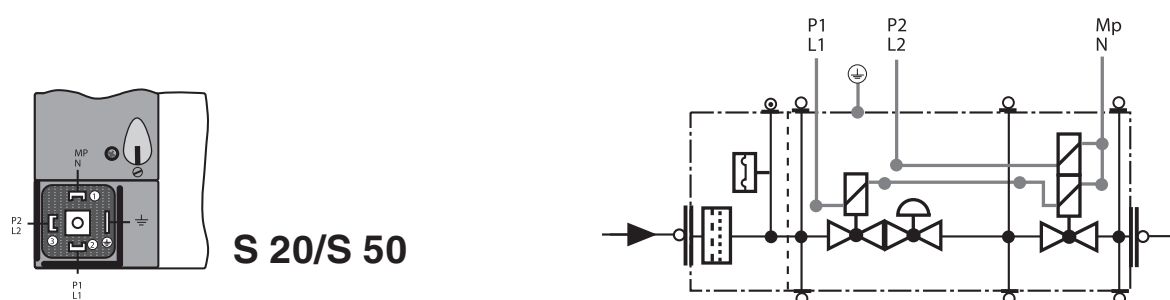
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4.2.1 Pressure taps



1,2,3,4,5 1/8 screwed sealing plug

4.2.2 Electrical connection



5. General instructions

5.1 Flame monitoring and ionisation current check

The burner is monitored according to the ionisation principle. The ionisation current should be checked at initial starting and at each service visit.

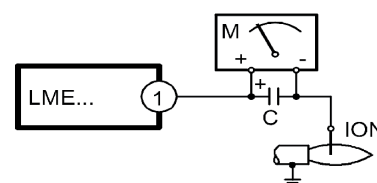
The reason for low ionisation current can be leakage current, poor connection to earth, fouling or incorrectly placed ionisation electrode in the combustion head. Sometimes incorrect gas-air mixture can also be the cause of poor ionisation current.

The ionisation current is measured with a microammeter (μA DC) which is connected in series with the ionisation electrode and gas burner control.

Connect the μA -meter as in Fig. 6.1.1. Min. required ionisation current for different gas control units is indicated in the table below. In reality, this current must be significantly higher, preferable more than $15 \mu\text{A}$. The connection of the μA instrument is facilitated by the fact that all gas burners are equipped with a detachable ionisation cable.

Gas burner control	Connection to the board in gas burner control	Min. required ionisation current	Normal ionisation current
LME	1	$5 \mu\text{A}$	$15 - 25 \mu\text{A}$

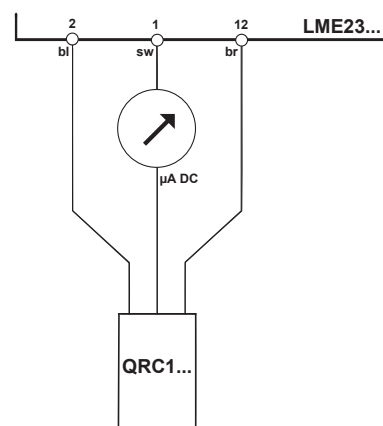
5.1.1 Flame monitoring ionisation



5.1.2 UV -detector (QRC)

Should not be exposed to temperatures higher than 60°C . The current passing through the UV-detector, when it is lighted, should be at least $70 \mu\text{A}$. The current can be measured with a moving coil instrument. A check is necessary only if a malfunction is suspected.

5.1.3 Flame monitoring UV-detector (QRC)

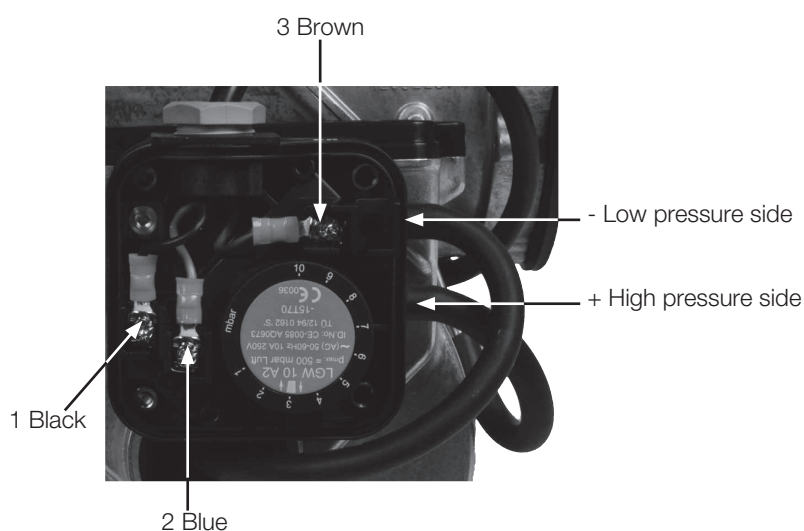


5.1.4 Setting of air pressure switch

The air pressure switch should block the burner if the air quantity is insufficient. The air monitoring device should be set so that, if there is missing air supply at the burner's max. or min. capacity, it reacts before the monitored pressure is less than 80% of the pressure on the controlled stage and before the CO-level in the flue gases exceeds 1 per cent by volume.

To set, turn the scale on the air pressure switch clockwise. When the break point is reached and the burner stops, read the value on the scale. Then turn the scale counter-clockwise to the determined pressure, at which point the air pressure switch should open according to valid norms. If nothing else is indicated, decrease 20%. Perform repeated starts to ensure that the air pressure switch is not set too narrow.

Setting area approx.:	Type	Max. pressure
1-10 mbar	LGW 10 A2	500 mbar
2,5-50 mbar	LGW 50 A2	500 mbar



5.1.5 Setting gas pressure switch min

The min. switch should react to a gas pressure that is too low and prevent start of the burner.

Too low a gas pressure during operation should stop the burner. The burner can start again when the nominal gas pressure has been corrected. Remove the protective cover. Connect a pressure gauge for measuring the nominal pressure. Determine the pressure at which the gas switch should break according to current local standards; if nothing is indicated, lower approx. 20%. Set this pressure with the ball valve. Carefully turn the knob (see fig.) until the gas pressure switch breaks.

The value on the scale should then approximately correspond to the pressure gauge reading. Tolerance on the scale approx. $\pm 15\%$. Open the ball valve.

5.1.6 Setting gas pressure switch max

(Accessories)

The gas pressure switch should block the burner if the gas pressure exceeds the set value. Starting can then take place only through manual resetting (gas burner control or gas pressure switch).

Remove the protective cover. Connect a pressure gauge for measuring the nominal gas pressure. Check the function of the pressure switch by slowly turning it down until it breaks. Determine the pressure at which the gas switch should break according to current local standards; if nothing is indicated, increase 20%. Turn the wheel to this value. Tolerance on the scale $\pm 15\%$

Setting area approx.:	Type	Max. pressure
2-10 mbar	GW 10 A5	500 mbar
5-50 mbar	GW 50 A5	500 mbar
5-150	GW 150 A5	500 mbar

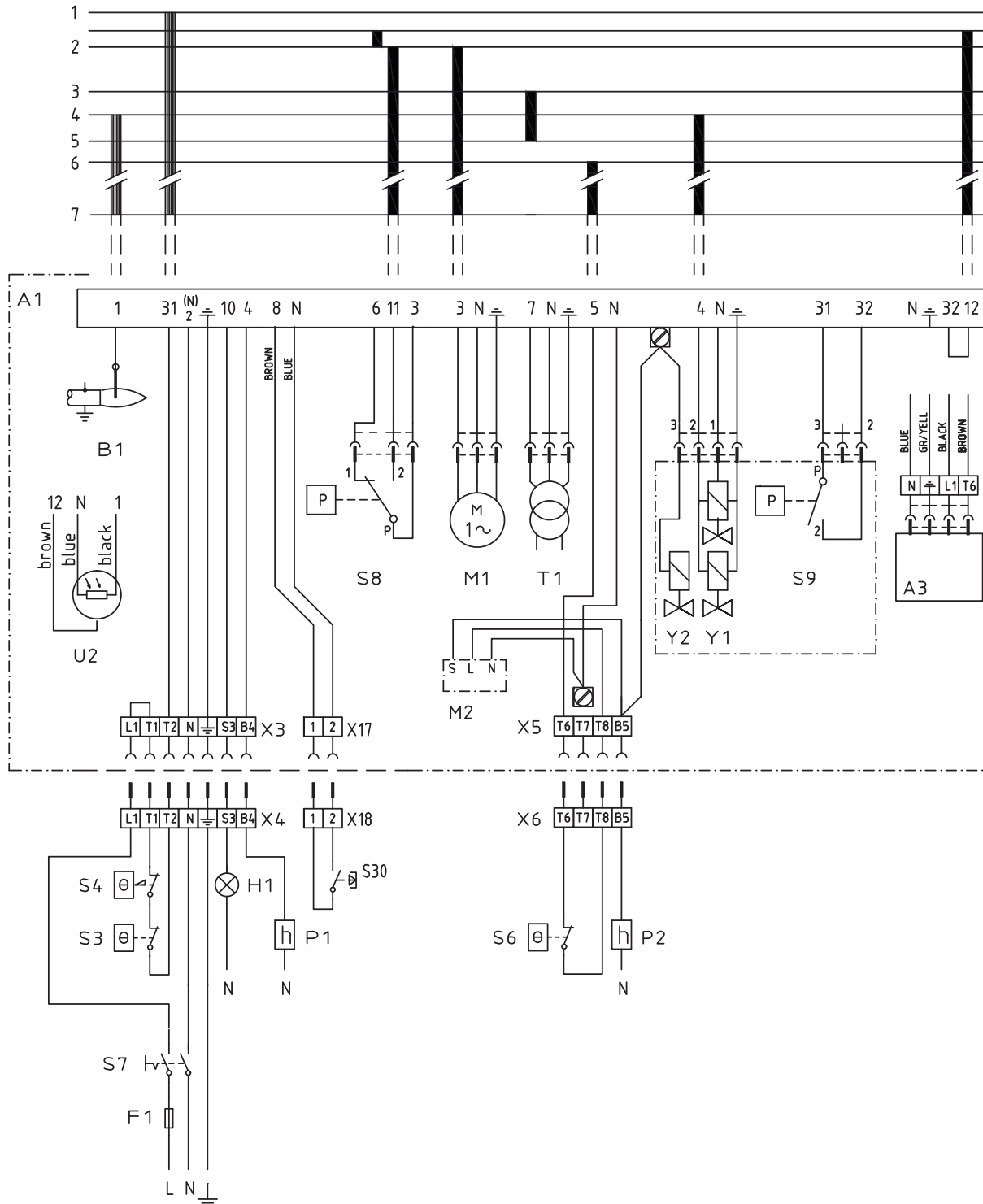


5.1.7 Handing over of the installation

- Perform repeated start tries to check that the settings work.
- Close the ball valve during operation to check that the gas pressure switch breaks at set value.
- Remove the hoses for the air pressure switch to check that the burner goes into blocking.
- Check the gas installation for leaks.
- Check that all protective covers and test nipples are installed and tightened.
- Fill out required test protocols.
- Instruct operating staff in the care and maintenance of the system and how to react in case of breakdown.
- Review and service should be performed by authorized personnel only.

6. Electric equipment LME...

6.1 Wiring diagram



6.1.1 List of components

A1	Gas burner control	S7	Huvudbrytare
A3	Valve, leak tester, Dungs VPS504 (optional)	S8	Lufttryckvakt
B1	Ionization electrode	S9	Gas pressure switch
U2	UV-detector QRC (LME23...)	S30	External reset (optional)
F1	Operating fuse	T1	Ignition transformer
H1	Lamp, low capacity	Y1	Gas solenoid valve 1
M1	Burner motor	Y2	Gas solenoid valve 2
M2	Damper Motor STM6SF-L	X3	Plug-in contact, burner
P1	Time meter, total operating time	X4	Plug-in contact, boiler
P2	Time meter, high capacity, total operating time	X5	Plug-in contact, stage 2, burner
S3	Control thermostat	X6	Plug-in contact, stage 2, boiler
S4	Temperature limiter	X17	Plug-in contact, burner external reset (optional)
S6	Control thermostat, stage 2	X18	Plug-in contact, boiler external reset (optional)

6.1.2 Function LME...

1. Operating switch ON-Thermostat ON-Gas pressure switch ON
A check that the air pressure switch does not indicate fan pressure is carried out
2. Burner motor starts
A check that the air pressure switch indicates sufficient fan pressure is carried out
3. The ignition spark is created
4. The gas solenoid valve is open
The gas is ignited. The ionisation electrode now indicates a flame
5. The safety time expires
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
6. Operating position
The burner is in operating position and can now change over to full load if the operating switch and the thermostat for full load are in position ON. The burner can alternate between full and low load depending on set temperature.
7. Stop
If the gas burner control is blocked
Red light in the gas burner control is lit. The burner is restarted by pushing the reset button

6.2 Control program at faults; fault mode indicator LME

6.2.1 Colour codes

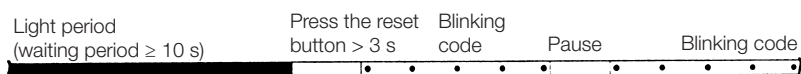
Table colour codes for multi-coloured signal light (LED)		
Status	Colour codes	Colours
Waiting period «tw», other waiting periods	○.....	Off
Ignition phase, ignition controlled	•○ •○ •○ •○ •	Blinking yellow
Normal operation	□.....	Green
Operation, poor flame signal	□○□○□○□○□○	Blinking green
Illegal flame 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

6.2.1.1 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:



6.2.1.2 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.

6.2.1.3 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

6.2.1.4 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.

7. Troubleshooting

Gas Burner

Conditions favourable to disruption-free operation of the system can only be guaranteed through the interaction between three factors – electricity, gas flow and combustion air. A change in any of these factors may cause disruptions.

It has been shown that a large proportion of disruptions can be attributed to relatively small things. Therefore, before requesting servicing, you should ascertain the following:

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 gas pressure to the burner sufficient?
5. Are the burner controls on standby and not locked?
6. Is air supply to the burner adequate?

To facilitate troubleshooting, we have created a table of the most common faults that may arise in a gas burner system and how they should be rectified.

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

Cause of fault	Action
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 185 V	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
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 6 μ A, but should ideally lie between 8 and 20 μ A
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 °
Ignition spark too weak	Check the transformer
Poor combustion	
Poor draught conditions	Check the chimney

Cause of fault	Action
Flue gas temperature too high	Boiler overloaded Decrease the gas volume, sweep the chimney if necessary
CO ₂ 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

EU Declaration of conformity

Bentone Gasburners



Certificate No.	Type	Certificate No.	Type
CE-0123CT1269	BFG 1	CE-0123CT1326	BG 550
CE-0123CT1270	STG 120	CE-0123CT1337	BG 600
CE-0123CT1281	STG 146	CE-0123CT1348	BG 650
CE-0123CT1292	BG 300	CE-0123CT1359	BG 700
CE-0123CT1304	BG 400	CE-0123CT1360	BG 800
CE-0123CT1315	BG 450	CE-0123CT1371	BG 950

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

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+A2:2008

(excluded Annex J/K)

Automatic forced draught burners for gaseous fuels

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

Enertech AB
Box 309
S-341 26 LJUNGBY

Ljungby February 15th, 2018

Håkan Lennartsson
Managing Director
Enertech AB



9. General instructions for gasburners

9.2.1 Installation

1. Follow standards and instructions applicable to the installation of gas burners
2. Ensure that the electric installation is made in accordance with existing regulations
3. Check that the fresh air intake of the boiler room is sufficiently dimensioned
4. Check by studying the data plate that the efficiency of the burner is adapted to the boiler output
5. Check that the burner is adapted to the gas quality in question
6. Check that the input pressure of the gas is correct
7. Check that the dampers of the boiler are open
8. Check that there is water in the system
9. Check that thermostats etc. are correctly adjusted
10. Read the instructions and follow the directions given for the burner as to starting-up and service

9.2.2 Maintenance

General instructions

1. Keep the boiler room clean
2. Ensure that the fresh air intake of the boiler room is not restricted
3. Switch off the current and shut off the gas supply if the burner must be withdrawn from the boiler
4. Do not use the boiler for burning paper and waste if there is no special arrangement (fire room) for this

Normal operation

1. Ensure that the air supply to the burner is not obstructed by dust and dirt
2. Have the installer make a yearly overhaul of the installation so that safety is not jeopardized
3. Have the installer at the yearly overhaul also adjust the burner to ensure optimal combustion economy
4. Check periodically that there is water in the system (fill up if necessary) and that thermostats etc. are normally adjusted
5. Ensure that there is no water or dampness in contact with the burner

9.2.3 If the burner has stopped

1. Press the reset button of the relay
2. Check that the max. thermostat has not cut out
3. Check other thermostats for example room thermostat, if any
4. Check that the gas pressure to the burner is sufficient
5. Check that the electric fuses have not blown
6. Make a new attempt to start the burner and check the counter of the gas meter to find out whether the solenoid valve opens
7. If the burner does not start in spite of repeated starting attempts call the installer

9.2.4 Shut-Off

1. Switch off the current with the main switch
2. Shut-off the gas supply with the shut-off cock on the burner

9.2.5 Warning

1. Never keep your face in front of the fire room door when starting up the burner
2. Do not use naked flame when inspecting the fire room

Authorized installer::

Address:

Telephone:



Service- and inspection card

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

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

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

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

