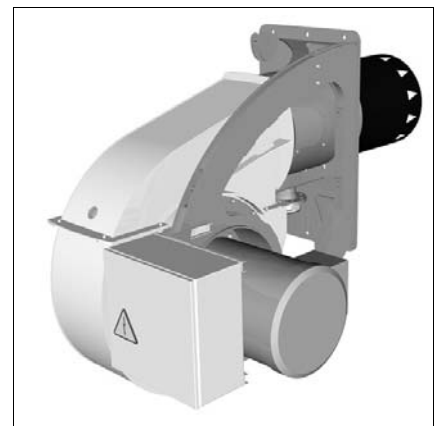


Operation manual
for the authorized specialist

Gas forced draught burner Low-NO_x
N10... G-EU2

elco



Contents

Overview	Contents	2
	Important information Warranty, safety instructions	3
	Safety instructions Installation, start-up, maintenance	4
Technical data	5
	Important components, burner description	6
	Operation fields	7
	Operation fields	8
	Gas pressure loss burner head Gas pressure loss gas butterfly	9
	Dimensional drawing	10
	Installation conditions	11
Installation	Mounting to boiler Electrical connection Presetting	12
	Burner head settings	13
	Gas connection	14
	Gas train description	15
Start-up	Checking procedure	17
	Disassembling firing head	18
	Gas start-up mode Gas operating mode General safety function	19
	Fuel-air compound control	20
	Electronic burner controller	21
	Servo motor type SAD 15	22
	Electrical actuator STM 40	22
	Flame sensor	23
	Gas pressure switch Air pressure switch	24
	Adjustment Combination controls CG 15 -30	25
	Exhaust gas test	27
Servicing instructions	Burner maintenance	29
	Fan impeller	30
Trouble shooting instructions	Cause and removal of disturbance	31
Manufacturer's declaration	33

Overview

Important information Warranty, safety instructions

General information

These operating instructions are a fixed component of the system which should be displayed in a prominent location at the point of installation of the heat generator and should include the address and telephone number of the nearest customer service centre.

They are directed solely at authorised expert personnel.

These operating instructions contain the most important information for installing, commissioning and maintaining the burner safely and must be observed by any personnel who work on the system.

Important information

The burners are designed in accordance with the specification in the Technical data section (alternative fuels on request).

The burners should be installed and taken into operation carefully by qualified personnel. The work should be done in accordance with the applicable regulations and guidelines.

Only a duly authorised specialist should be entrusted with the installation of the gas system, and all applicable directives and regulations must be observed. Any repair work on monitors, limiters and automatic furnace controllers and on the other safety facilities are allowed to be done on the single items only by the manufacturers themselves or specialists authorized by them.

Original parts should only be exchanged by a duly qualified specialist.

Standards and regulations

The following standards should be observed in the interest of a safe, easy-on-the-environment and energy-saving operation of the burner:

EN 676 Gas burners with blowers

The operator must, in accordance with country-specific standards and legislation, be given instruction on how the heating installation operates.

National requirements and building regulations must be taken into consideration during installation of a gas-fired system.

Screwed unions of metal used in gas lines should be fitted with approved sealing elements.

Prior to taking the burner into operation make sure to vent the gas line, but this should in no case be done through the furnace chamber.

Place of installation

The burner must not be operated in rooms containing corrosive vapours (e.g. spray, perchloroethylene, hydrocarbon tetrachloride, solvent, etc.) or tending to heavy dust formation or high air humidity.

Adequate ventilation must be provided at the place of installation of the furnace system to ensure a reliable supply with combustion air.

Maintenance

The furnace system should be serviced at least once a year by an authorized specialist. It is recommended to conclude a maintenance agreement to this effect.

Guarantee

The guarantee does not cover damage resulting from:

- failure to commission and maintain the burner in accordance with the operating instructions;
- damage or loss arising from incorrect installation;
- damage or loss arising from incorrect adjustment;
- damage or loss arising from unauthorised tampering and
- damage or loss arising from improper operation (e.g. operating the system at excessive pressure).

Subject to change without notice due to ongoing technical developments.

Safety instructions

The burner has been built and tested to applicable standards and directives and recognised rules of technical safety and, depending on the burner type, has either been type tested (see declaration of conformity in the Technical data section) or must be tested individually (see manufacturer's declaration in the Technical data section). Risks to persons or property may arise if the burner is not operated correctly or used for its intended purpose.

To eliminate these risks, the burner may only be installed and operated

- in accordance with its intended purpose
- in a technically safe condition

- in compliance with all guidelines and information contained in these operating instructions
- in compliance with all inspection and maintenance guidelines, as specified in the operating instructions or components documentation, or as defined by applicable national legislation, standards or requirements.

Safety measures and rules of conduct

1. Burner only to be operated in an undamaged, defect-free and technically safe condition.
2. Assembly, commissioning / adjustments, repair and maintenance carried out only by experts trained and authorised for the work concerned. This also applies to work on the electrical system and the gas/oil

supply.

3. All safety devices of the system must be checked on a regular basis as specified by applicable regulations.
4. Protective clothing must be worn while work is being carried out on the system.
5. The information in the operating instructions must be observed as well as the applicable requirements or regulations of accident prevention and relevant national construction and safety regulations, requirements, standards and legislation.
6. The markings on the system must be maintained in a clearly readable condition and restored if necessary.

Overview

Important information Safety instructions Installation, start-up, maintenance

7. Equipment to be operated only with safety devices activated and in good working order.

damage and for the correct operation of safety devices.

8. The system must be checked annually – or more frequently if necessary, depending on system conditions - for externally visible

9. Safety functions and safety times must not be impaired, rendered inoperational or modified by additional external wiring.

Tasks carried out on the electrical system

- All tasks involving the electrical system must be carried out by expert electricians.
- Before any work is carried out, the system must be disconnected from the power supply and secured against unexpected reconnection.
- Work on live systems may only be carried out under the supervision of a second person who would be able to disconnect the power supply in the event of danger.
- The electrical system must be routinely checked as part of maintenance. Damage of any kind (e.g. loose connections, damaged cable insulation) must be rectified immediately.

Safety instructions for assembly Always disconnect the system from the power supply!

Before assembly work begins, switch off the master and emergency switches and secure them against the possibility of being switched back on.

Danger! Failure to comply could result in a harmful or fatal electrical shock. Risk of severe injury and danger of death.

Safety instructions for initial commissioning

The initial commissioning of the heating installation must only be carried out by the constructor, manufacturer or another of the experts described. All regulating, control and safety devices must be checked for correct operation and – where adjustment is possible – for correct adjustment.

Before initial commissioning, it is necessary to check electrical circuits for correct fusing, and the measures for protection against accidental contact with electrical equipment and wiring.

Safety instructions for maintenance

- The operator must be informed of all work to be carried out before it begins.
- Assembly, commissioning / adjustments, repair and maintenance carried out only by experts trained and authorised for the work concerned. This also applies in particular to work on the electrical system and the gas/oil supply.
- Protective clothing must be worn while work is being carried out on the system.
- Specified adjustment, maintenance and inspection work must be carried out at the specified intervals.
- Before any work is carried out on the system, the system must be disconnected from the power supply and secured against unexpected reconnection.
- The fuel supply must be closed before work is carried out on the system.
- All safety devices of the system must be checked on a regular basis as specified by national requirements, regulations, standards and legislation.
- Damaged system parts must be replaced immediately. If parts are to be replaced, it is only permitted to use genuine parts, or replacement parts that have been approved or authorised by the manufacturer.
- The installation of additional components that were not subjected to model series or individual testing at the same time as the system is not permitted.
- Do not modify the system or fit attachment or conversion parts without the authorisation of the manufacturer.
- Loose connections must be checked for firm seating after they have been reconnected.
- If seal connections are opened, the sealing surfaces must be cleaned thoroughly at the time of reassembly. Ensure a perfect connection;

damaged seals must be replaced with new ones. Check for leaks once reassembly is complete.

- Repairs to limiting devices, automated equipment, flame monitoring equipment and other safety devices must only be carried out by the manufacturer or its appointed representatives. The expert charged with carrying out maintenance work must replace complete components or assemblies with those of the same type.
- Safety devices must be checked for correct operation following their replacement or repair and after any maintenance work has been completed.
- Only use the burner with furnaces that are suitable for the flame dimension concerned, i.e. in which the flame may burn out unhindered.
- Any change to the furnace pressure (e.g. as a consequence of modifications to the flue system), and any modification that would result in a change in the supply of air to the burner (e.g. a retrofitted soundproofing shroud), requires reconfiguration of burner regulation.
- Persons present in the proximity during burner operation must be equipped with suitable measures for protection against harmful noise levels.

After all maintenance and repair work:

1. Function test.
2. At all load points, check O₂- (CO₂-) / CO -/ NO_x- values, soot emissions and exhaust gas losses.
3. Create a measurement report, leave a copy with the system.

Technical data

Burner type	N10.12000.30 G-EU2	N10.12000.37 G-EU2	N10.14000.37 G-EU2	N10.14000.45 G-EU2 FQ	N10.16000.45 G-EU2 FQ
Combustion power output (*FQe=frequency converter for motor externally)	1.500* - 12.000 kW *(1.750 kW without FQe or Natural gas LL)	1.500* - 12.000 kW *(1.750 kW without FQe or Natural gas LL)	1.750* - 14.000 kW *(2.000 kW without FQe or Natural gas LL)	1.750 - 14.000 kW	2000 - 16.000 kW
Max. control ratio	1:8 for Natural gas E and with FQe 1:7 without FQe or Natural gas LL Deviating values on request (N.B.: the lower operating point must also be within the working field.)				
Boiler furnace pressure	Selection of the nominal burner capacity within the nominal capacity area marked in the working field. Deviating nominal capacities on request. At burners with FQ higher furnace back pressure by rise of the motor frequency to > 50 Hz up to the max. capacity limit.				
Fuels	Natural gas E, LL				
Operation type	Continuously modulating				
Electronic air-fuel-compound-control, automatic firing device	Etamatic OEM or BCS 300 on burner Alternative electronic burner controls in separate cabinet				
Electrotechnical equipment	Attached to the burner is an IP54 control cabinet that contains the terminal block and, where applicable, the combustion manager and other components				
Optional electro-technical equipment	BCS or Etamatic OEM as burner controller Power controller with protection, soft start or Y-D start externally in a separate control cabinet Power regulation by external 4-20 mA nominal value input Frequency converter externally in a separate control cabinet Preparation for controller-specific O ₂ regulation, probe fitted externally Profibus DP, Modbus RT, Ethernet				
Fan motor	400/690 V, 50/ 60 Hz / 2950 U/min, IP55				
	30 kW	37 kW	37 kW	45 kW	45 kW
Gas connection	DN100, PN16, Natural gas E p _{min} =250 mbar, Natural gas LL p _{min} =300 mbar				
Protection class	IP40, IP54 as option				
NOx-emissions	Emission class 3 according EN 676, 70-150mg/kWh (0% O ₂ acc. EN 676) Precise values on request.				
Flame length max. at 3% O₂	6,0 m	6,0 m	6,4 m	6,4 m	6,8 m
Flame diameter	min. 1,3 - 1,6 m (depending on combustion output and NOx requirements)		min. 1,4 - 1,75 m (depending on combustion output and NOx requirements)		
Acoustic Emissions, Sound Pressure	< 97 dB(A) (average value on enveloping surface at 1 m distance)				
Site	Closed rooms or weatherproof on site; non-aggressive atmosphere				
Ambient temperature (including impact of heat radiation)	0°C - 60°C with BCS or Etamatic on burner, -10°C - 60°C with alternative electronic burner controls in switch cabinet, relative humidity max. 60% (special corrosion protection on request)				
Burner weight	Approx. 550 kg plus 100 kg for transport rack				

Technical data

Important components, burner description

Burner type	N10.12000.30 G-EU2	N10.12000.37 G-EU2	N10.14000.37 G-EU2	N10.14000.45 G-EU2 FQ	N10.16000.45 G-EU2 FQ
important components:					
Flame monitor	QRA 2, QRA 53 / FFS 06				
Ignition transformer	EBI				
Servo motor	SAD15 / STM 30/40				
Air pressure switch	DL 50 A				

Operating mode

The burner is designed as an automatic controllable gas blast burner to EN 437 Gasfamily 2. It is tested according to EN 676 and fitted with a **delta burner head**, a system for the low NO_x combustion of fuel.

Application

The burners are applicable for the operation at heating boilers, steam boilers and air heater with 3-pass, draft or reverse furnace.

Design

The burner is supplied with connection leads fixed to a terminal block ready for connection to the boiler system.

BCS and Etamatic OEM design

The burner is equipped with an electronic burner control system (automatic furnace controller, electronic compound controller, gas valve leak detector).

Other electronic burner controller

Electronic burner control (automatic furnace controller, electronic compound controller, gas valve leak detector) is placed in the separated switch cabinet.

Combustion air

An overpressure fan impeller with a steep characteristic is provided to ensure a high pressure build-up. This ensures a pulsation-free and steady combustion behaviour also on boilers with a high exhaust gas resistance.

Control

The fuel-air ratio is controlled by an electronic compound controller with actuators provided for positioning the following control elements:

- air damper,
- gas damper.
- event. frequency inverter.

Sensors

A flame sensor and an approved automatic furnace controller are provided for flame monitoring. An differential pressure switch is fitted for fan air monitoring. A speed monitor is installed if an automatic speed control system is used.

Ignition

Electrical high voltage ignition of the enclosed ignition burner.

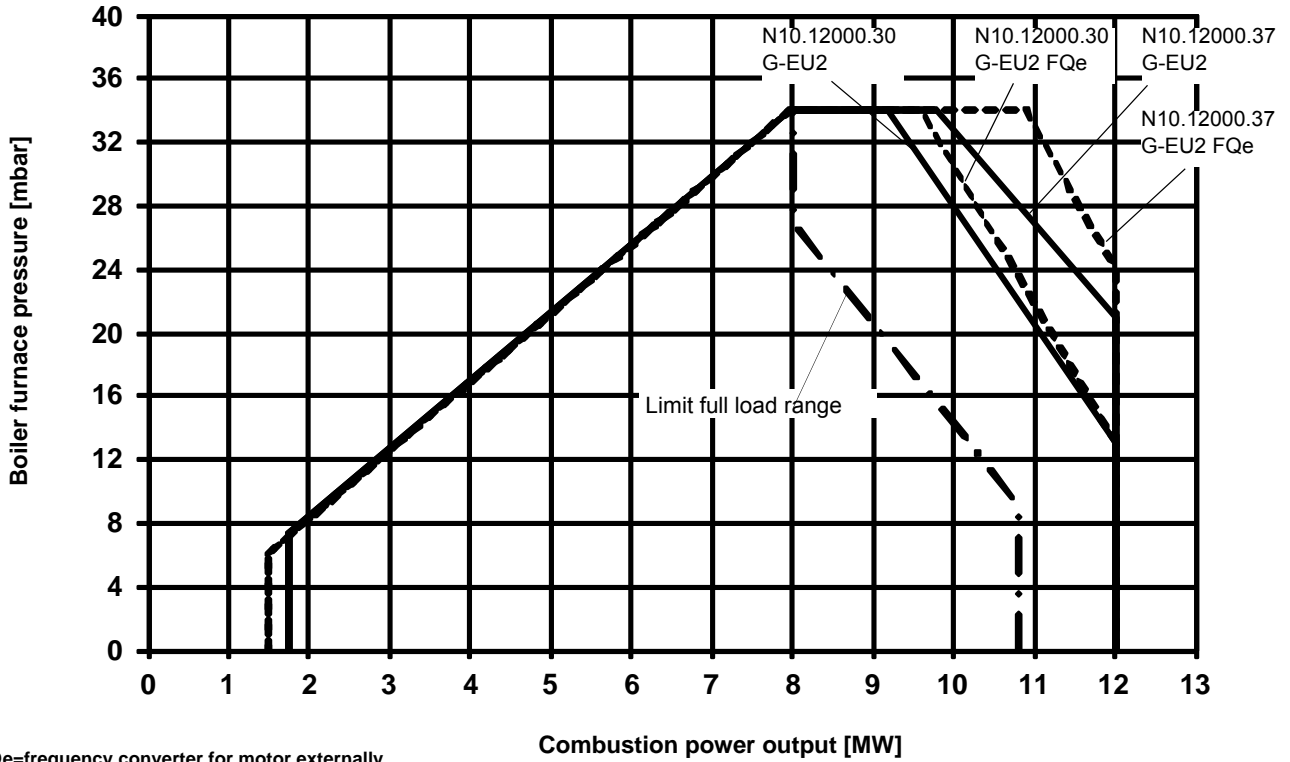
Heat capacity of the ignition flame < 10% of the main flame.

Internal exhaust gas return

As a primary precaution to minimize the generation of nitric oxides, the **delta burner head** will internally extract combustion gases from the furnace chamber and feed them to the fuel mixture. This concept does away with the equipment otherwise required for the external return of the exhaust gases.

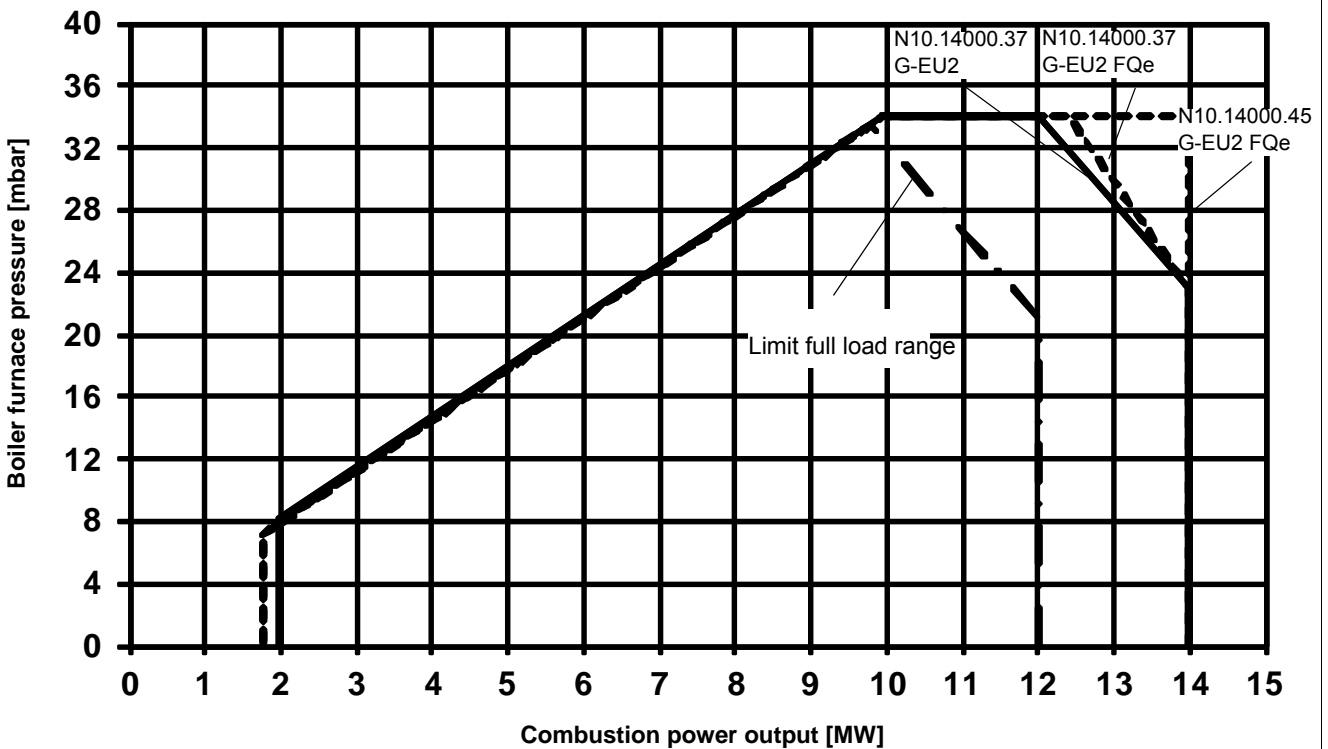
Operation fields

Operation fields N10.12000 G-EU2 according EN 676



FQe=frequency converter for motor externally

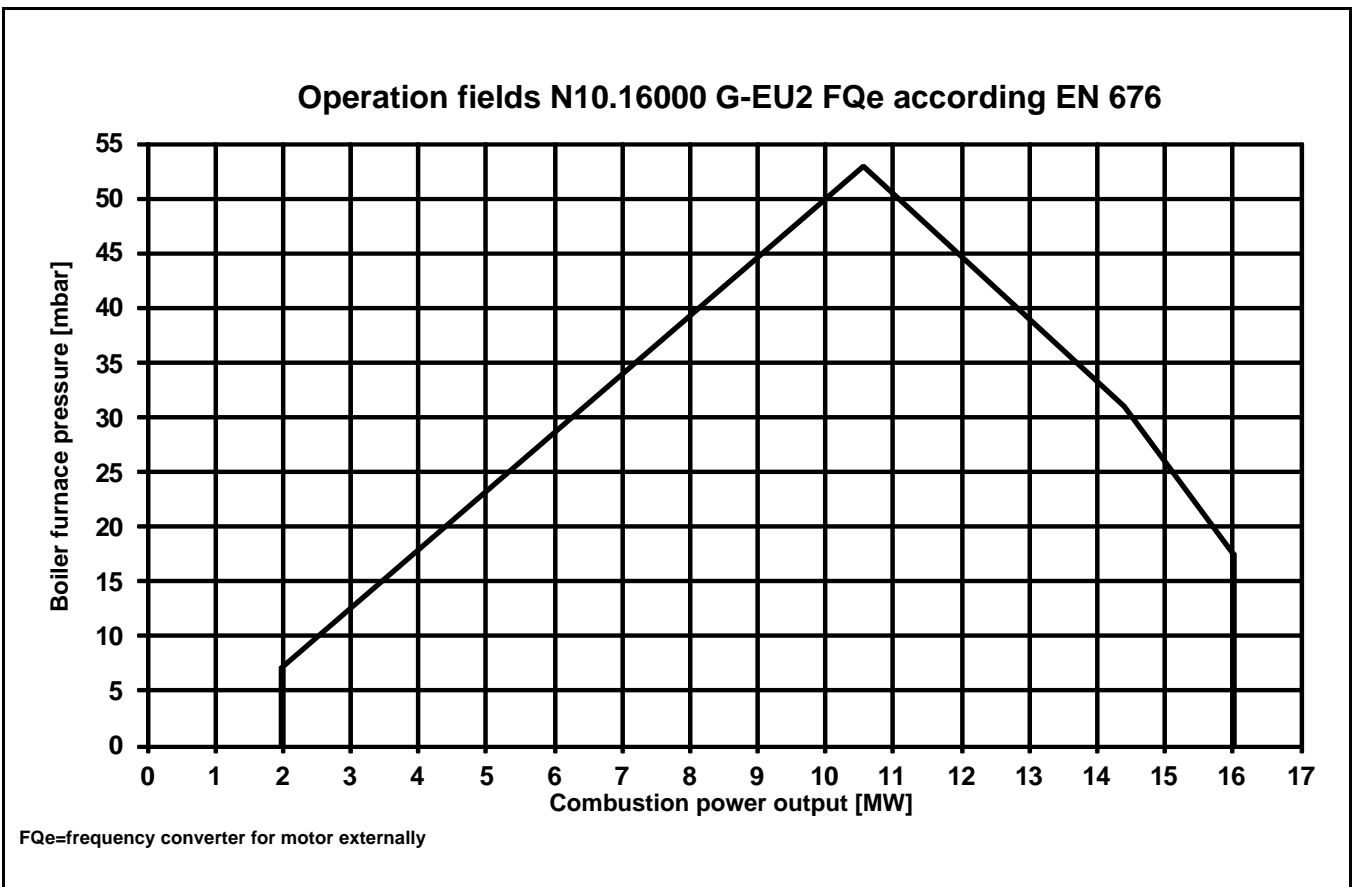
Operation fields N10.14000 G-EU2 according EN 676



FQe=frequency converter for motor externally

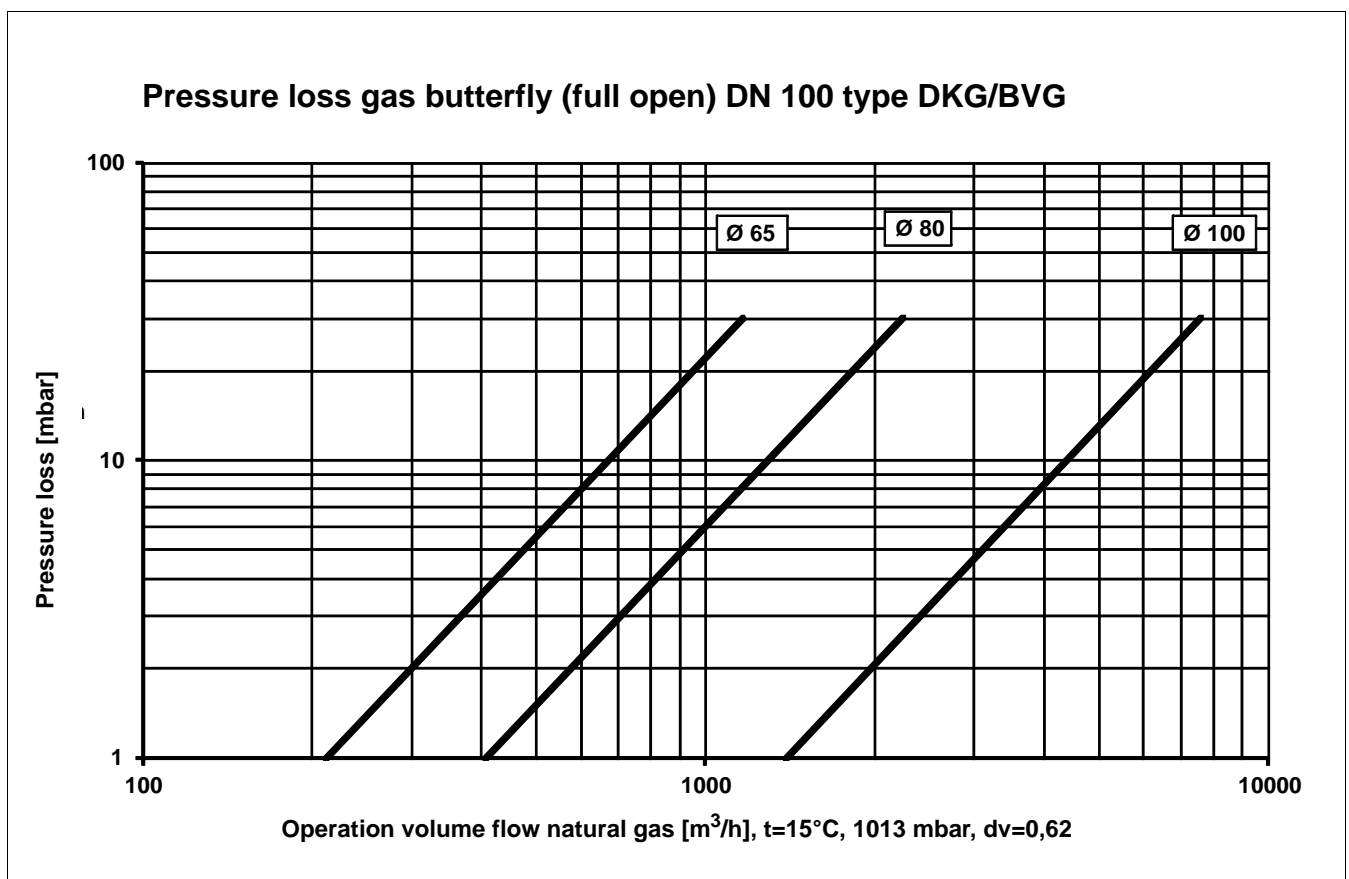
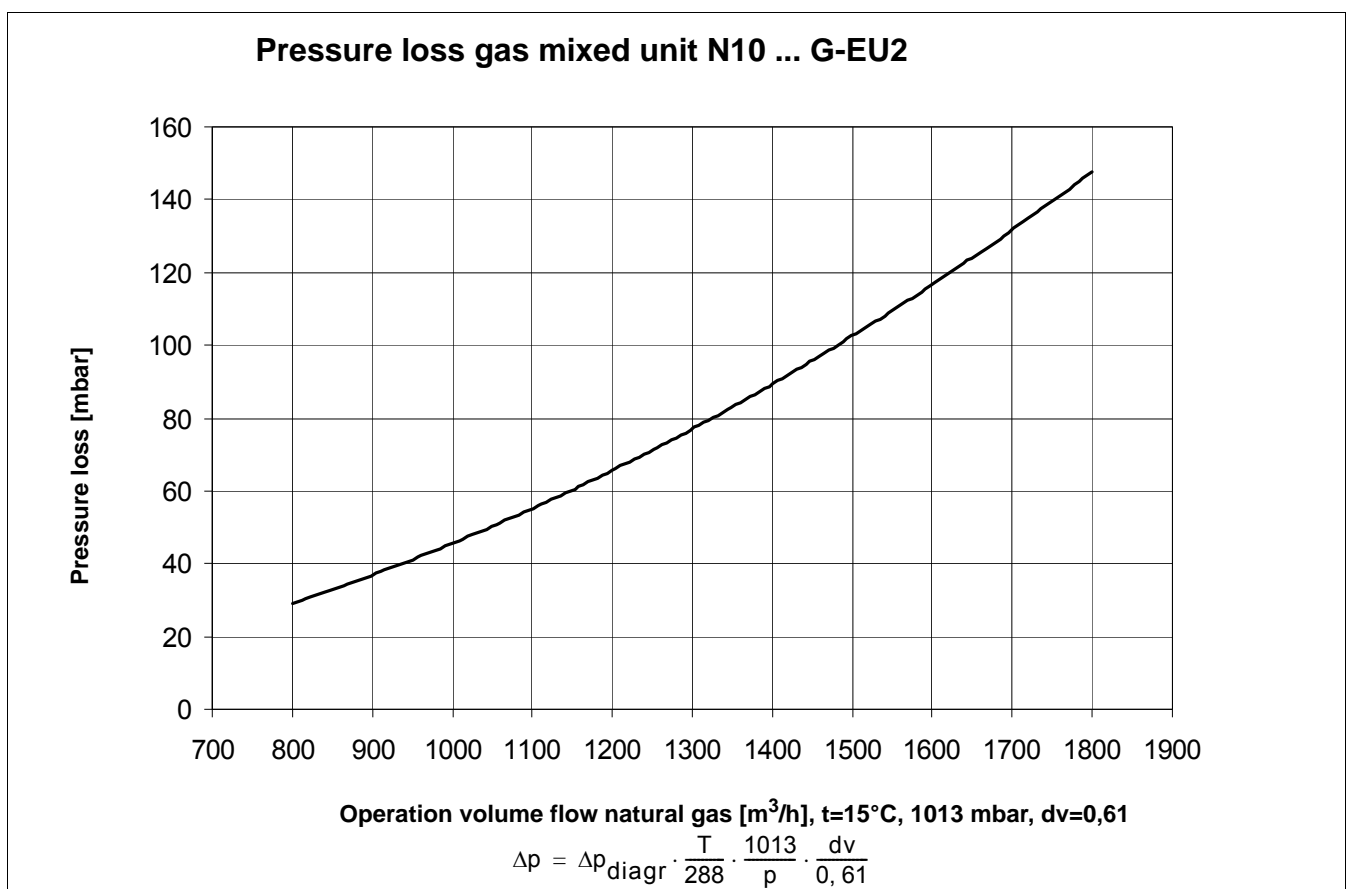
Technical data

Operation fields



Technical data

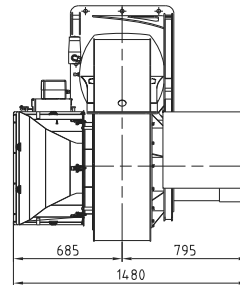
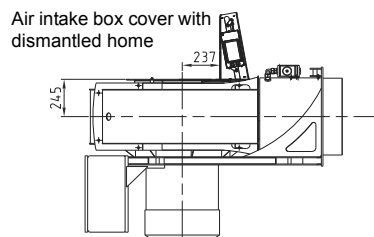
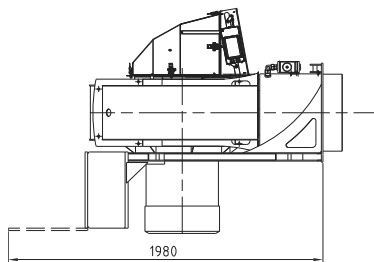
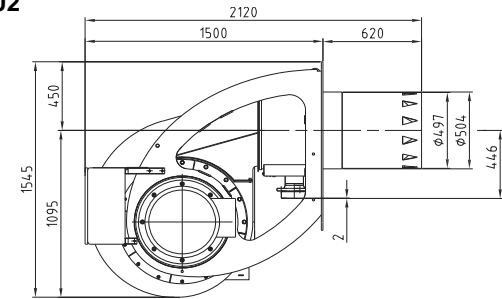
Gas pressure loss burner head Gas pressure loss gas butterfly



Technical data

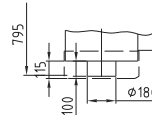
Dimensional drawing

N 10... G-EU2

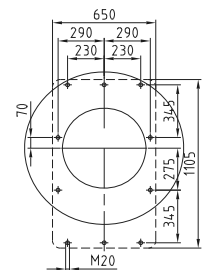


The cover of motor is removable in case of opening boiler door for revision

Motor with disassembled protection grid

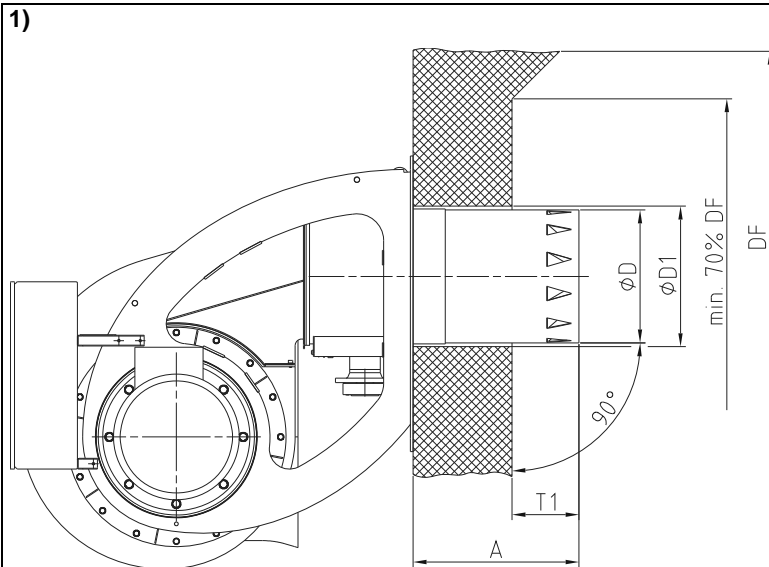


Drilling Template



Technical data

Installation conditions



ad 1) Boiler lining

$D = 497$

$D_1 = 525$

D_F = combustion chamber diameter

$T_1 = 150-250$

$A = 620$

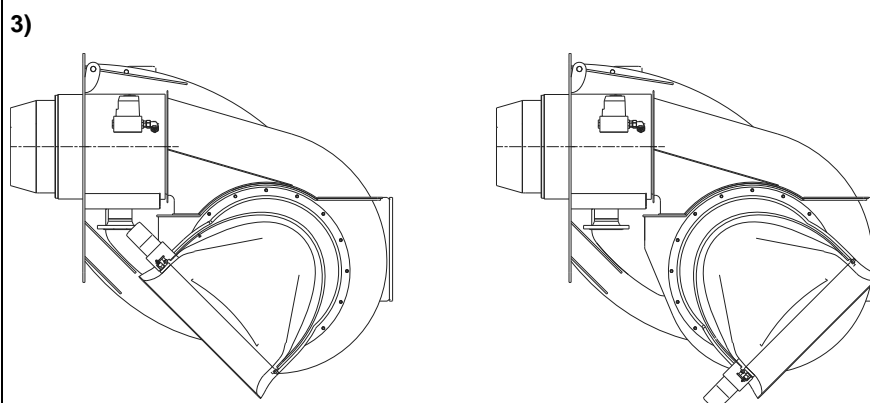
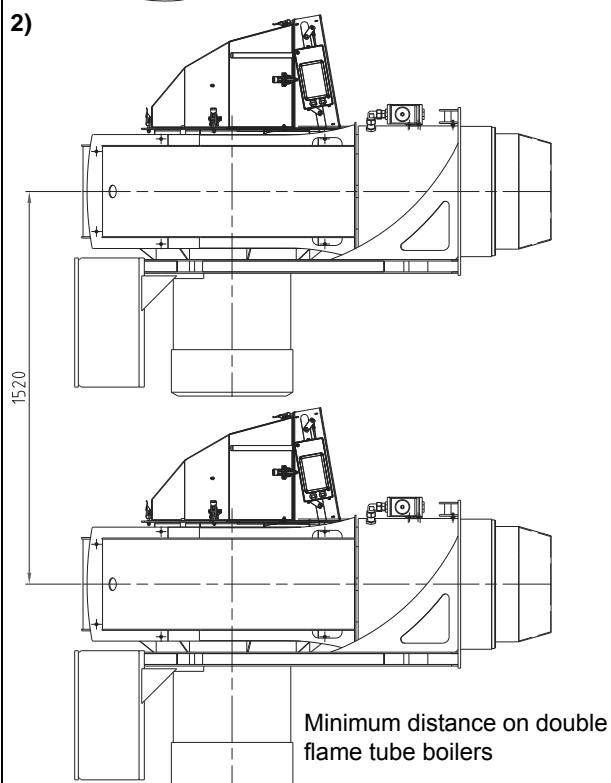
(option: extensions of 100 and 200 mm)

The burner lining must be installed at right angles to the burner tube.

Possible trimming work (beveling, rounding) as is required for reversing boilers, for example, should be done at a diameter not below 70 % of the combustion chamber diameter.

The space between the flame pipe of the burner and the boiler lining should be lined with heat resistant material, such as Cerafelt.

This space is not allowed to be lined with brickwork.



ad 3)

Note:

In special cases, the air intake box can be mounted in a way that the opening shows to another direction. The dimensioned drawing will differ slightly.

The air intake box can be rotated in steps of $22,5^\circ$.

Installation

Mounting to boiler Electrical connection Presetting

Check before burner installation

Check the mixing unit for correct setting; see dimensioned drawing.

Deviations from the burner head adjustment data may be acceptable following a type test or individual testing by arrangement with the test authority in order to adapt the burner to the boiler and flue gas system. However, these deviating adjustments must be carried out by an authorised expert and all modified dimensions must be documented in the adjustments and measurements log containing the flue gas measurement and combustion stability evaluation. This must be handed over to the test authority on request.

- Set the ignition electrodes according to the sketch.
- Check the burner pipe mounting according to Section "Boiler lining for burners" and the boiler manufacturer's specifications.

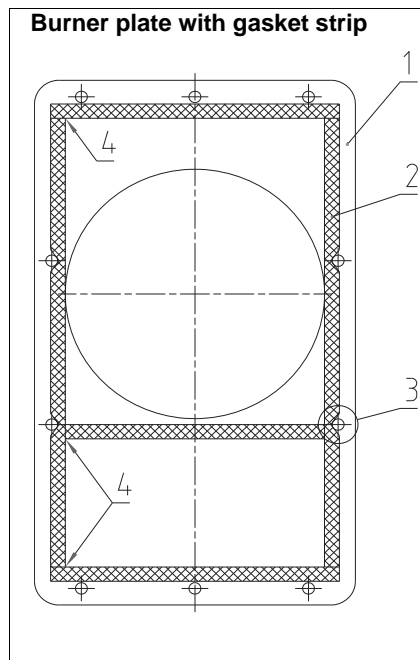
Electric connection:

The electric connection including all installation materials as well as joints and earth terminals must be made in accordance with the applicable regulations. For the electrical installation of the burner reference should be made to the circuit diagram of the furnace system. The electric connection of the burner and gas valves and instruments is allowed to be entrusted to authorized specialists only.

Burner installation

For mounting the burner to the boiler make sure the connection plate is prepared in accordance with the dimensions given in the technical datasheets.

- Install the stud bolts in the connection plate.
- Put the insulating base and burner in place and fasten with bolts.



Arrangement of sealing tape on the boiler (1)

- Evenly stick on self-adhesive tape (2) according to Figure.
- Adapt the flat gasket by cutting to the boreholes in the area of the four vertically arranged boiler fastening holes. (3)
- In case of butt joints make sure the bordering is fitting closely. (4)

Attention:

After the completion of the electric connection work make a check of the wiring of the burner electric system. This includes a check for the direction of rotation of the burner motor (fan).

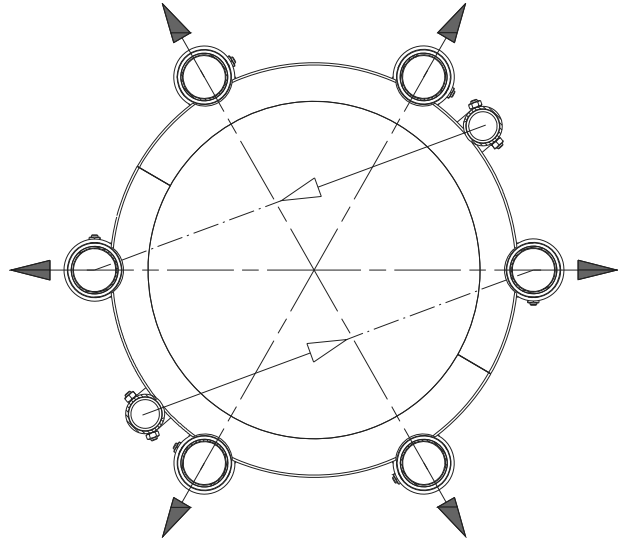
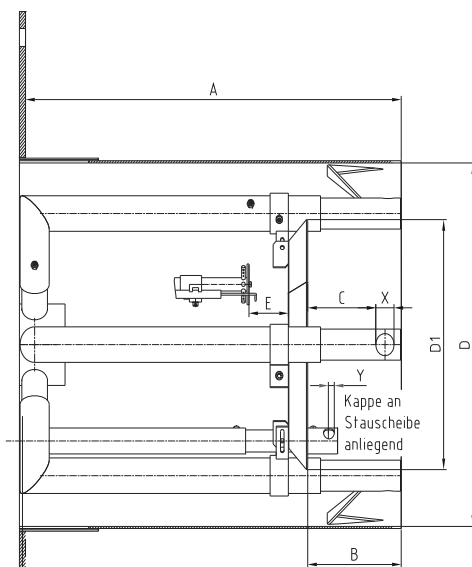
Boiler inspection glass cooling

For cooling and cleaning the boiler inspection glass, a cooling line (e.g. a hose) may be installed from the burner to the inspection glass. A connection piece is provided on the burner for this purpose.

Installation

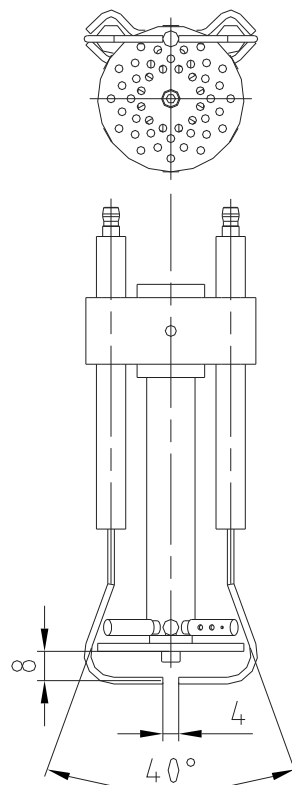
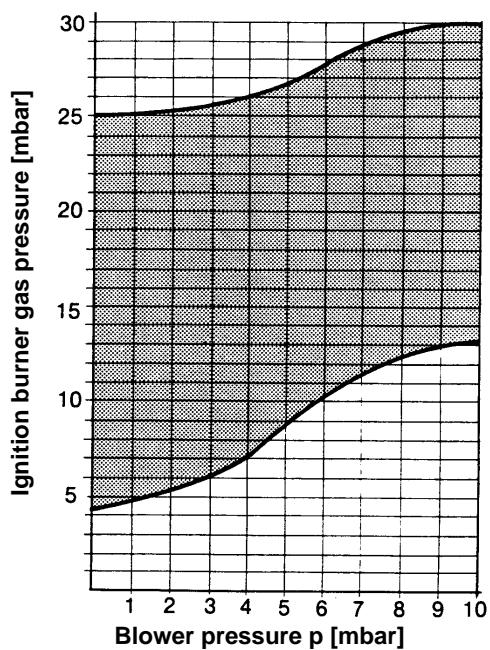
Burner head settings

N 10.... G-EU2



Burner	A	B	C	D	D1	E	X	Y
N10.12000 G-EU2	620	155	118	491/497	375	65	30	10
N10.14000 G-EU2	620	155	118	491/497	338	65	30	10
N10.16000 G-EU2	620	155	118	491/497	338	65	30	10

Adjustment electrical Ignition Operation Gas ignition burner ZB 2



Installation

Gas connection

Gas connection

The gas lines and valves and instruments group should be installed and taken into operation in accordance with the applicable engineering standards and regulations.

The connection between the gas distribution network and the gas ramp must be done by authorised persons.

The section of the pipings must be calculated so that the loss of load doesn't exceed 5% of the distribution pressure.

A quarter turn manual valve (not supplied) must be provided for upstream of the gas ramp and the filter.

The filter must be installed on a horizontal nozzle with the cover in the vertical position to enable cleaning.

The threaded unions used must be in conformity with present standards (tapered male thread, straight female thread with sealing provided in the thread).

Gas properties

Prior to any installation work make sure to obtain the following data from the gas supply company:

1. type of gas
2. calorific value $Hu_n = \text{kW/m}^3$ (kJ/m^3)
3. maximum CO_2 content of exhaust gas
4. gas connection pressure and rest pressure

Type of gas test

Prior to mounting the burner to the gas feed line check the available type of gas and burner type against the data given on the burner nameplate (attached to burner). Be sure the description of the burner and the type of gas are the same as indicated on the nameplate.

Gas connection pressure

A minimum connection pressure must be available upstream of the burner gas valve to ensure the proper functioning of the burner.

For the installation of the valves and instruments group take care to observe the mounting instructions supplied by their manufacturers (these are packed with the equipment).

The gas line installed to the burner must be dimensioned in accordance with the throughput rate and the available pressure.

For selecting the nominal bore „DN“ of the gas valves and instruments group **care should be taken to observe the flue resistance of the boiler and the gas pressure loss of the burner and valves and instruments group.**

Caution!

The absence of impurities and foreign bodies must be checked before installation and commissioning of the gas ramp, the lever valves and unions.

Gas valves and instruments group

The gas valves and instruments group can be connected directly to the gas feed line. **Take care to observe the correct order of installation and direction of flow (arrow on housing).** Check the valves and instruments and connection pieces for absence of dirt particles and foreign matter before installation and initial operation. **To provide effective conditions for start-up make sure the distance between the burner and the gas stop valve is as short as possible.**

Leak test

The gas line upstream of the burner gas valves and instruments group must be installed in accordance with the applicable regulations, checked for absence of leaks, vented and certified accordingly by the gas installation company. The screwed unions and flanged joints must be checked for proper tightness (by making a pressure test). The leak test must be made under pressure using approved foaming agents which do not cause corrosion. For steam boiler furnaces the result of the leak test must be duly certified.

Venting

Caution! Prior to taking the burner into operation or after any repair work make sure to vent the complete gas feed line and the gas valves and instruments group into the open atmosphere (e.g. by means of a hose) taking care to avoid any hazards.

In no case should the gas line be vented into the heating or furnace chambers.

Make use of a test burner to check the gas-carrying spaces are free from an inflammable gas mixture.

Support

The valves and instruments group must be supported with at least one telescopic jacking member or similar during and after installation (e.g. on filter and valve).

Joint

It is recommended to provide an easy-to-disconnect joint (with planar sealing faces) to facilitate repair work on the boiler (furnace) and allow the boiler door to be swivelled out if required.

Installation

Gas train description

The burner's scope of delivery may include a gas train. In this case, the burner and the gas train are issued with a CE Declaration of Conformity. If the gas train is not delivered with the burner, the conformity of the burner is valid only if the gas fittings and instruments and the design of the gas train satisfy the burner test specified by EN 676 and meet the Pressure Equipment Directive. Individual testing will be necessary where this is not the case.

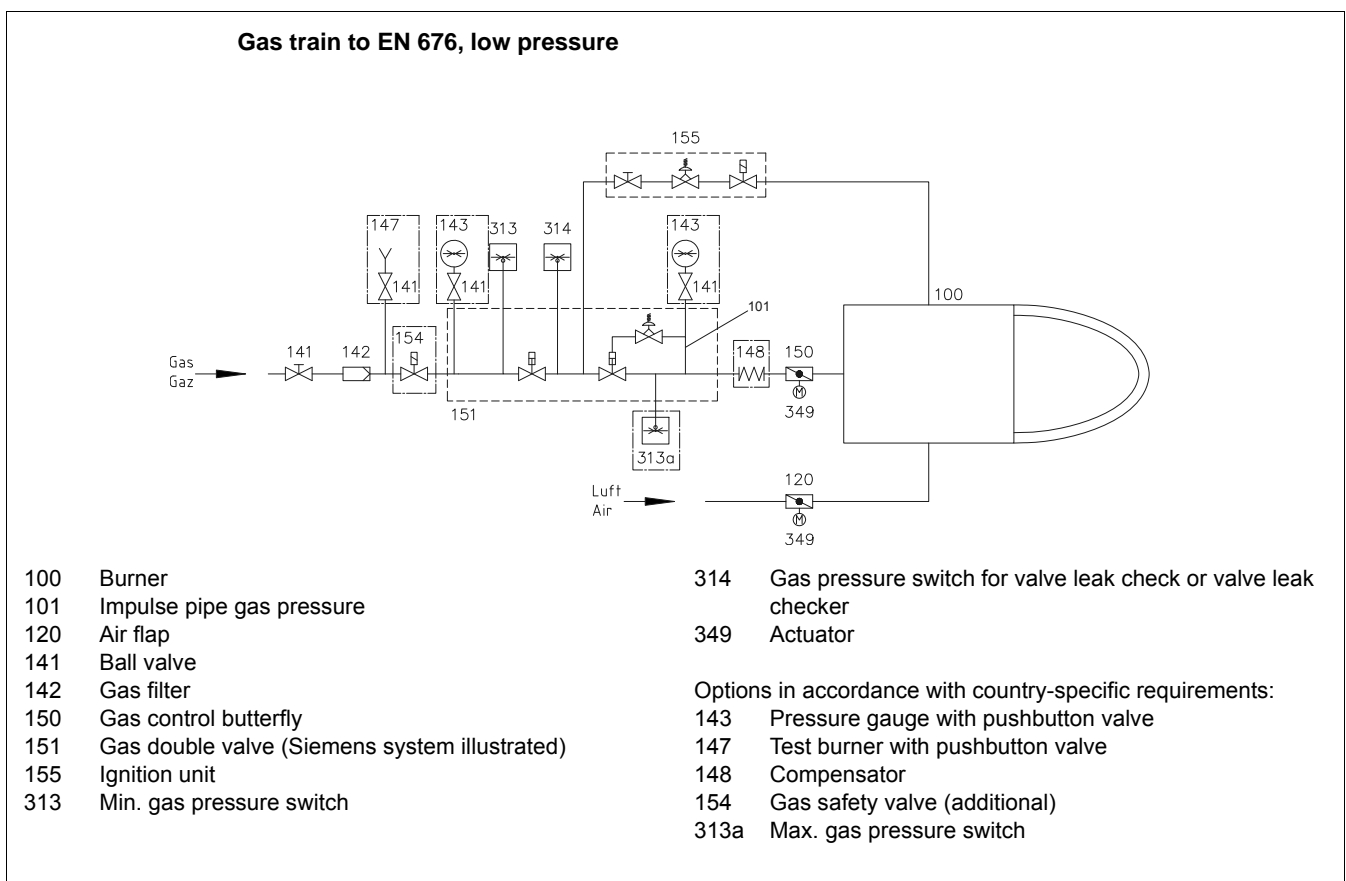
The gas train delivered has its own documentation including operating instructions and a spare parts list. There follows a general description of the gas train.

Gas trains with a double valve are intended for the supply, main shut-off, gas filtration, gas pressure regulation and monitoring of the gas supply. They are compatible for use with gases conforming to the specifications of the gas fittings and instruments. They are built in accordance with EN 676. All function parts have been individually tested and awarded the CE marking and number of the Notified Body. The preassembled gas train is checked for leaks in the factory.

Low- and high-pressure gas trains

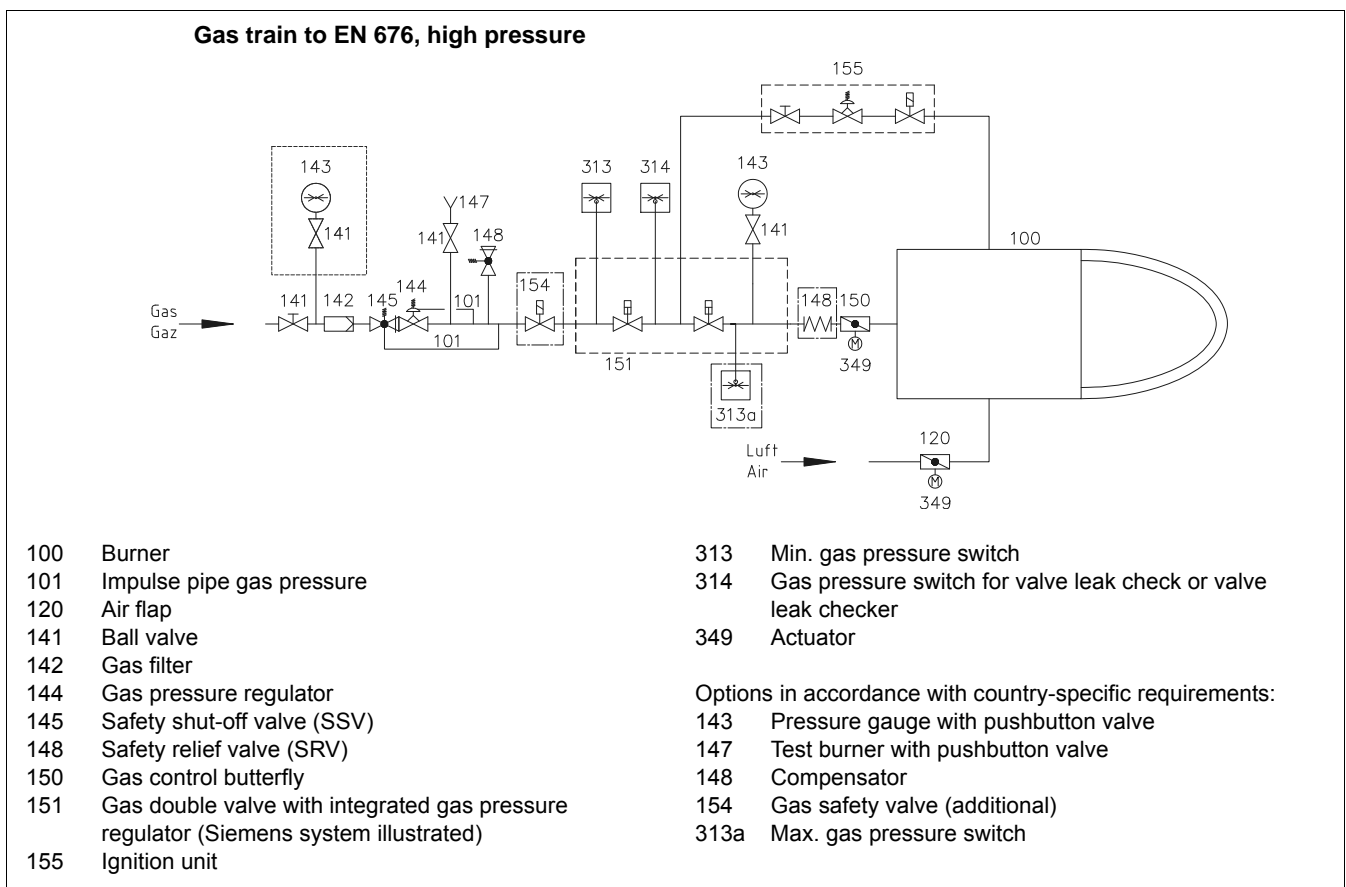
If the outlet side of the regulator, i.e. individual fittings and instruments downstream of the gas pressure regulator, has not been designed to be compatible with the maximum supply pressure that occurs in the event of a fault, the gas train must be equipped with a safety shut-off valve (SSV) and a safety relief valve (SRV) in accordance with EN 676. This equipment is generally required for maximum supply pressures of >360 mbar and > 500 mbar respectively. These are known as high-pressure gas trains.

If all fittings and instruments of the gas train have been designed/approved for the maximum supply pressure that occurs in the event of a fault, the gas train is known as a low-pressure gas train. This is the case, depending on component selection, for maximum supply pressures of 360 and 500 mbar.



Installation

Gas train description



Gas valves and instruments group

The gas trains must be dimensioned to suit the throughput required and the available gas pressure. The gas valves and instruments group is defined on a system-specific basis.

The following must be taken into consideration:

- Burner output,
- Combustion chamber counterpressure,
- Gas pressure loss in the burner head,
- Gas pressure losses in the gas fittings and instruments.

The total drop in gas pressure must always be lower than the available gas flow pressure.

Start-up

Checking procedure

Check the following prior to the initial operation of the boiler system:

- Take care to observe the operating instructions supplied by the boiler manufacturer. The boiler must be mounted ready for operation.
- Ensure that the heating system is filled with water to capacity.
- Check the complete system for correct electrical wiring.
- Check the burner motor for correct direction of rotation.
- Check for the proper setting of the temperature and pressure controllers, limiters, safety switches and electrical limit switches.
- Check the gas connection pressure.
- Make a test of the all gas-carrying elements for absence of leaks.
- Bleed the fuel-carrying lines (make sure they are free of air).
- Check the exhaust gas ports are opened and adequate fresh air intake is ensured.
- With burner in starting position check that air damper is in „CLOSED“ position.
- Check that automatic furnace controller is unlocked and that it is in original position.

Gas butterfly valve:

The position indicator can be altered on the system without the use of tools. As a result, the position indicator is not always a definitive indication of flap position. The position of the gas flap is always determined by the pin that forms a positive connection with the valve shaft and is arranged at a 90° angle to the position of the valve.

Gas start-up

- Connect the measuring instruments for the gas head pressure on the test connection downstream of the gas damper and the air pressure on the burner test connection.
- Open the gas shut-off valve before the gas-armatures and test the gas pressure on the pressure gauge.

Prior to the initial fuel feed start make a functional test of the burner program flow:

- Shortly open the gas shut-off valve in the valve group until pressure is available and close again.
- Start burner and check program flow for correct start-up sequence:
 1. Valve tightness check.
 2. Fan.
 3. Pre-ventilation damper.
 4. Check air pressure.
 5. Partial-load damper.
 6. Ignition.
 7. Valves open (disconnected valve remains closed).
 8. Shut-off upon trouble after expiry of safety period (see automatic furnace controller) or shut-off because of gas supply failure.
- Reset the Electronic Burner Controller

Start-up

Disassembling firing head

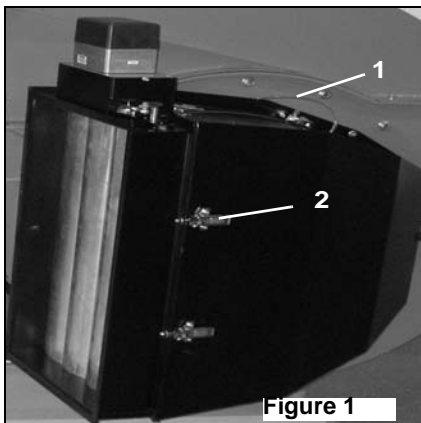
- Isolate the system from power source. Set the main switch to „OFF“.
- Close all shut-off valves upstream of the burner.

To disassemble the combustion head, the cover on the housing must be removed. In order to make it easier to disassemble the combustion head, it is recommended that the air intake box is removed.

Disassembling the air intake box (Image 1):

Only a few steps are required to disassemble the air intake box:

- Detach the hose (1) from the air pressure switch on the pressure tap located on the air intake box
- Open the manual locking system
- Remove the cover



Removing and closing the casing cover (Figure 2)

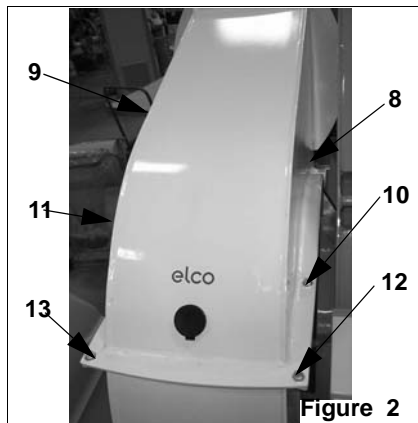
The casing cover is removed as follows:

- Screw out the screws (8) to (13).
- Remove the casing cover.

When closing the casing cover do the following steps:

- Screw in the screws (8) to (13) by doing only a few turns.

Tighten the screws beginning with the screws (8) and (9), followed by the screws (10) and (11) and finally by the screws (12) and (13).



Removal of the firing head

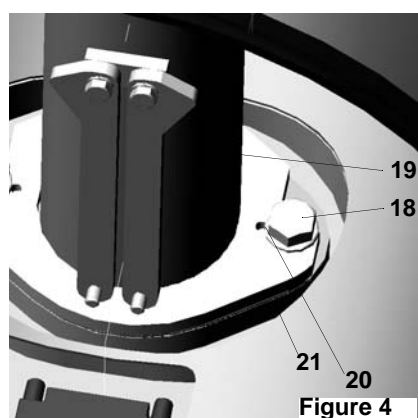
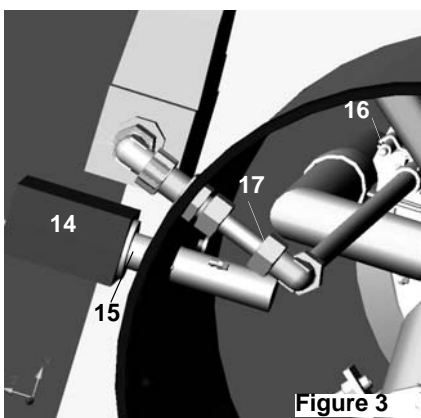
(Figure 3 and 4)

For replacing and adjusting the baffle plate and ignition system make sure to remove the complete gas head from the burner according to the following procedure:

- Withdraw the flame sensor (14) after loosening the screw (15).
- Disconnect ignition cable (16).
- Loosen nut (17) and remove the gas pilot burner.
- Screw out the gas head fastening screws (18), lift up the gas head (19) from the locking pins (20) and take it

out backwards. Make sure the gasket (21) is not damaged.

- Prior to reassembly, check the gasket (21) and replace it if required.
- Reassemble in reversed order.



Start-up

Gas start-up mode Gas operating mode General safety function

Gas starting function

If there is a demand for heat by the furnace system the burner control circuit will be closed and the program flow started. At the end of the program flow the burner will start.

Prior to any burner start and after burner stop the gas valve will be automatically tested for proper tightness. The necessity results from the legal provisions that apply to the heating system.

The air damper will be closed at burner stop.

The electric actuator will move the closed air damper into its full-load position so that the burner ventilates the furnace and the exhaust ducts with the specified air flow rate. Shortly after pre-ventilation start the air failure cut-out must change over to working position, i.e. the preset minimum air pressure must be reached and maintained until the burner is turned off. After the expiry of the preset pre-ventilation time the air damper and the gas control damper are set to their partial-load positions.

The ignition transformer is commissioned. Following the pre-ignition period, the ignition gas solenoid valves are opened and gas flows into the pilot burner. The ignition gas is ignited by the ignition electrodes on the pilot burner.

The UV radiation of the pilot light is now monitored by the flame sensor (1st safety period), and the safety shut-off valves are opened. The gas is supplied to the gas nozzles by way of the gas control butterfly, the combustion air by the ventilator. Both media are thoroughly mixed in the mixing unit and ignited by the pilot light.

The ignition gas solenoid valves then close and the pilot light goes out. By the end of the 2nd safety period, the radiation of the main flame must have been detected by the flame sensor.

Gas operating function

After flame formation, the burner will shortly remain in the separately set ignition load and is then run at minimum output. This brings the burner to its operating position. The controller will now automatically control the burner between its partial-load and full-load positions.

Depending on the heat demand the output controller will actuate the electronic compound controller which in turn will control the actuators of the gas control damper and air control dampers and increase or decrease the flow rates according to a specific program.

The stepless control makes it possible to operate the burner at any desired stage between its partial-load and full-load positions.

For turning off the burner this must always be in its partial-load position. The air damper will be closed when the burner is in its off position so as to prevent cold air from flowing through the furnace chamber, heat exchanger and chimney. The interior cooling losses will be greatly minimised.

Attention:

If there are shut-off dampers in the flue gas tract they must be complete open. **Otherwise there will be a high danger of low-speed detonation or explosion!** The open-position of the shut-off damper can be assured by the integration of the opening contact of the shut-off damper in the safety chain of the heat generator.

General safety functions

In case a flame does not develop when starting the burner (fuel release), the burner controller will shut off at the end of the safety period (shut-off on trouble).. A shut-off on trouble will also occur in the case of flame failure during operation, air flow failure during the pre-ventilation phase and pressure failure during the whole period of burner operation. Any failure of the flame signal at the end of the safety period and a flame signal during the pre-ventilation phase (external light control) will result in a shut-off on trouble with the automatic furnace controller being locked. The trouble is indicated by the trouble signal lamp lighting up. The automatic furnace controller can be unlocked immediately after a shut-off on trouble by pressing the unlocking key. The program unit will return to its starting position and proceed with the restart of the burner. A voltage failure will result in a regular shut-off of the burner.

After voltage recovery, the burner can be automatically restarted unless another interlock is active, e.g. one caused by the safety circuit. In any case, the fuel oil supply will be immediately stopped upon occurrence of a trouble.

When using the burner control system (electronic compound control) all operational and fault messages may be indicated in plain text on an optionally available operating and display module.

Start-up

Fuel-air compound control

Fuel-air compound control

This compound pneumatic control system with precision-adjustment capability has been designed to allow the fuel and air flow rates to be steadily varied in sliding mode for an adjustment of the fuel-air ratio over the whole control range.

In the stepless control mode the load will be controlled at any point within the control range depending on the heat demand.

Electronic compound control

The air flap and the gas flap are each fitted with a servomotor that controls the position of these servo components. At the factory, the air curve of the compound controller is configured in such a way that the air flap is closed at the minimum setting and open at the maximum setting.

As part of burner commissioning, the servo components for the fuel and air are assigned permanently defined positions in relation to burner output. During burner operation, the servo components move into these positions with great accuracy. This precision is a fundamental prerequisite for permanently ensuring low-emission combustion.

The gas pressure should be corrected at the gas pressure regulator if necessary.

Please note!

The gas outlet pressure (gas regulating pressure) must always be less than the gas inlet pressure but higher than the total pressure loss of the system.

Proceed in accordance with the commissioning instructions for the electronic compound control system when making gradual adjustments to the load points (fuel flow rate, air flow rate).

Where possible, a combustion measurement should be carried out at each point.

Equipment option: speed control

The burners can be equipped with a speed controller as an option.

During long burner operating periods in the partial load range in particular, the reduction in blower speed helps to conserve electrical energy and reduce noise emissions from the burner blower itself.

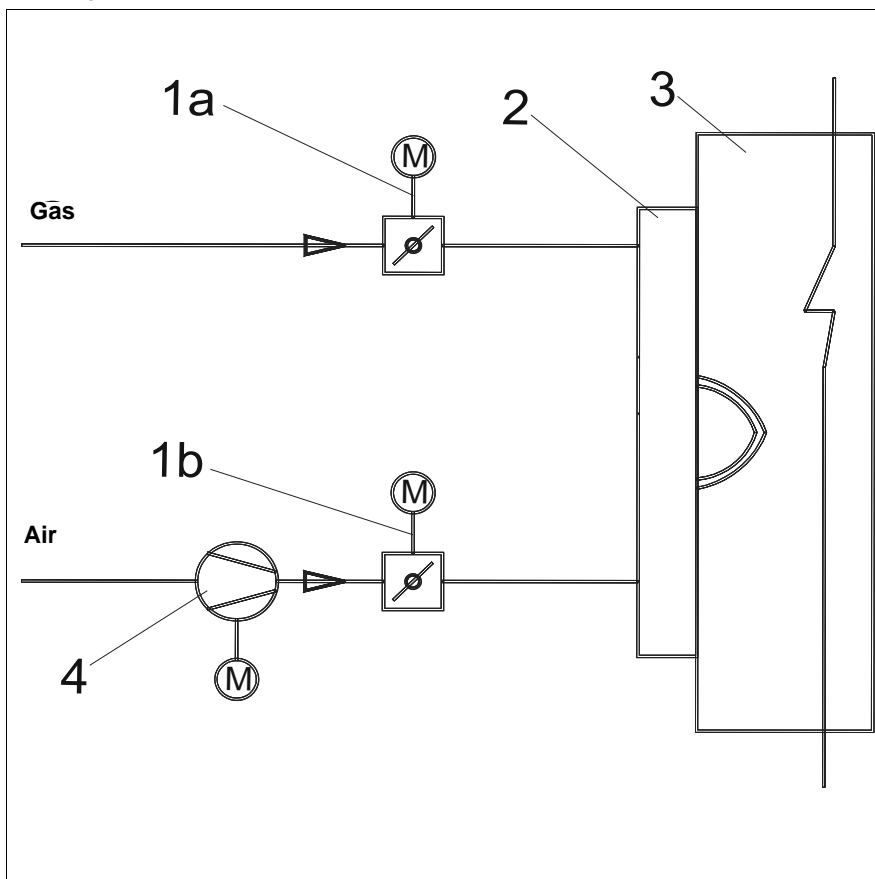
The speed of the blower is measured by a Namur sensor

and controlled to the programmed reference value for the current output level.

Equipment option:

O₂ control / CO control

To improve the efficiency of the system, the combustion manager can be equipped with residual oxygen or CO control (CO control available only with the use of a Lamtec burner controller). The residual oxygen is measured in the flue gas of the heating system by an O₂ measuring probe with zirconium oxide sensor and sent to the combustion manager as a correction factor. Thanks to O₂ control, it is possible to eliminate variations in ambient conditions (e.g. combustion air temperature and humidity, calorific value fluctuations, etc.) and significantly reduce the air surplus required for calibration. Reference value deviations are controlled by corrections to the blower speed or the air flap position. With the use of CO control (only possible with gas operation), the CO content is measured in addition to the residual oxygen. The air surplus is reduced to the "CO edge" by a correction to the blower speed or the air flap position. The correction factors are determined in a system-specific "learning process" and stored temporarily in the combustion manager. This makes it possible to maximise the system's heating efficiency across the entire output range and optimally manage the combustion process. For further information, please refer to the manufacturer's documentation for the electronic combustion manager.



- 1a Gas damper with actuator
- 1b Air dampers with actuators
- 2 Burner
- 3 Boiler
- 4 Comustion air fan

Start-up

Electronic burner controller

Description

The electronic burner controller is a programmable automatic combustion control unit with an integrated electronic coupled controller. There may be additional functions, depending on the equipment and model.

The following burner-specific controllers are used:

Burner controller	BCS 300	Etamatic OEM
Manufacturer	Dungs	Lamtec
Technical Data	Operating voltage: 230 VAC Frequency: 50/ 60 Hz Power consumption: <16,5 VA Ambient temperature during operation: 0-60°C Storage: -20-70°C Mode of operation: Continuous operation	Operating voltage: 230 VAC Frequency: 50/ 60 Hz Power consumption: ca. 50 VA Ambient temperature during operation: 0-60°C Storage: -25-60°C Mode of operation: Continuous operation
Components and integrated functions	Flame monitor module FLW05 for connecting various flame sensors Actuator SAD15 integrated power regulator integrated valve leak check	Actuator STM 30/40 Customer interface integrated power regulator integrated valve leak check
optional equipment	Operating and display module Expansion module EM1 for speed regulation and O ₂ -regulation	Programming unit Installation kit for speed control O ₂ -regulation

Additionally, some burners are delivered without a controller and all components are connected to a terminal block. The burner controller in this case does not form part of the burner's scope of delivery.

Commissioning

Commissioning must be carried out by trained and expert personnel only. For the wiring of the system, the relevant electrical diagram for the burner and all local standards and legal regulations must be observed.

The procedure described in the relevant operating instructions for the burner controller must be observed.

The burner controller has a burner-specific factory setting. At the time of initial commissioning, it must be checked whether the parameters have been appropriately configured to meet the requirements of the system. The actuators must similarly be checked for correct adjustment.

During the I/O test, the manual gas shut-off valves must be kept closed at all times. It is not permitted to extend fixed safety times using external circuitry.

Start-up

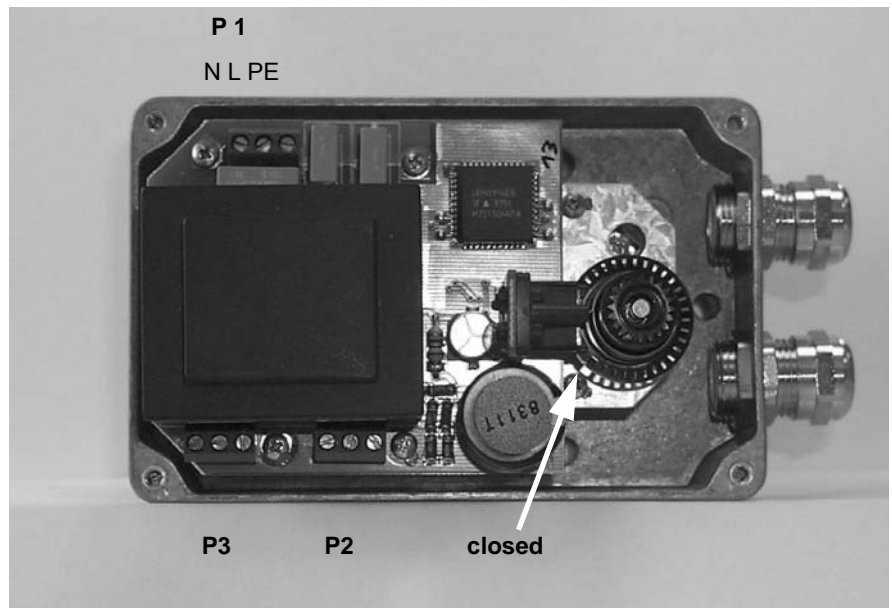
Servo motor type SAD 15 Electrical actuator STM 40

The electronic compound control system type BCS makes use of digitally activated servomotors type SAD 15. These consist of a stepping motor with electronic trigger and power pack. A driver with digital feedback via encoder disk is provided for monitoring the function and direction of rotation. Take care to observe the instruction for operation for the burner control system type BCS 300.

The connection is documented in the wiring diagram for burners.

NOTE: Check the zero position of the servomotors prior to start-up.

Technical documentation:
BCS 300, Dungs



The STM 40 servomotor is used in conjunction with various electronic compound control systems. Priority with products supplied by "Lamtec" (Etamatic, Etamatic OEM, VMS, FMS). With some types of burner, the motor is also used as a servomotor for other servo components independently of the compound control system (e.g. nozzle linkage safety adjustment). Please refer to the appropriate section of the operating instructions.

The electrical diagram for the burner shows how to establish the servomotor's electrical connection.

Observe the documentation issued by the manufacturer.

Technical data:

Voltage:	230 V AC
Frequency:	50 Hz
Angle of rotation:	90°
Running time:	40 sec. for 90°
Torque:	15 Nm
Static holding moment:	8 Nm
Dimensions (a x b x c):	93 mm x 144 mm x 149 mm
Potentiometer (integrated):	5 kΩ

Start-up

Flame sensor

The flame sensor is a component of the flame monitoring system.

In interaction with the automatic combustion control unit, it suppresses stray flame during burner start-up and monitors the presence of flame during bur-

ner operation. Depending on the requirements of the burner and fuels, the flame sensor may be an optical sensor that monitors light radiation in the ultraviolet, infrared or visible spectrum emitted by the flame. In some gas burners, flame monitoring

is achieved by means of ionisation. In this case, no optical flame sensor is present.

The flame sensors used are listed in the table below.

Table: Flame sensor

Name	Spectral range	Area of use	Connection	Mode of operation	Producer	Note
D-LX 100 EK-S (IR)	IR	oil, gas, dual fuel burner	BCS	continuous service	Durag	LED display for settings and operating status, sensitivity setting
FFS 06	IR	oil, gas, dual fuel burner	EVR of the firm Lamtec (Etamatic, Etamatic OEM)	continuous service	Lamtec	Sensitivity setting
FFS 06 UV-1	UV	oil, gas, dual fuel burner	F 150 and Etamatic	continuous service	Lamtec	Sensitivity setting
QRA-2 KPL	UV	gas-, dual fuel burner	BCS, LFL1, LFE1	intermittent	Siemens	
QRA-53 C 27	UV	gas, dual fuel burner	BCS, LGK, LGI	continuous service	Siemens	
RAR-7	light	oil burner	BCS, LAL, LAE1, LOK 16, LAE10	continuous service	Siemens	

The appropriate type of flame sensor is selected based on the spectral range of the flame radiation, the mode of operation required and the burner controller used.

For the electrical connection, please refer to the electrical diagram and the supplementary information for the individual flame sensors contained in the manufacturer's documentation.

N.B.:

The flame sensors must be regularly inspected for dirt and cleaned as necessary. The sensor windows of the optical flame sensors must be kept free of dust. The ionisation rods must be checked for burn-up and replaced if necessary.

Start-up

Gas pressure switch Air pressure switch

Gas pressure switch A5



Gas pressure switch GW...A5/A6

The pressure switch can be used to monitor either falling pressure (min.) or increasing pressure (max.). Types GW...A5/A6 are EC-type-tested and certified in accordance with the EC Gas Appliances Directive and EC Pressure Equipment Directive. Class "S" as defined by EN 1854 and TÜV-tested as a pressure switch of special type for use in heating installations of steam and hot-water boilers in accordance with TRD 604 and VdTÜV information sheet pressure 100/1.

The nominal value (switch point) is adjusted using an adjustment wheel with scale.

Use:

GW ... A5 for dual solenoid valves
GW ... A6 for individual solenoid or motor valves

Technical data:

Type of gas:
Gases according to DVGW Worksheet G 260/1, gas families 1, 2, 3

Degree of protection: IP 54

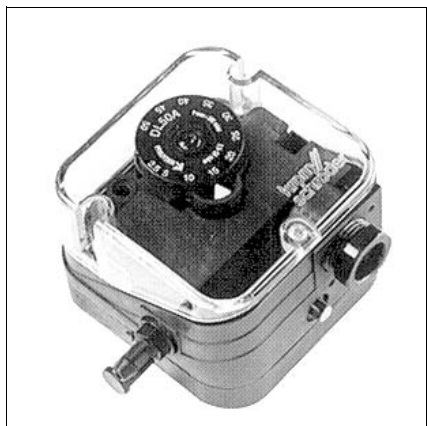
Ambient temperature: -15°C to +60°C

Mounting position: any

Operating pressure up to:
GW 50/150 A5/A6 500 mbar
GW 500/ A5/A6 600 mbar

Adjusting range:
GW 50 A5/ A6 5-50 mbar
GW 150 A5/ A6 10-150 mbar
GW 500 A5/ A6 100-500 mbar

Gas pressure switch A6

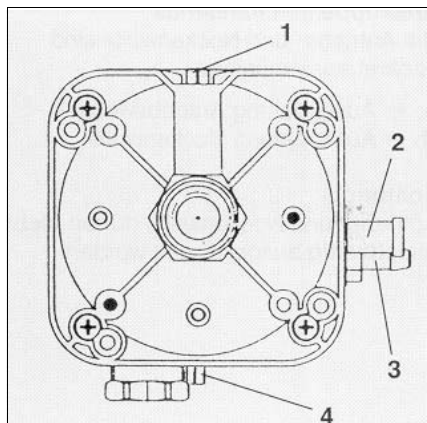


Air pressure switch

The air pressure switch is provided for monitoring the pressure of the combustion air fan. The pressure switch DL 50A has been designed for switching on, off or over an electric circuit in the case of changes of the actual pressure levels from the set-point setting. The pressure switch DL 50A can be used as overpressure, vacuum or differential pressure monitor for air and non-aggressive gases but not for gases according to DVGW Worksheet G 260/I.

Certification

The pressure switch is registered by CE/DIN-DVGW.



Determining the differential pre-flushing pressure and adjusting the differential pressure switch

- Burner in the pre-aeration phase.
- Measure pressure on test connection (2).
- Measure vacuum on test connection (3).
- Add the measured pressures.
- Set the scale to 90% of the calculated value.

Switch function test

Test buttons are provided to check the switch functions for proper operation (with safety cut-out and interlock). The burner is normally run in partial-load condition when testing the safety functions. On pressing button (4) the vacuum will be removed which causes the differential pressure to drop below the required level. If it is necessary to test the pressure switch functions under full-load conditions this may be done by pressing button (1).

Start-up

Adjustment Combination controls CG 15 -30



Combination controls CG 15-30

Complete with strainer, two safety valves (Class A) and servogovernor for maximum control accuracy

Application

The combination controls are type-tested and certified pursuant to the Gas Appliance Directive (90/396/EEC) in conjunction with EN 126 and EN 12067-1.

General technical data

Type of gas: natural gas, propane and butane gas.

Inlet pressure range: 10 to 360 mbar.

Ambient temperature: -15 to +60°C.

Storage temperature: -20 to +80°C.

Threaded connection: Rp to ISO 7-1 .

Pressure test points at the inlet downstream of the strainer and at the outlet.

Housing parts: AISi.

Diaphragms: Perbunan.

Strainer: plastic.

Option:

- With four connections and screw plugs on both first and second valve (e.g. for connection of a pressure switch or pilot gas).

- May also be supplied prepared for tightness control TC 1 .

Connections on

1st valve: 1/8"

2nd valve: on CG 15,20: 1/8",
on CG 25,30: 1/4".

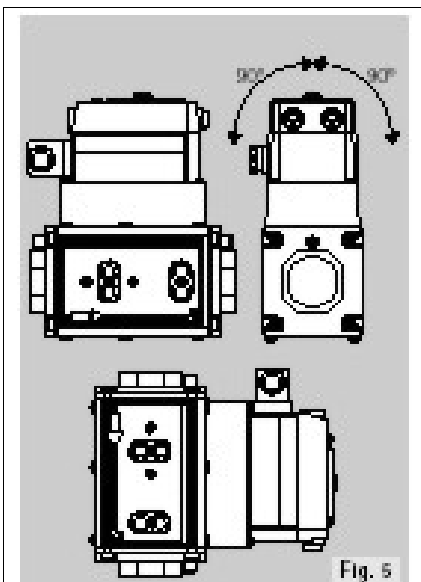
Function

The incorporated, power-saving linear compressor increases the inlet gas pressure level for opening and controlling the valves. In conjunction with the servogovernor, this results in a high control accuracy over a wide inlet pressure range up to 360 mbar at low control pressures and with only slight pressure difference between inlet and outlet pressure.

The first valve can be controlled separately (e.g. in conjunction with a pilot gas supply connection in the intermediate space).

Features

CG ... D1 with constant governor



Safety valves (Class A) with spring-loaded valve disc, normally closed (when de-energised).

Switching frequency: any.

Persistence time: approx. 0.5 seconds.

Full opening time: max. 10 seconds.

Closing time: ≥ 1 second.

Mains voltage:

230 V AG, +10/-15 %, 50/60 Hz,

24 VAG, +10/-15 %, 50/60 Hz.

The electrical power is the same on switch-on and in continuous operation: 20 VA, 17 W. CG for TC 1: 22 VA, 19W.

Duty cycle: continuous duty (100 %).

Enclosure IP 54 to IEG 529.

Fusing: max. 6.3 A slow-blow.

Electrical connection:

ISO 4400 plug with connection type:

Pg 11.

Installation

Fitting position:

CG..D1, D2, Z (Fig. 5)

in vertical pipework: any,

in horizontal pipework: tilted up to max. 90° to left/right, not upside down.

Start-up

Adjustment Combination controls CG 15 -30

Adjustment

After fitting, the governor must be checked for proper functioning in conjunction with the gas consuming installation, because the governor set-point set at the factory might not be the same as the setpoint required for the gas consuming installation.

- The scale readings are approximate.
- All adjustments are to be carried out with a 2.5 mm!

Governor CG..D1

The gas outlet pressure p_G can be set from 1 to 20 mbar (standard) or 4 to 50 mbar (CG.-50), being pre-set at the factory to: $p_G=10$ mbar.
Pre-setting:

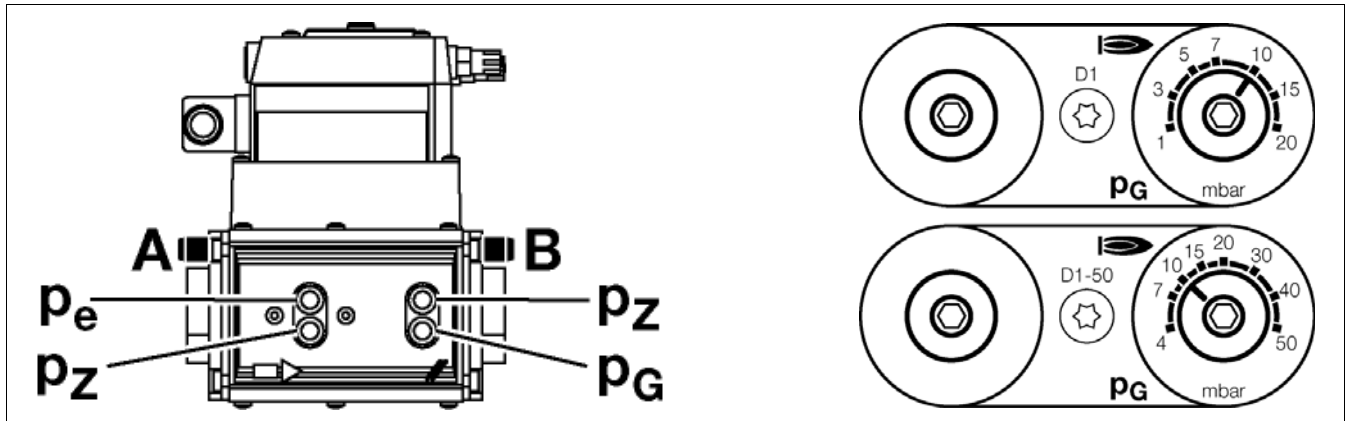
- Measure gas pressure p_G at test point B.
- Set gas pressure at p_G in accordance with the burner manufacturer's specifications and flue gas analysis.
- Set pressure switch for gas (see below).
- Close off all test points.

Testing control capacity

Set burner to high fire.

Measure gas pressure at A and B. Slowly close manual valve up-stream of the combination control until the gas inlet pressure at A drops by 2 mbar.

- The gas outlet pressure at B should not drop by more than 10%. Otherwise, the settings should be re-checked and adjusted. If the control capacity is insufficient, the device may not be operated.
- Open manual valve.



Start-up

Exhaust gas test

Exhaust gas test

To ensure an economically efficient and trouble-free operation of the system it will be necessary to adjust the burner specifically in accordance with the furnace system. This is achieved by means of a fuel-combustion air compound control unit which adjusts the burner to ensure a proper combustion. Exhaust gas tests are required for this purpose. The percentage CO₂ and O₂ and the exhaust gas temperature will have to be measured to determine the efficiency and combustion quality. Prior to any measurement make sure to check the boiler and exhaust gas system for absence of leaks.

Secondary air will falsify the measured results

Check that the exhaust gases have a residual oxygen (O₂) content as low as possible and a carbon dioxide (CO₂) content as high as possible. The carbon monoxide content of the

exhaust gases must be below the currently applicable specifications in all load stages.

In the fuel oil combustion mode the permissible soot number in the exhaust gas is not allowed to be exceeded.

Determining the volumetric gas flow rate

The thermal furnace output of a boiler (Q_F) is the amount of heat supplied with the gas in a unit of time.

When taking the burner into operation the volumetric fuel flow rate should be selected according to the nominal thermal capacity of the boiler.

Example:

Nom. thermal output	Q _N	1000 kW
Boiler efficiency	η _K	0,88
Calorific value of gas	H _U	9,1 kWh/m ³
Gas pressure	p _u	100 mbar
Barometer reading	p _{amb}	980 mbar
Gas temperature	t _{gas}	15 °C
Standard pressure	p _n	1013 mbar

$$Q_F = \frac{Q_N}{\eta_K} = \frac{1000}{0,88} = 1136 \text{ kW}$$

Volumetric gas flow rate at STP:

$$V_{Bn} = \frac{Q_N}{H_U \cdot \eta_K} = \frac{1000}{9,1 \cdot 0,88} = 125 \text{ m}^3/\text{h}$$

Volumetric gas flow rate in operating condition:

$$V_{BB} = V_{Bn} \cdot \frac{T}{273} \cdot \frac{p_n}{p_{amb} + p_u} = \text{m}^3/\text{h}$$

$$= 125 \cdot \frac{273 + 15}{273} \cdot \frac{1013,25}{980 + 100} = 123,9 \text{ m}^3/\text{h}$$

Ratio between O₂ - and CO₂- for natural gas H (CO_{2max}=11,86%)

$$O_2 = 21 \times \frac{CO_{2max} - CO_{2gem}}{CO_{2max}} = \%$$

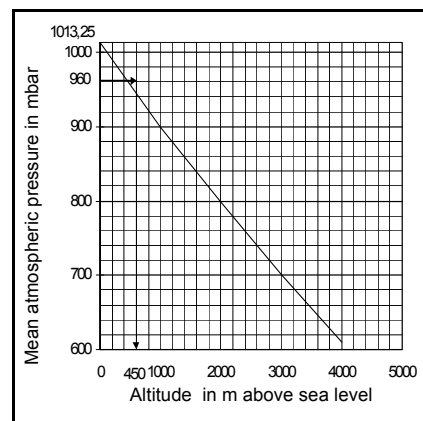
%O ₂	%CO ₂	%O ₂	%CO ₂
0,00	11,86	3,00	10,16
0,10	11,80	3,10	10,10
0,20	11,75	3,20	10,04
0,30	11,69	3,30	9,99
0,40	11,63	3,40	9,93
0,50	11,58	3,50	9,87
0,60	11,52	3,60	9,82
0,70	11,46	3,70	9,76
0,80	11,41	3,80	9,70
0,90	11,35	3,90	9,65
1,00	11,29	4,00	9,59
1,10	11,24	4,10	9,53
1,20	11,18	4,20	9,48
1,30	11,12	4,30	9,42
1,40	11,07	4,40	9,36
1,50	11,01	4,50	9,31
1,60	10,95	4,60	9,25
1,70	10,90	4,70	9,19
1,80	10,84	4,80	9,14
1,90	10,78	4,90	9,08
2,00	10,73	5,00	9,02
2,10	10,67	5,10	8,97
2,20	10,61	5,20	8,91
2,30	10,55	5,30	8,85
2,40	10,50	5,40	8,80
2,50	10,44	5,50	8,74
2,60	10,38	5,60	8,68
2,70	10,33	5,70	8,63
2,80	10,27	5,80	8,57
2,90	10,21	5,90	8,51

Ratio between O₂ - and CO₂ - for light oil EL (CO_{2max}=15,40%)

% O ₂	% CO ₂	% O ₂	% CO ₂
0,00	15,40	3,00	13,19
0,10	15,33	3,10	13,12
0,20	15,25	3,20	13,04
0,30	15,18	3,30	12,97
0,40	15,11	3,40	12,89
0,50	15,03	3,50	12,82
0,60	14,96	3,60	12,75
0,70	14,88	3,70	12,67
0,80	14,81	3,80	12,60
0,90	14,74	3,90	12,53
1,00	14,66	4,00	12,45
1,10	14,59	4,10	12,38
1,20	14,52	4,20	12,31
1,30	14,44	4,30	12,23
1,40	14,37	4,40	12,16
1,50	14,29	4,50	12,08
1,60	14,22	4,60	12,01
1,70	14,15	4,70	11,94
1,80	14,07	4,80	11,86
1,90	14,00	4,90	11,79
2,00	13,93	5,00	11,72
2,10	13,85	5,10	11,64
2,20	13,78	5,20	11,57
2,30	13,71	5,30	11,49
2,40	13,63	5,40	11,42
2,50	13,56	5,50	11,35
2,60	13,48	5,60	11,27
2,70	13,41	5,70	11,20
2,80	13,34	5,80	11,13
2,90	13,26	5,90	11,05

Mean barometer readings

	Sea level [m]	Mean barometer [mbar]
Aachen	205	991
Berlin	50	1009
Dresden	120	1000
Erfurt	315	978
Frankfurt/M.	104	1004
Hamburg	22	1011
Cologne	45	1009
Leipzig	130	998
Magdeburg	79	1005
Munich	526	955
Nuremberg	310	980
Rostock	4	1013
Stuttgart	297	984
Schwerin	59	1010
Ulm	479	960



Start-up

Exhaust gas test

Flue gas loss

Flue gas loss caused by free heat arises as a consequence of the temperature difference between the fuel-air mixture entering the combustion chamber and the gases that leave it. The higher the air surplus and thus the greater the flue gas volume, the higher the loss.

It is calculated as follows:

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

q_A = flue gas loss in %

t_A = flue gas temperature in °C

t_L = combustion air temperature in °C

CO_2 = carbon dioxide content in %

	Fuel oil EL	Fuel oil S	Natural gas	City gas	Liquid gas
$A_1 =$	0,50	0,490	0,370	0,350	0,420
$B =$	0,007	0,007	0,009	0,011	0,008

Examples:

Measured values in natural gas operation:

CO_2 content of the flue gases 10.8 %

Flue gas temperature 195 °C

Air intake temperature 22 °C

Flue gas loss is calculated thus:

$$q_{Af} = (195 - 22) \cdot \left(\frac{0,37}{10,8} + 0,009 \right) = 7,48\%$$

Measured values in fuel-oil operation:

CO_2 content of the flue gases 12.8 %

Flue gas temperature 195 °C

Air intake temperature 22 °C

Flue gas loss is calculated thus:

$$q_{Af} = (195 - 22) \cdot \left(\frac{0,49}{12,8} + 0,007 \right) = 7,83\%$$

Servicing instructions

Burner maintenance

To ensure a high operational readiness, functionality, safety and economic efficiency, the user should have the boiler system inspected by an authorized person of the manufacturer or other specialist once a year. The whole system must be checked for proper operation and faults detected should be rectified without delay. It is advisable however to make another inspection of the system in addition to the one specified herein. The inspection should comprise the following work:

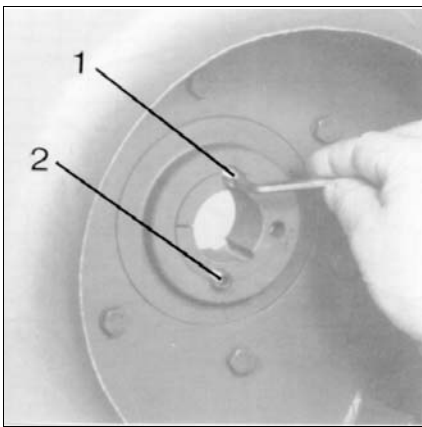
1. Inspect the boiler internals and insulating packages and replace by new ones if required. Check boiler for possible accumulation of dirt.
2. Remove the nozzle, check it and replace it by new one if required.
3. Clean the ignition electrodes.
4. Check the ignition electrode and spark functions and readjust if required.
5. Clean the burner interior and exterior.
6. Clean the fan impeller.
7. Check the fan impeller for possible deformation and cracks.
8. Clean the UV flame sensor.
9. Clean the filters and screens.
10. Check the electrical connections.
11. Check the burner head setting. Check the flat sealing between gas head and burner tube for absence of leaks.
12. Check the gas valves and instruments group for absence of leaks.
13. Check the gas valves for absence of leaks and clean condition.
14. Check the control equipment for proper operation, setting and safety period.
15. Check the pressure switch for proper setting and operation.
16. Clean the air damper and check for smooth operation.
17. Check the combustion process and make exhaust gas tests:
 - Fuel throughput rate adjustment
 - Heating chamber temperature (intake temperature)
 - Exhaust gas temperature
 - Pressure in combustion chamber and exhaust gas pipe
 - CO₂ and O₂ contents of exhaust gases
18. Enter measured data in test record.
 - CO test, soot test
 - UV sensor current measurement

N.B.: Before maintenance and adjustment work

- switch off the power supply to the system. Master switch to "OFF".
- Close all shut-off valves upstream of the burner.

Servicing instructions

Fan impeller



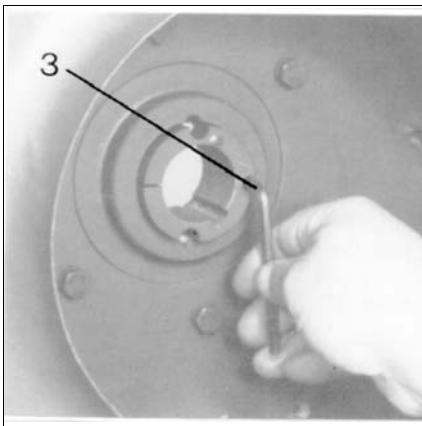
Note:

Prior to removing the fan impeller, the shaft or the fan impeller must be marked on the edge of the suction funnel so that the fan impeller is in the same position when reassembling, or the same overlapping of the suction funnel (dimension in Fig.) can be readjusted as initially. An axial displacement of the impeller on the shaft may result in a lower efficiency, thus having a reduced air flow.

Prior to removing the bush from the disk, the position of the bush in the disk must be marked so that a rotating against one another can be prevented. Rotating the bush deteriorates the balance of the fan impeller.

To demount the impeller, remove the screws (1) and (2), screw in one of them as separating screw into the hole (3) having half a thread in the bush and tighten it.

This causes the bush to loosen. Open the bush by means of a wedge if required. Remove the loose impeller ran without striking a blow and without damage by hand.



- Clean and degrease all bright-finished surfaces. A requirement for achieving a high slipping moment is always a **clean and fat free** surface of all parts to be fitted into one another.
- For reassembly: Place the disk and the bush into their initial position (without rotating) into one another, make sure that the holes are congruent.
- Screw the bush into or out from the disk until about 2..3 mm of the bush are protruding.
- For new installation: Mark the dimension x on the inside of the fan impeller.
- Mount the fan impeller onto the shaft. For this, open the bush by means of a wedge if required. Adjust the position to maintain the dimension x using the marking(s).
- Align the two opposing screws (1) and (2) and tighten them evenly step by step. In doing so, start with the first step of the torque (max. 10 Nm) by tightening one screw, then rotate the fan impeller by half a rotation and tighten the other screw with the same torque, afterwards rotate the fan impeller to the initial position. Increase the torque by one step and proceed until the specified torque is reached as described above. The torque steps should not be larger than 10 Nm.
- check the dimension X.

The following torques must be followed:

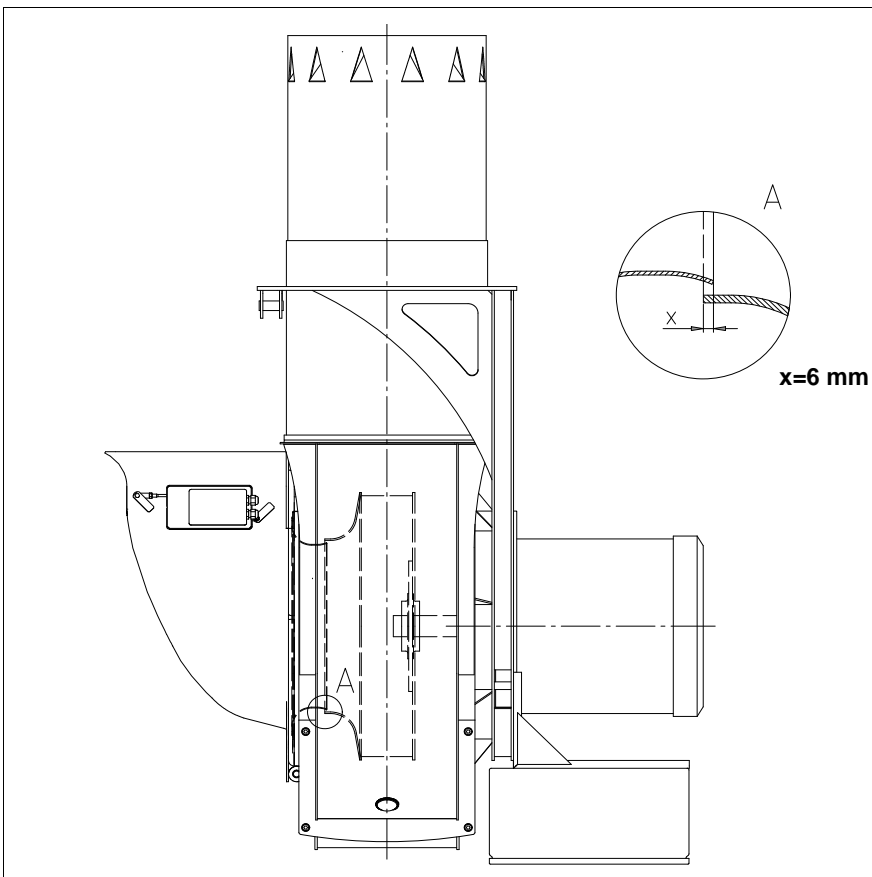
SM 25, Bushes No. 2517 – centre bore 42 and 48 mm:

Torque: 50 Nm.

WM30 Bushes No.3030 – centre bore 48 mm:

Torque: 90 Nm.

Overlapping of suction funnel above fan impeller: 6 mm



Trouble shooting instructions

Cause and removal of disturbance

Important note: defective safety boxes must always be replaced. It is prohibited to open them and attempt to repair them yourself.

In case of operating trouble it should be checked whether the system is in proper working order.

Make a check for the following:

1. Availability of fuel. Availability of gas in the line at sufficiently high pressure. Availability of fuel oil in the tank (for dual fuel burner). Correct position of fuel selector switch.

2. Availability of electric power in the burner system.

In any case of trouble proceed with checking the basic conditions for a proper operation of the boiler system:

1. Is electric power available?
2. Is fuel oil contained in the tank?
3. Is there any gas pressure?
4. Are the shut-off valves opened?
5. Are all control and safety instruments such as boiler thermostat, water supply failure cut-out, limit switches, etc. properly set?

1. Ignition failure

Cause	Remedy
Ignition electrode short circuit.	Adjust electrodes.
Wide ignition electrode spacing.	Adjust electrodes.
Dirty and wet electrodes.	Clean electrodes.
Cracked insulator.	Replace insulator.
Defective ignition transformer.	Replace transformer.
Defective automatic furnace controller.	Replace controller.
Burnt ignition cable.	Replace cable; search for cause and eliminate.
Pilot burner failure.	Adjust ignition gas pressure
Ignition gas valve does not open.	Search for cause and eliminate
Defective solenoid.	Replace

3. Proper functional order and setting of all control and safety instruments such as temperature controller, safety limiter, water failure cut-out, electrical limit switches, etc. If the trouble is not found to be due to any of the above-mentioned points it will be necessary to test the burner functions very carefully.

Prevailing conditions:

The burner will be found to be out of operation and in faulty and interlocked position.

2. Motor running failure

Cause	Remedy
Motor protection relay and fuses.	Check and replace if required.
Air pressure switch not changed over or defective.	Check and replace if required.
Defective motor.	Replace motor.
Defective power contactor.	Replace contactor.
Air fan motor starts but stops after 20-25 secs.	Check for solenoid leaks
Air fan motor starts, but stops after about 10 secs in pre-ventilating mode.	Air pressure switch fails to change over; replace switch if defective; clean switch if dirt has accumulated; check electrical connections.

3. Pump oil delivery failure

Cause	Remedy
Shut-off valves closed.	Open valves.

Proceed with searching for the cause of the trouble and eliminate it. Unlock the automatic furnace controller by pressing the fault eliminate key and start the burner.

Do not press the fault eliminate key longer than 10 seconds.

The start-up program will be initiated and should be carefully monitored. The possible cause of the fault may be quickly found by reference to the fault indicator of the automatic furnace controller and watching the start-up and operating program.

Filter blocked by dirt.	Clean filter or replace cartridge.
Filter leaks.	Replace filter
Oil lines leak.	Retighten screwed unions; tighten oil lines.
Suction valve leaks.	Remove and clean or replace.
Direction of rotation of pump.	Check irection of rotation.
Damaged gearbox.	Replace pump.
Reduced pump output.	Replace pump.
- Strong mechanical noise	
Pump takes in air	Retighten screwed unions.
High vacuum in oil pipe	Clean filter; fully open valves.
For heavy oil: Incorrect oil temperature.	Check pre-heater: thermostat setting, dirt

Trouble shooting instructions

Cause and removal of disturbance

4. Unsteady atomization

Cause	Remedy
Loosened nozzle.	Tighten nozzle
Hole partly clogged.	Remove and clean or replace.
Worn by long-time use.	Replace by new one.
-Oil flow blokage :	
Due to clogged nozzle.	Remove and clean.
Nozzle leaking.	Replace nozzle.
Shut-off valve in nozzle rod leaking.	Replace valve.

5. No response to flame by automatic furnace controller with flame sensor

Cause	Remedy
Dirty flame sensor.	Clean flame sensor.
Burner fails to start.	Check connection of automatic furnace controller.
Trouble lamp lights; flame trouble.	Unlock and search for cause
UV-Radiation too weak.	Check combustion setting.
Burner starts without flame formation.	Defective coil or rectifier.
Solenoid valve fails to open.	Check connection.
Lack of gas or gas pressure too low.	Check gas pressure controller, gas valve, gas filter. Is the equipment gas cock open?

6. Mixing unit gives poor combustion data

Cause	Remedy
Incorrect settings.	Correct settings.
Incorrect mixture ignition unit.	Replace unit.
Nozzle too large or too small.	Replace nozzle.
Incorrect angle of spray.	Replace nozzle.
High or low combustion air flow rate.	Readjust burner.
Furnace chamber not sufficiently ventilated.	Furnace chamber to be ventilated through a non-closed opening with a cross section of min. 50 % of all chimney cross sections of the furnace system. Take care to observe the application regulations.

7. Solenoid valve fails to open

Cause	Remedy
Defective coil.	Replace coil.
Defective automatic furnace controller.	Replace automatic furnace controller.
Valve does not close tightly; dirt accumulated on sealing surfaces.	Open valve; remove foreign matter; replace valve if required.

8. Cleaning and lubricating instructions

Depending on the amount of dirt introduced by the combustion air it will be necessary to clean the fan impeller, ignition electrodes, flame sensors and air dampers as required.

For burner with mechanical compound controller:
Lubricate the ball heads of the compound controller setting screws with grease.

The bearing points of the burner moving parts require no maintenance. Damages of ball bearings should be detected and eliminated at an early stage to avoid greater subsequent trouble. Listen to the motor bearing noise to identify possible irregularities.

Manufacturer's declaration

Elco Burners GmbH

Herbert-Liebsch-Str. 4a
01796 Pirna

Phone: 03501/795-30
Fax: 03501/795-502

Manufacturer's Declaration Monobloc Burners Type N10

Product designation: N10.10000
N10.12000
N10.14000
N10.16000

Design: G-E, GEU2, L-E, LEUF, GL-E, GLEUF

We hereby declare that the burners, as parts of the heat generation system, have been designed and manufactured in compliance with the below-mentioned relevant directives and standards. There is no homologation by one of the recognized testing agencies (Notified Bodies). In order to establish CE conformity of the product, the burners of this plant need to be separately tested. This may be done by a recognized testing agency along with the testing of the overall system.

The following directives and standards were taken into account in the design and manufacture of the products:

EU Directive	Applied standard	Form of future CE conformity certification
Gas Appliances Directive 2009/142/EC	DIN EN 676:2003+A2:2008	Homologation by appointed testing agency (Module B) Quality assurance (Module D)
Pressure Equipment Directive 97/23/EC	DIN EN 676:2003+A2:2008 Annex K DIN EN 267:2009 Annex K DIN EN 12952-8:2002 DIN EN 12953-7:2002	Homologation by appointed testing agency (Module B) Quality assurance (Module D)
Machinery Directive 2006/42/EC	DIN EN 676:2003+A2:2008 Annex J DIN EN 267:2009+A1:2011 Annex J	Own declaration (Module A)
Low-voltage Directive 2006/95/EC	DIN EN 50156-1:2004	Own declaration (Module A)

We further declare that the product as delivered cannot be provided with a CE mark under the applicable EU directives as it is a component part to be incorporated in heat generation systems subject to testing.

The product will receive the CE mark and respective conformity certification when it passes the homologation at a later time. It can then be used on a heat generation plant without any further individual tests.


ppa. Hoffmann
Plant Manager


pp. Kretschmer
Manager R&D

Customer Service:

ELCO GmbH
D - 64546 Mörfelden-Walldorf

ELCO Austria GmbH
A - 2544 Leobersdorf

ELCOTHERM AG
CH - 7324 Vilters

ELCO Rendamax B.V.
NL - 1410 AB Naarden

ELCO Belgium n.v./s.a.
B - 1731 Zellik

ELCO Italia S.p.A
I - 31023 Resana (TV)