N6.2400 G-R
N6.2900 G-R
N7.3600 G-R
N7.4500 G-R

elco

Operating instructions

For specialist installation engineers

Gas burners ..... -

en

de, fr 4200 1030 7000
it, nl ..... 4200 xxxx xxxx

..... 4200 1028 8600

06/2010 - Art. Nr. 4200 1030 6900A

Overview

Contents

Important information
N6 and N7 G-R burners are designed for the combustion of natural gas. The design and function of the burners meet standard EN 676. They are suitable for use with all heat generators complying with standard within their respective performance range. Any other type of application requires the approval of ELCO.
Installation, start-up and maintenance must only be carried out by authorised specialists and all applicable guidelines and regulations must be complied with.

Burner description
N6 and N7 G-R burners are progressive mechanical fully automatic monoblock devices.
Emissions values may differ, depending on combustion chamber dimensions, combustion chamber load and the firing system (three-pass boilers, boilers with reverse firing). For specifying warranty values, the conditions for the measuring equipment, tolerances and humidity must be observed.

Packaging
The burner is supplied packaged in two boxes on a pallet:
- Burner with:
  - integrated switch cabinet
  - flange seal and securing screws
  - operating instructions, circuit diagram and spare parts list
- Compact gas train with integrated or external filter

The following standards should be observed in order to ensure safe, environmentally sound and energy-efficient operation:

EN 226
Connection of fuel oil and forced-draught gas burners to a heat generator

EN 60335-1, -2-102
Specification for safety of household and similar electrical appliances, particular requirements for gas burning appliances

Gas lines
When installing the gas lines and trains, the general directives and guidelines, as well as the following national regulations, must be observed:
CH: - G1 instruction text from SSIGE
- EKAS form no. 1942, liquefied gas directive, part 2
- Cantonal authority guidelines (e.g. directives for the pilot valve)
DE: - DVGW-TVR/TRGI

Installation location
The burner must not be used in rooms with aggressive vapours (e.g. hair spray, tetrachloroethylene, carbon tetrachloride), high levels of dust or high air humidity (e.g. laundry rooms).
If no connection to an air exhaust system is provided for the air supply, there must be a supply air inlet measuring:
DE: up to 50 kW: 150 cm^2
per additional kW: ; + 2.0 cm^2
CH: QF [kW] x 6= ...cm^2; but at least 150 cm^2.
Variations may arise as a result of local regulations.

Declaration of conformity for gas burners

We, certified company
Elco Burners GmbH, Herbert-Liebsch-Straße 4a, 01796 Pirna, Germany,
declare under our sole responsibility that the products
N6.2400 G-R
N6.2900 G-R
N7.3600 G-R
N7.4500 G-R

conform to the following standards
EN 50165
EN 12953-7
EN 12952-8
EN 61000-6-2
EN 61000-6-4
EN 676

These products bear the CE mark in accordance with the stipulations of the following directives

2006/42 /EC	Machinery directive
2004/108/EC	EMC directive
2006/95/EC	Low voltage directive
2009/142/EC	Gas appliances Directive
97/23/EC	Pressure Equipment Directive

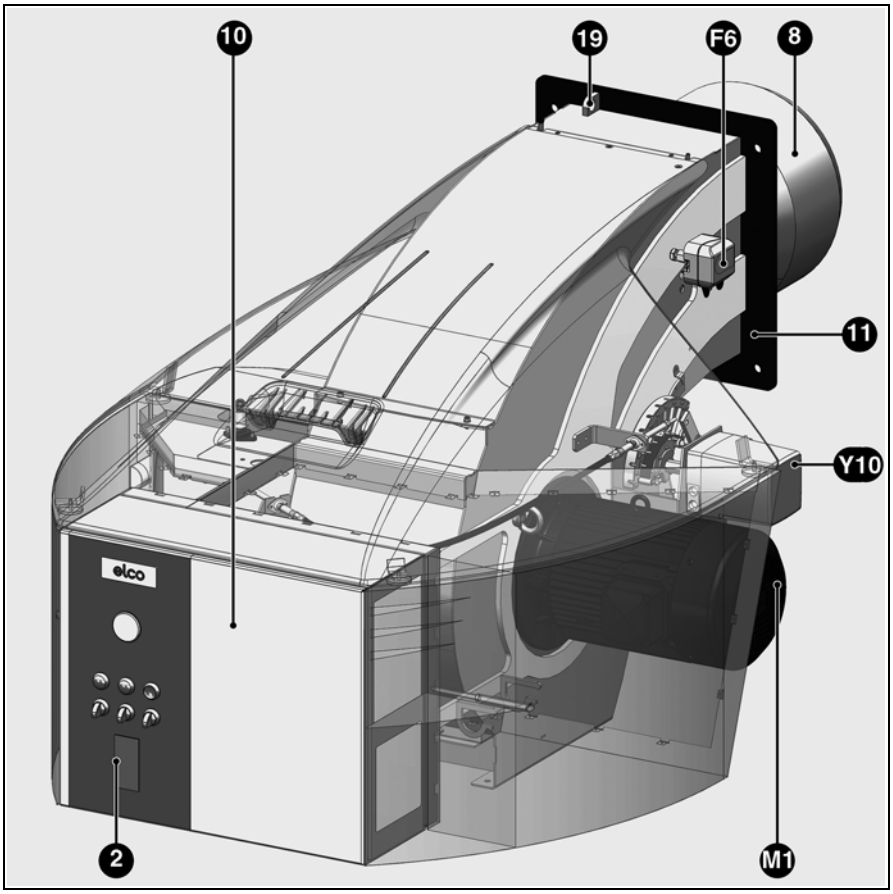
Pirna, 26th May 2010
D. HOFFMANN

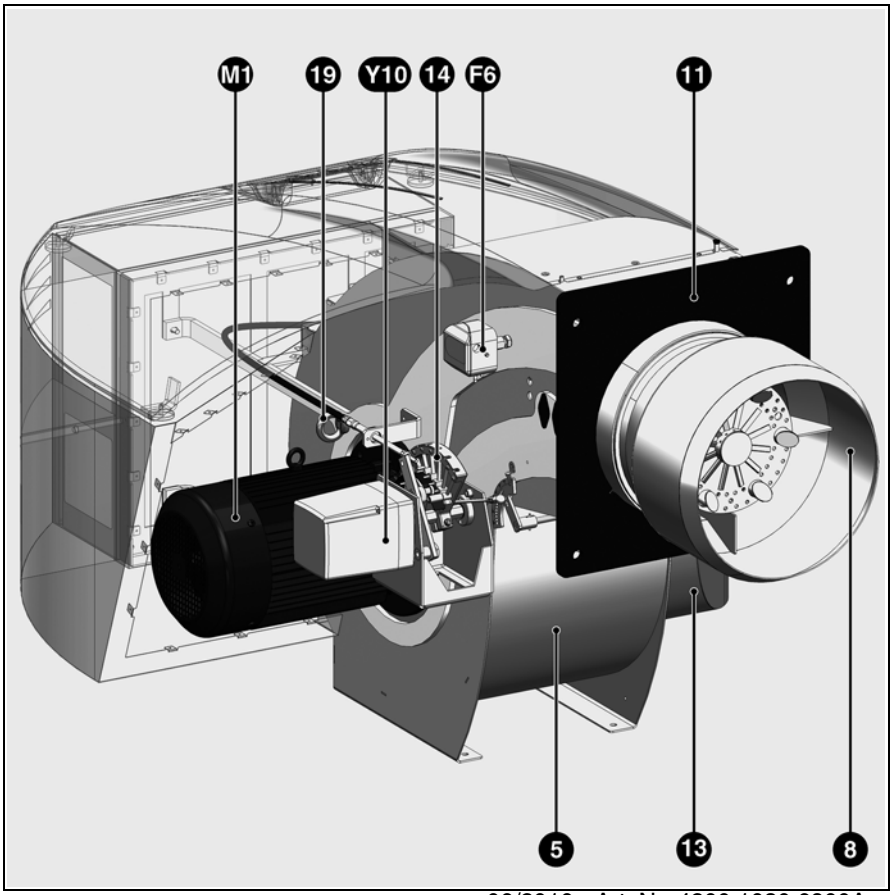
We accept no responsibility for damage arising from:
- inappropriate use.
- incorrect installation and/or repair on the part of the buyer or any third party, including the fitting of non-original parts.

Final delivery and instructions for use
The firing system fitter must supply the operator of the system with operating and maintenance instructions on or before final delivery. These instructions should be displayed in a prominent location at the point of installation of the heat generator, They should include the address and telephone number of the nearest customer service centre.

Notes for the operator
The system should be inspected by a specialist at least once a year.
Depending on the type of installation, shorter maintenance intervals may be necessary! It is advisable to take out a maintenance contract to guarantee regular servicing.

Burner description





2 Power controller (option)
5 Housing
6 Gas inlet flange
8 Burner flame tube
10 Integrated electrical cabinet
11 Burner fixing flange
13 Air intake box
14 Mechanical compound
19 Hoisting eyes
F6 Air pressure switch
M1 Blower motor
Y10 Actuator for air and gas dampers

Operation

Gas start-up mode
Gas operating mode
General safety functions

Gas start-up mode
As soon as the furnace system is required to supply heat, the burner control circuit will close and the program flow started. When the program has come to its end, the burner will be turned on.

An automatic test is made for the tightness of the gas valves prior to each burner start.

The air damper is in its closed position when the burner is out of operation.

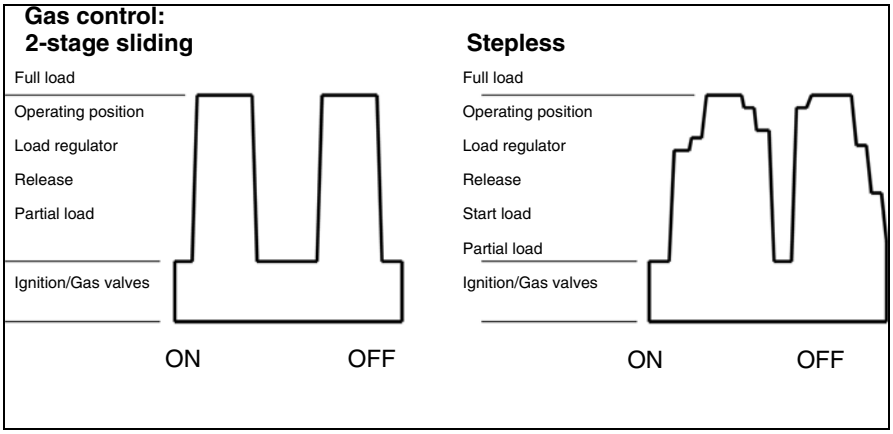
The electric actuator will open the closed air damper to its full-load position so that the burner will ventilate the furnace and the exhaust hoods with the specified air rate. Shortly after the pre-ventilation process has been started the lack-of-air cut-out must change over to operating position within a certain time, i.e. the minimum air pressure setting must be reached and maintained until the burner is turned off. At the end of the specified pre-ventilation time the air damper will be moved into its partial-load position in a linked control concept with the gas damper.

The ignition transformer is activated.

After the pre-ignition time, the main gas valves are open and the gas comes out from injectors where it is mixed in the combustion head with air coming from the fan. The ignition of the gas air mixture is done directly by a high voltage spark on a gas injector. During the safety time, a stable flame is formed and is monitored by an ionisation sensor. The ignition is stopped before the end of the safety time and the burner operates at its minimum power. The start-up programme is completed. After the safety period has run down the pilot burner will be turned off.

Gas operating mode
After the flame has developed the load regulator will be enabled which brings the burner into its operating position. The load regulator will now control the burner automatically between its partial-load and full-load stages. Depending on the heat demand, the electric actuator of the compound control system will be fed with the OPEN or CLOSE command via the regulator and thus increase or decrease the gas and air flow rates. This compound control system will vary the positions of the gas control valve and air damper and thus regulate the gas flow rate in a linked concept with the air flow rate. The burner can either be controlled by a 2-stage sliding or, if a respective controller is provided, a stepless control concept. The stepless control will allow the burner to be operated at any desired stage between its partial-load and full-load positions. The burner will always be turned off out of its partial-load position. The air damper will be closed when the burner is out of operation and will thus prevent cold air flowing through the burner chamber, heat exchanger and chimney. The interior cooling losses will thus be greatly minimized.

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-oft 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.

Fuel-air compound control
Gas valves and instruments group

Fuel-air compound control
This compound 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 two-stage sliding control concept the partial-load and full-load positions are within the control range. Depending on the heat demand these two load points will be selected in sliding mode. A larger fuel feed will not be suddenly turned on or off. In the stepless control mode the load will be controlled at any point within the control range depending on the heat demand. The two-stage sliding and the stepless control concepts are different only in the control systems used with the burners. The same mode of operation is used for both versions.

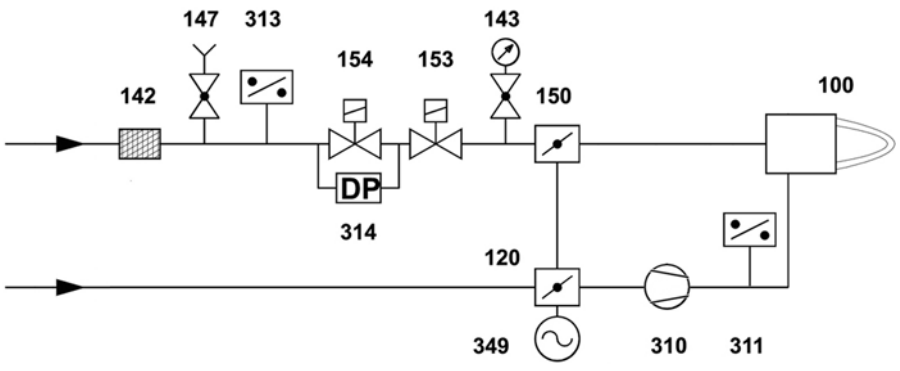
Mechanical compound control:
The compound control system will be operated by the steplessly reversible electric drive unit in dependence of the heat requirement. The air damper and the gas damper will be controlled by the same system.

To ensure an optimum air-to-fuel adjustment over the full control range, it will be possible to vary the position of the air damper by means of stud bolts incorporated in the compound controller.

Gas valves and instruments group
The gas valves and instruments group used with the furnace will be selected according to the specific requirements to be met by a burner system.

The following factors must be taken into account:
- burner output
- furnace back pressure
- gas pressure loss of the burner head
- gas pressure losses of the gas valves and instruments group

The total gas pressure loss must always be smaller than the available gas flow pressure.
NOTE: Use should only be made of gas valves and instruments that have been approved in accordance with the burner test specifications.

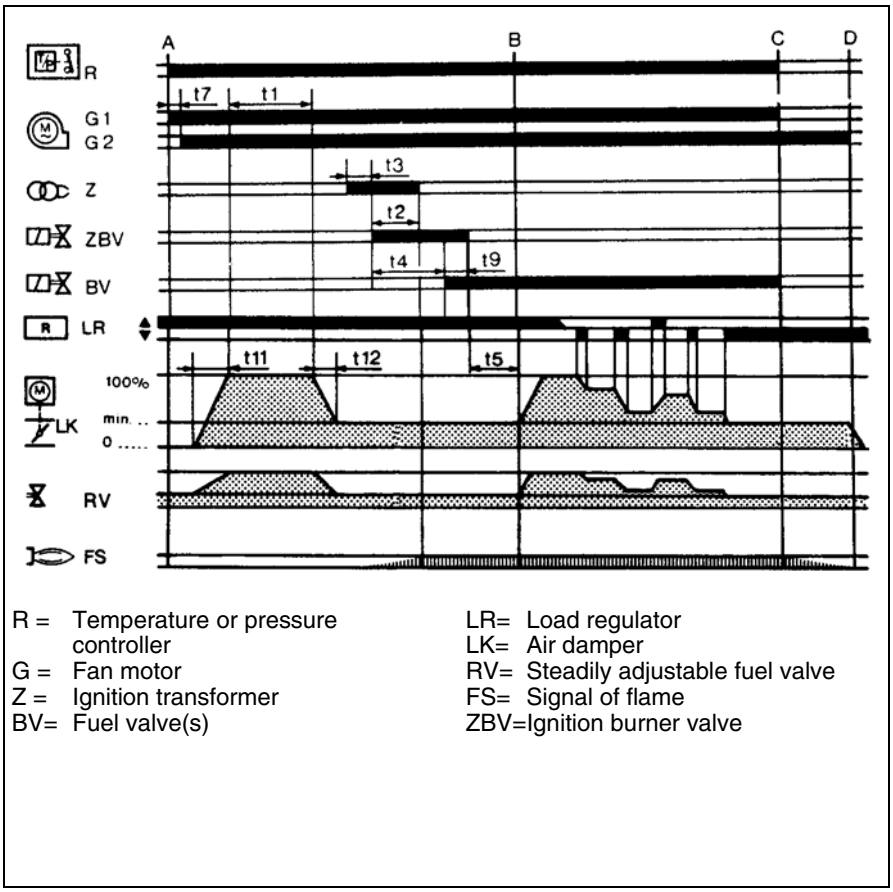


100 Burner
120 Air damper
141 Ball valve
142 Gas filter
143 Pressure gauge with stop valve
147 Test burner with stop valve (optional)
150 Gas damper
153 Main gas solenoid valve
154 Safety solenoid valve
310 Blower
311 Minimum air pressure switch
313 Minimum gas pressure switch
314 Leak test
349 Actuator

Automatic furnace controller LFL 1...

The LGK 16… type controller is designed to control and monitor burners working according to a stepwise or modulating principle. A detailed functional description with technical data and project planning information with respect to the automatic combustion controllers can be found in the annex and in the documents:

LFL 1...-7451 D

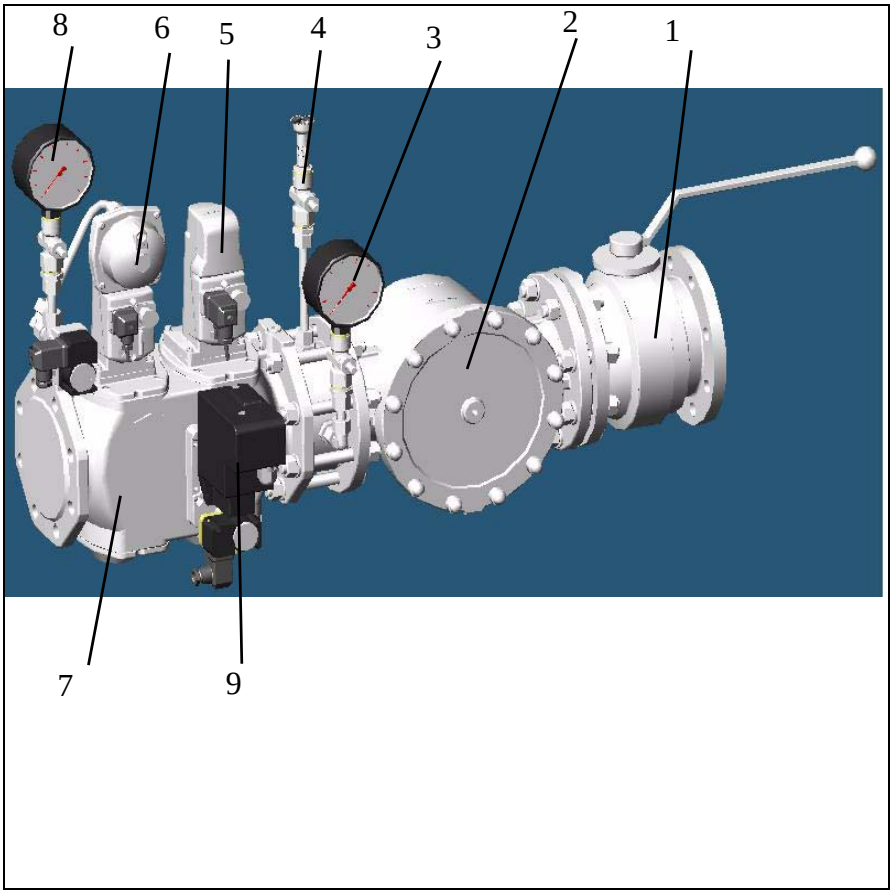


R = Temperature or pressure controller
G = Fan motor
Z = Ignition transformer
BV= Fuel valve(s)
LR= Load regulator
LK= Air damper
RV= Steadily adjustable fuel valve
FS= Signal of flame
ZBV=Ignition burner valve

Functional diagram LFL 1...

A = Starting type interval
A-B= Flame development interval
B = Burner has reached operating position
B-C= Burner operation (heat generation)
C-D= regular shut-off
t1 Pre-ventilating time
t2 Safety time
t3 Pre-ignition time
t4 Fuel valve enable
t5 Load regulator enable
t11 „OPEN“ run time of air damper
t12 „CLOSE“ run time of air damper

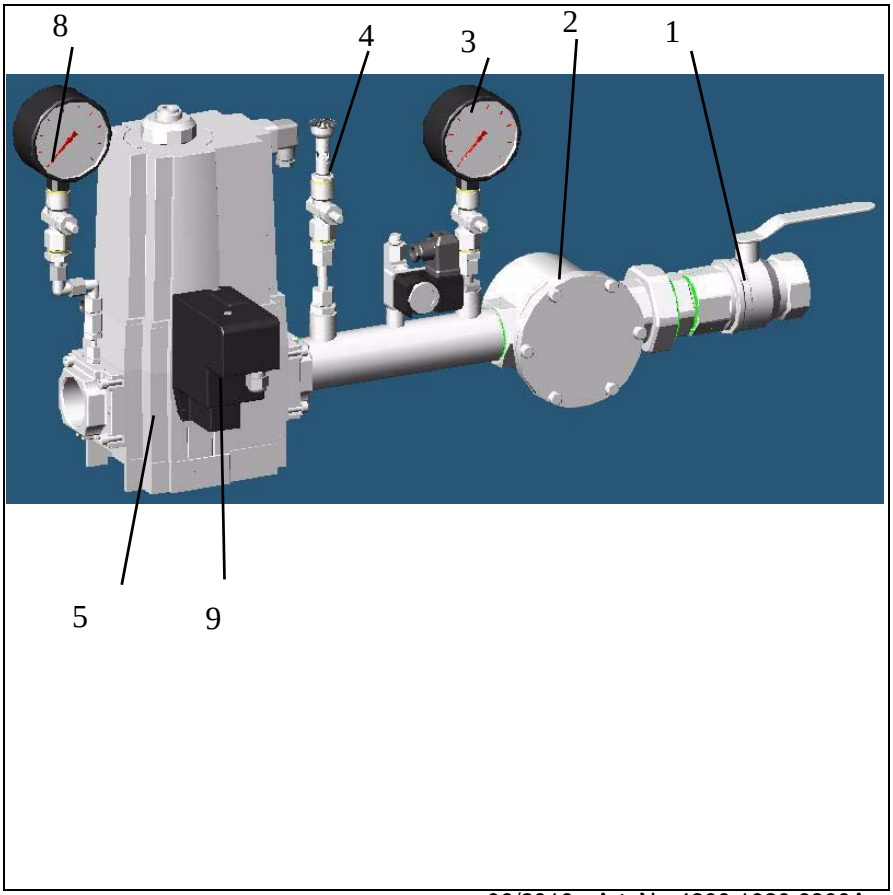
Gas valve VGD with SKP regulator
Gas valve MBC-SE



1 Gas ball valve
2 Filter (under the cover)
3 Gas manometer with push button (upstream)
4 Test burner with push button (option)
5 Servomotor SKP 15
6 Servomotor SKP 25
7 Gas main valve VGD..
8 Gas manometer with push button (downstream) (option)
9 Gas tightness control unit

Technical data

Input pressure	360 mbar max.
Ambient temperature	-15 to +60°C
Voltage	230 V/ 50 Hz max.
Protection rating	IP 54



1 Gas ball valve
2 Filter (under the cover)
3 Gas manometer with push button (upstream)
4 Test burner with push button (option)
5 Compact gas train (safety valve + main valve)
8 Gas manometer with push button (downstream) (option)
9 Gas tightness control unit

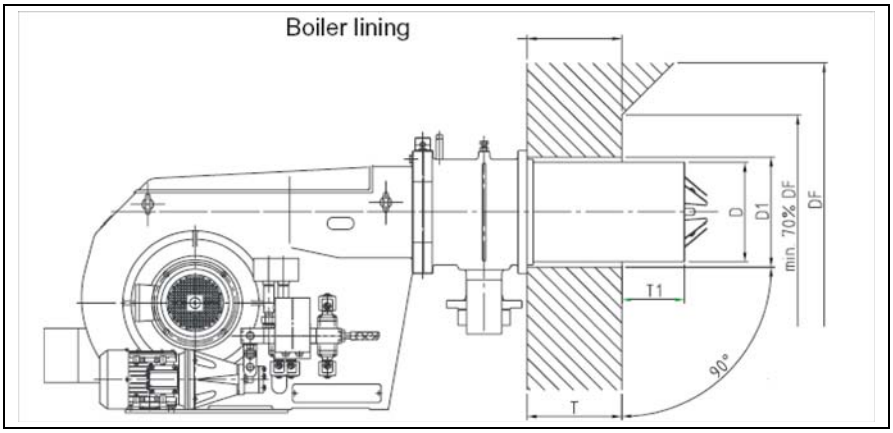
Technical data

Input pressure	360 mbar max.
Ambient temperature	-15 to +60°C
Voltage	230 V/ 50 Hz max.
Absorbed output (in operation)	250 W max
Protection rating	IP 54

Boiler lining for G-R burner

Boiler lining
The burner lining must be installed right-angled to the burner tube. Possible trimming work (bevelling, rounding) as required for reverse boilers, for example, should 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



D = see dimensioned drawings
D1 = see dimensioned drawings
DF = combustion chamber diameter
T1 > 80 mm
T = depth of boiler lining
(option: extensions of 130 and 260 mm)

Note for reverse flow boilers!
For reverse flow boilers the dimension T1 is only a recommended value. Depending on type of boiler the burner head must stand at least 50 mm ahead the opening for flue gas turning back.

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).

Provide for sufficient space to access the gas pressure switch adjustment.

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 Hun=kW/m³ (kJ/m³)
3. maximum CO2 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.**

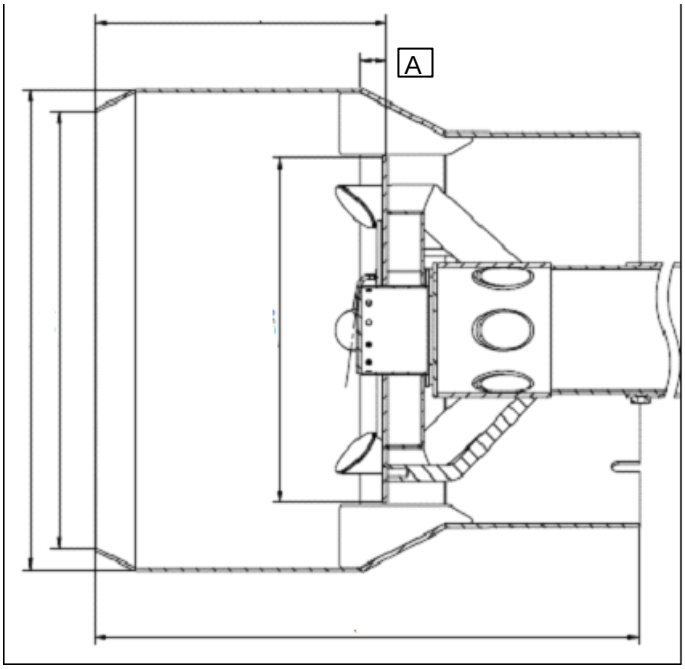
Leak test
The gas line upstream of the burner gas valves and instruments group must be installed in accordance with the applicable regulations, checked for absence of leaks, vented and certified accordingly by the gas installation company. The screwed unions and flanged joints must be checked for proper 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.

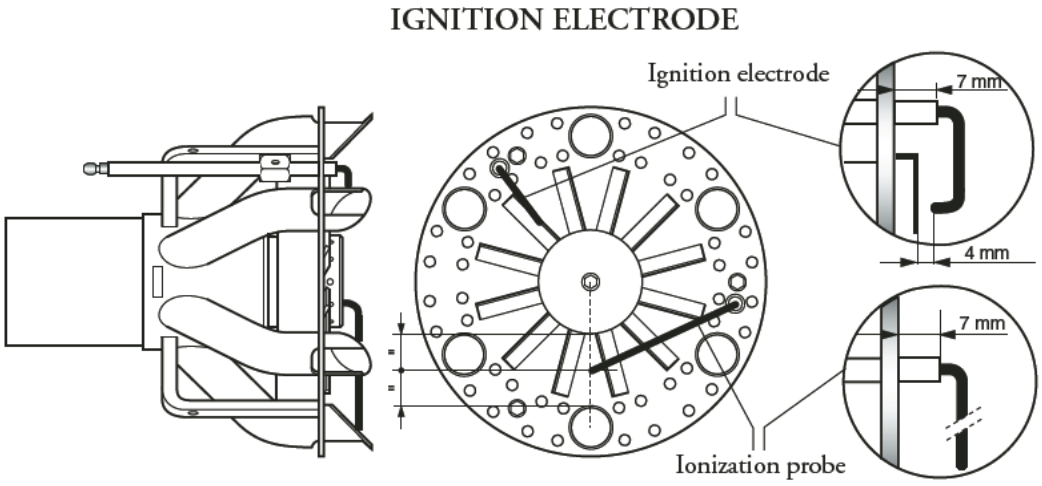
Support
The valves and instruments group must be supported with a telescopic jacking member or similar during and after installation (e.g. on filter and valve).

Joint
It is recommended to provide an easyto-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.

Checking the combustion components



Burner	Dimension A
N6.2400 G-R	0
N6.2900 G-R	19
N7.3600 G-R	50
N7.4500 G-R	10



Gas connection
Electrical connection
Checks before commissioning

General regulations applying to the gas connection

- The gas train must only be connected to the gas mains by a recognised specialist.
- The cross-section of the gas line should be of a size designed to guarantee that the gas flow pressure does not drop below the specified level.
- A manual shut-off valve (not supplied) must be fitted upstream of the gas train.
- In Germany, a thermally triggered shut-off valve (to be installed by the customer side) must be fitted as specified by the draft combustion ordinance.

It is the responsibility of the fitter or his representative to obtain approval for the system at the same time as the burner is commissioned. Only the fitter or his representative can guarantee that the system meets applicable standards and regulations. The fitter should be in possession of the corresponding official permit, and should carry out the corresponding sealing tests and purge the system of air.

All electrical installation and connection work must only be carried out by a suitably qualified electrician.

The applicable guidelines and directives must be observed, as well as the electrical circuit diagram supplied with the burner!

Electrical connection

- Check to ensure that the power supply is as specified (230V, 50 Hz single phase with neutral and earth)

Boiler fuse: 10 A

Electrical connection

It must be possible to disconnect the burner from the mains using an omnipolar shutdown device complying with the standards in force.

Burner motor connection

The burner is delivered for a power supply of 400V - 50Hz of triphase current with neutral and earth.
Connect the burner motor cable to the terminals in the electrical cabinet.
Check the direction of rotation of the ventilation motor manually with the burner contactor.

Connecting the gas train

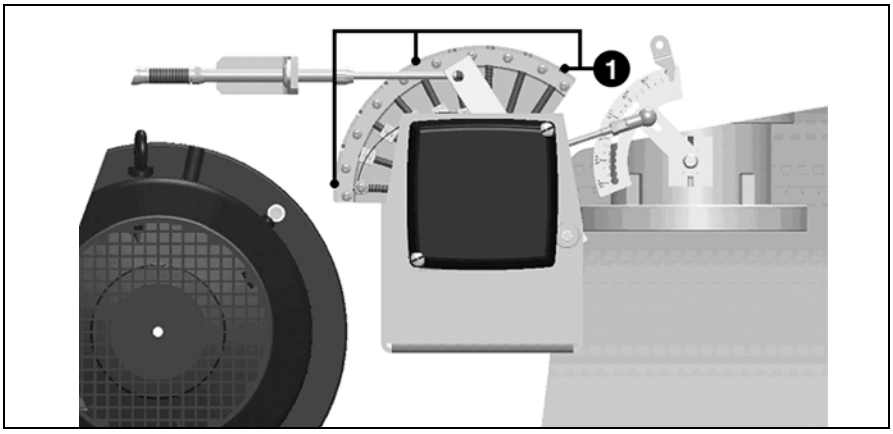
Connect the gas train to the plugs on the burner.

Checks before commissioning

The following must be checked before initial commissioning:

- That the burner is assembled in accordance with the instructions given here.
- That the burner is pre-set in accordance with the values in the adjustment table.
- Setting the combustion components.
- The heat generator must be ready for operation, and the operating regulations for the heat generator must be observed.
- All electrical connections must be correct.
- The heat generator and heating system must be filled with water and the circulating pumps must be in operation.
- The temperature regulator, pressure regulator, low water detectors and any other safety or limiting devices that might be fitted must be connected and operational.
- The exhaust gas duct must be unobstructed and the secondary air system, if available, must be operational.
- An adequate supply of fresh air must be guaranteed.
- The heat request must be available.
- Sufficient gas pressure must be available.
- The fuel supply lines must be assembled correctly, checked for leaks and bled.
- A standard-compliant measuring point must be available, the exhaust gas duct up to the measuring point must be free of leaks to prevent anomalies in the measurement results.

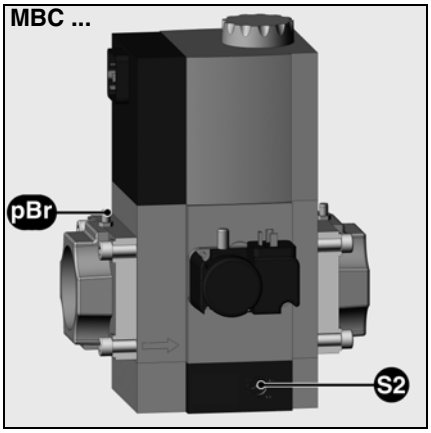
Burner power adjusting sequence



SQM actuator switch assignment		
Description	Pre setting	Function
I	130°	Max. power (air and gas)
II	0°	Closed flaps (air and gas)
III	20°	Gas min. power
IV	-	Not used
V	-	Not used

VGD ...

MBC ...



Setting sequence (short description)

- In electrical cabinet, set switch on "Manual (Manuell)" position, or "Manual operation" (Handbetrieb)"
- Adjust min. power switch (minimum flame power), for example on 20°
- Adjust max. power switch (maximum flame power) for example on 130°
- Check air shut-off switch (0°)
- Switch burner on
- Air flow-rate setting (min. power). Screws (Pos. 1) allow the combustion air flow-rate setting. Rotation to the left : less air. Rotation to the right : more air.
- Increase power gradually up to max. power, either using "higher - lower" ("Höher-Tiefer") switch, either by disengaging the actuator. During adjustment, continuously check emissions of CO, CO_2 and soot!
- Adjustment of max. power by setting the air flow-rate and adjusting the gas pressure. Adjust the max. power switch again. Burner power should never exceed the max. heat generator allowed flame power.

$$\dot{Q}_F = \frac{\dot{Q}_N}{\eta}$$

(see chapter entitled ''Exhaust gas test'')

- Decrease power gradually down to min. power using "higher - lower" ("Höher-Tiefer") switch, while accurately refining the air flow according to the new defined gas pressure.
- Register in a measurement report the main data (flow rates, power, gas pressure, air pressure, combustion values) for at least three power levels (min. power, intermediate power, max. power).
- Adjust min. power switch (minimum flame power) on the desired min. power.
- Switch burner off
- Set switch on "Auto" position
- If fitted : go on with the electrical modulating power controller setting

Gas pressure setting

Gas train VGD

- Remove protection cap on SKP25
- Set gas pressure **pBr** using screw **S1** (hidden by the cap)
- Check setting : position of the index in relation with the scale **X**

Gas train MBC

- Set gas pressure **pBr** using screw **S2**

Caution!
Gas output pressure (regulator output pressure) must be adjusted lower than the input pressure, but **higher than the total gas pressure loss of the heating plant.**

Mechanical compound
Electrical actuator
Limit switch setting

Technical data SQM actuator

Voltage	230 V -15% 50 / 60 Hz 240 V +10% 50 / 60 Hz
Power input	9 VA
Max. contact load	250 V 10 (3) A
Mounting position	as required
Ambient temperature	-20°C + 60°C
Protection classification	IP 54, DIN 40050
Weight	1,7 kg

	SQM10/11	SQM20/21
Running time at 130° turning angle	42 Sec.	66 Sec.
Torque	10 Nm	20 Nm

Description
The SQM actuator is intended for use with two-stage sliding or modulating oil, gas or dual-fuel burners. The reversible actuator is fitted with a synchronous motor which drives a shaft via a gearbox. The shaft end carries a coupling to drive the fuel and combustion air controlling element.

The SQM actuator has been designed for dual-wire control by controller or switching units with change-over contacts. Potentiometers can be installed for a range of applications on customer's request.
The 60 Hz frequency will reduce the running times by approx. 17 %.

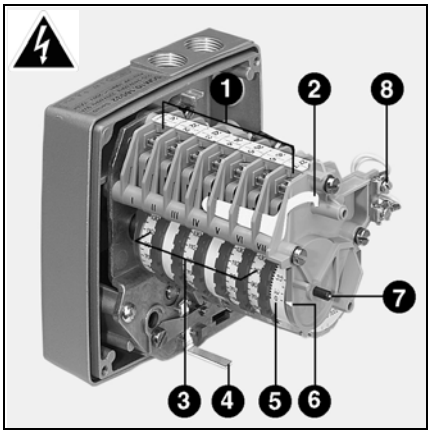
Limit switch factory setting

Description	Pre setting	Function
I	130°	Max. power (air and gas)
II	0°	Closed flaps (air and gas)
III	20°	Gas min. power
IV	-	Not used
V	-	Not used

The limit and auxiliary switches are set by means of manually adjustable latching cam plates. Scales are fitted between the disks to facilitate the selection of the switching points.
The cam plates are provided with a small pointer for indicating the switching point of a scale between the setting ranges.
An additional scale fitted to the end of the cam roller serves to indicate the position of the actuator.

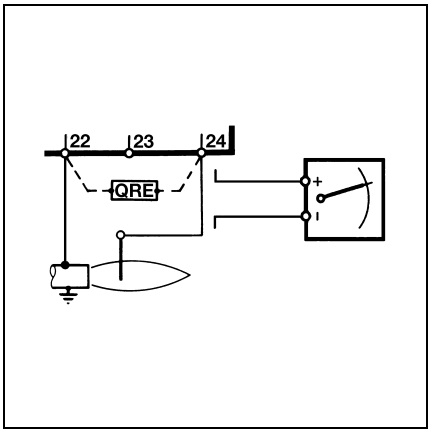
The drive unit may be disconnected from the controlling element by changing over a rocker arm mounted to the gearbox. This will allow any desired position of the controller plate to be selected by hand. Drive and output will be coupled in the vertical position of the rocker arm.

The fuel-air curve should be set over the full range of the cam plate so that operating safety will be retained also when the limit switch is overrun.



Positions
1 Terminals
2 Cam setting key
3 Scales for switching point setting
4 Rocker arm for uncoupling
5 Scale for actuator position
6 Actuator position indicator
7 Shaft end to fit a return potentiometer
8 Power supply

Monitoring of the flame by ionisation
Sensor current measurement



Ionisation monitoring
Detection of the flame using an ionisation device. Flame detection is achieved using the conductivity and the rectification effect of the hot flame gases. An alternating voltage is applied to the sensor (in refractory material), which is dipped into the flame. When a flame is present, the current (ionisation current) circulates and forms the flame signal. This signal is transmitted to the input of the flame signal amplifier. The flame signal amplifier is designed to react only to the continuity of the flame signal. This eliminates the possibility for confusion of a potential short-circuit between the sensor electrode and earth with a flame signal (as an alternating current would be used in this scenario). Use a microammeter to measure the signal (take into account the measurement range). This device is placed between the control box and the ionisation electrode. Make sure the polarity of the device is observed (see connection examples for the control box LFL 1…/LKG 16…).

During ionisation monitoring, it is important that the signal is transmitted without wastage. The connection cable must not lie adjacent to a multicore cable. A soiled sensor electrode bracket or faulty ceramics encourage leakage currents, which reduce the flame signal. The burner (as a counter electrode) must be earthed in conformity with the directives. If this is not the case, an ionisation current cannot flow. Earthing of the boiler only is often inadequate. The ionisation current must be monitored when the burner is set to ensure combustion hygiene, i.e. when switching from partial load to full load. The ionisation current must not fall below the minimum monitoring current required. A large drop in the ionisation current indicates either a lack or an excess of air. These malfunctions must be corrected using appropriate methods. A consistently high ionisation current indicates a stable flame and the correct combustion hygiene.

Sensor currents

Automatic controller	Minimum required	Maximum possible
* LFL 1...	6 µA	- µA
* LGK 16...	12 µA	100 µA

Recommended instrument range:
0 - 150 µA

* See technical data for automatic furnace controller LFL 1 / LGK 16...

Gas pressure switch
Air pressure switch

en

Gas pressure switch A5

Gas pressure switch GW...A5/A6
The gas pressure switch is designed to monitor the gas flow pressure. It can be used for monitoring either falling pressure (minimum) or rising pressure (maximum, specified for equipment according to TRD 604).
The types GW...A5/A6 may be used as pressure switches of specific design according to VdTÜV Leaflet "Pressure 100/1" for application in furnace systems complying with TRD 604. The setpoint (switching point) may be selected by means of a setting disk with scale.

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 +70°C

Mounting position: any

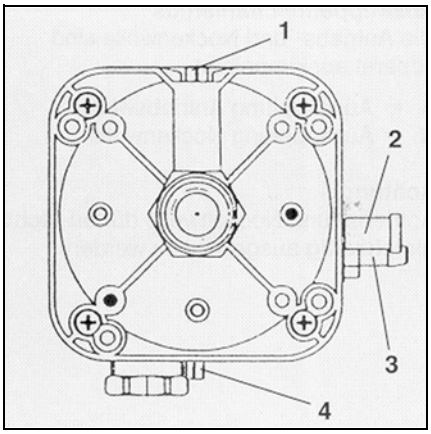
Operating pressure up to:
GW 50/150 A5A6 500 mbar
GW 500/ A5/A6 600 mbar

Gas pressure switch A6

Gas pressure switch setting
Remove the protective hood. Measure the gas flow pressure at full load. By subtracting approx. 20 % you will get the cut-off pressure. Proceed by turning the scale disk (item 1) until the desired cut-off pressure appears opposite to the arrow. Note that the scale readings are approximate values.
Then slowly close the gas stop valve until the desired cut-off pressure has been reached. Move the scale disk until the burner stops. Put the protective hood in place again and tighten bolts.

Air pressure switch
The air pressure switch is provided for monitoring the pressure of the combustion air fan.
The pressure switch „Dungs“ LGW 50 A4/2 has been designed for switching on, off or over an electric circuit in the case of changes of the actual pressure levels from the setpoint setting. The pressure switch LGW 50 A4/2 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 has been tested in accordance with DIN 3398 Part 2 and is registered by CE/DIN-DVGW. It has been registered in other important gas consumption countries.



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).

Description

Gas valves and instruments group type VGD
Technical data:

Types of gas:

Gas types of gas families 1, 2 and 3 according to DVGW Worksheet G 260/1

Max. inlet pressure:
500 mbar

Electrical connection: 230-240V, 50Hz

Protection classification: IP 54

Ambient temperature:
-15°C to +60°C

Description
The gas valves and instruments groups type VGD (screwed and flanged valves) are provided for gas supply, main shut-off, gas filtration and gas supply pressure control and monitoring. They can be used for all types of gases in the gas families 1, 2 and 3 according to Worksheet G 260/1. The valves and instruments groups are constructed as specified by EN 676 and DIN 4788, Part 2. All functional parts have been checked by individual tests and approved by a CE and DIN-DVGW registration number.
A detailed description of the valves and instruments used is contained in the Technical Datasheet for the Gas Valves and Instruments Groups Type VGD.
The premounted gas valves and instruments group is subjected to a leak test at the manufacturer's works.
For the installation and start-up of the gas pipes take care to observe the rules and regulations set forth by DVGW, especially DVGW-TRGI and TRF.

Specifications for the design, construction and safety features of gas furnace systems in heating installations are contained in DIN 4756 and TRD 412. Heating installations with higher operating pressures are subject to the DVGW Worksheets G 460 and G 461. The gas pipes must meet the specifications of DVGW-TRGI in the case of installations with operating pressures up to 100 mbar or higher than100 mbar.

Gas connection pressure
To ensure the proper functioning of the burner, a minimum connection pressure must be available.
The gas feed pipe to the burner must be dimensioned according to the throughput rate and the available pressure.
The nominal bore (DN) of the gas valves and instruments group must be selected on the basis of **the resistance of the boiler on its flue-gas side and the gas pressure loss of the burner and valves and instruments group.**

Gas valves and instruments group
The gas valves and instruments group may be connected directly to the gas supply line. **Care should be taken to install** the valves and instruments **in the specified order and according to the direction of flow** (arrow on housing). Prior to installation and operation, check the valves and instruments and the connecting elements for possible accumulated dirt particles and foreign matter. **To ensure proper conditions for start-up, the distance between the burner and the gas shut-off valve must be as low as possible.**

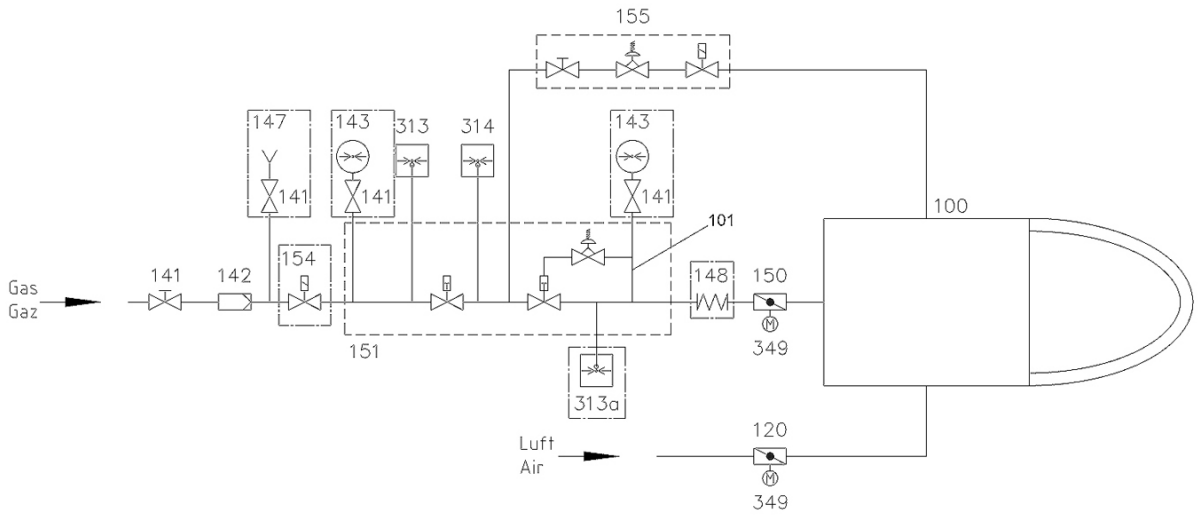
On completion of installation the gas valves and instruments group must be subjected to a leak test in accordance with DVGW Worksheet G 600 and G 490 in the furnace system.

Basic construction

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.

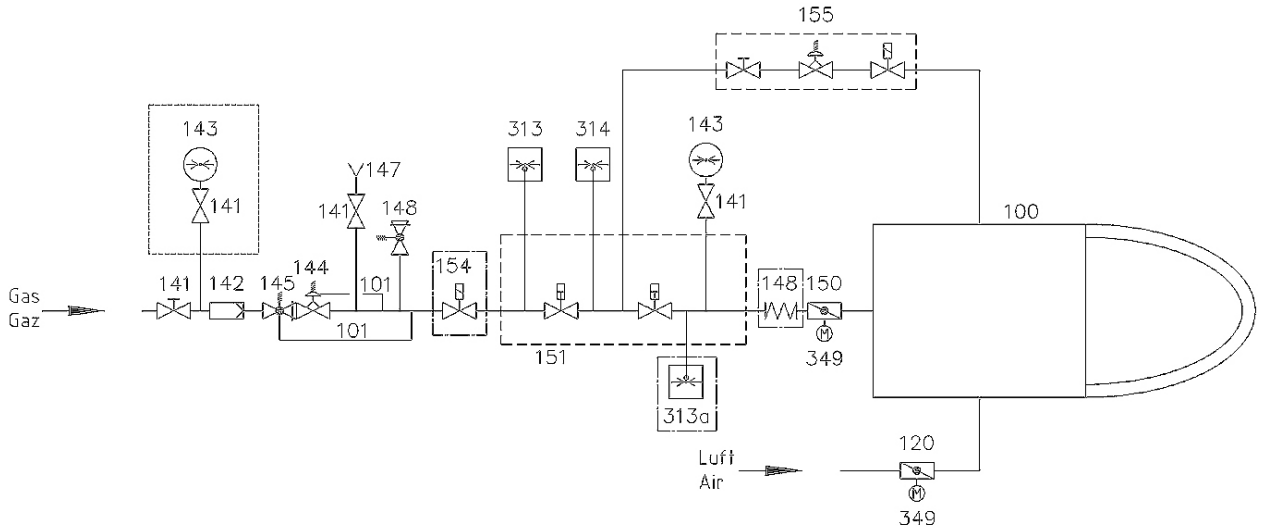
Low- and high-pressure gas trains
If the outlet side of the regulator, i.e. individual fittings and instruments downstream of the gas pressure regulator, has not been designed to be compatible with the maximum supply pressure that occurs in the event of a fault, the gas train must be equipped with a 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 highpressure 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.



100 Burner
101 Impulse pipe gas pressure
120 Air flap
141 Ball valve
142 Gas filter
150 Gas control butterfly
151 Gas double valve (Siemens system illustrated)
155 Ignition unit
313 Min. gas pressure switch
314 Gas pressure switch for valve leak check or valve leak checker
349 Actuator

Options in accordance with country-specific requirements:
143 Pressure gauge with pushbutton valve
147 Test burner with pushbutton valve
148 Compensator
154 Gas safety valve (additional)
313a Max. gas pressure switch

Basic construction



100 Burner
101 Impulse pipe gas pressure
120 Air flap
141 Ball valve
142 Gas filter
144 Gas pressure regulator
145 Safety shut-off valve (SSV)
148 Safety relief valve (SRV)
150 Gas control butterfly
151 Gas double valve with integrated gas pressure regulator (Siemens system illustrated)
155 Ignition unit
313 Min. gas pressure switch
314 Gas pressure switch for valve leak check or valve leak checker
349 Actuator

Options in accordance with country-specific requirements:
143 Pressure gauge with pushbutton valve
147 Test burner with pushbutton valve
148 Compensator
154 Gas safety valve (additional)
313a Max. gas pressure switch

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.

Basic construction

Installation and mounting of the gas filter
The gas filter may be installed in any desired position. Take care only to observe the direction of flow of the gas (arrow on filter housing). Make sure there is adequate clearance to facilitate the removal of the cover and replacement of the filter cartridge.

Filter replacement
The filter cartridge should be replaced by a new one as soon as a high pressure drop is noticed. If a new filter cartridge is not at hand it will be possible to wash the filter mat in 40°C water adding some light-duty detergent. Allow the mat to dry before reinstallation.

NOTE: For the installation of the filter mat take care to observe the marking or sticker.

Maintenance

Burner and boiler servicing must only be carried out by a professionally qualified heating engineer. The system operator is advised to take out a maintenance contract to guarantee regular servicing. Depending on the type of installation, shorter maintenance intervals may be necessary.

⚠

- Switch off the power supply before all maintenance and cleaning work.
- Use original spare parts.

Work recommended as part of annual burner maintenance:

- Burner test run, input measurement in the boiler room
- Clean the combustion components and replace defective parts if necessary
- Clean the fan wheel and the blower
- Clean the gas filter; replace it if necessary
- Visual inspection of the burner's electrical components; eliminate malfunctions if necessary
- Check burner start characteristics
- Leakage test
- Burner safety devices function check (air pressure/gas pressure switches)
- Flame monitor and automatic combustion control unit function check
- Commissioning the burner
- Check the gas flow
- Correct the adjustment values if necessary
- Draw up a measurement report

General checks

- Emergency stop button function check
- Visual inspection of gas lines in the boiler room

Checking the combustion components

- Remove the burner hood.
- Remove the screws **W** to remove the combustion components access cover.
- Remove the combustion components.
- Check the ignition electrodes and the ignition cables; replace if necessary.
- Clean the baffle plate.
- Check adjustments and settings during assembly.

Cleaning the fan

- Disconnect the motor by unplugging it from the power supply.
- Remove the motor.
- Thoroughly clean the fan.
- Do not use pressurised materials.
- Reassemble.

Maintenance

Filter replacement
- The filter element of the must be checked at least once a year and replaced if clogged.
- Loosen the screws of the filter cap.
- Remove the filter element and clean its housing.
- Do not use any pressurised cleaning products.
- Replace the filter element with a new element.
- Screw the cover back into place.
- Reopen the manual shut-off valve.
- Check it is airtight.
- Check the combustion values.

Cleaning the cover
- Do not use abrasive products or products containing chlorine.
- Clean the cover with water and a suitable cleaning product.
- Refit the cover.

Precautions
After any operation: check the combustion performance under real operating conditions (doors shut, cover fitted etc.). Record the results in the relevant documents.

Checking the flue gas temperature
- Check the flue gas temperature at regular intervals.
- Clean the boiler if the flue gas temperature is more than 30 °C above the value measured at the time of commissioning.
- Use a flue gas temperature gauge to make the check easier.

Exhaust gas test
Trouble shooting instructions

Exhaust gas loss
Exhaust gas loss by way of free heat will occur as a result of the temperature difference between the fuel-air mixture entering the furnace chamber and the gases discharged. Any increase in the excess of air and the resultant higher exhaust gas volume will cause the exhaust gas loss to rise. The exhaust gas loss can be calculated as follows:

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

q_A = exhaust gas loss in %
t_A = exhaust gas temperature in °C
t_L = combustion air temperature in °C
CO_2 = volumetric content of carbon dioxide in %
O_2 = volumetric content of oxygen in %

	Natural gas	Town gas	L.P.G.
A_1 =	0,370	0,350	0,420
B =	0,009	0,011	0,008

Example:
Data measured in natural gas mode:
CO_2 content of exhaust gases 10,8%
Exhaust gas temperature 195°C
Air intake temperature 22°C

The exhaust gas loss can be calculated as follows:

$$q_{Af} = (195-22)\left(\frac{0,37}{10,8} + 0,009\right) = \underline{7,48\ \%} \qquad q_{Af} = (195-22)\left(\frac{0,49}{12,8} + 0,007\right) = \underline{7,83\ \%}$$

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 ther any gas pressure?
3. Are the shut-off valves opened?
4. 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

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. 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
Ionisation current too weak.	Check combustion setting.
Burner starts without flame formation. Solenoid valve fails to open.	Defective coil or rectifier. Check connection.
Lack of gas or gas pressure too low.	Check gas pressure controller, gas valve, gas filter. Is the equipment gas cock open?

Exhaust gas test
Trouble shooting instructions

4. Mixing unit gives poor combustion data

Cause	Remedy
Incorrect settings.	Correct settings.
Incorrect mixture ignition unit.	Replace unit.
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.

5. Solenoid valve fails to open

Cause	Remedy
Defective coil or SKP actuator.	Replace coil or SKP actuator.
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.

6. 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 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.

Operating trouble

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.
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.

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.

Control program in the case of trouble and fault indicator LFL 1... / LGK 16...

LFL 1... / LGK 16...

a - b Starting program.

b-b' In a number of time versions; idle steps of the program unit to self-stop after burner start-up (b' = operating position of program unit).

b(b')-a After-flushing program after regular stop. In the starting position „a“ the program unit will automatically stop or initiate an immediate restart of the burner, e.g. after a fault has been eliminated.

• Duration of the safety period for single-tube burners.

•• Duration of the safety period for burners with ignition gas valve.

Basically, any type of trouble will result in the immediate stop of the fuel supply. At the same time, the program unit and consequently the fault indicator will stop. The type of trouble can be identified by the symbol opposite to the reading mark of the indicator:

◄ **No start,** e.g. because the „CLOSED“ signal from the „Air Damper CLOSED“ limit switch is missing or a contact is not closed between terminals (12) and (4) or (4) and (5); or the contacts of all control and safety units in the controlled system are not closed (e.g. gas pressure or air pressure switches, temperature or pressure switches, temperature or pressure regulators).

▲ **Operating stop** because the „OPEN“ signal from the „Air Damper OPEN“ limit switch is missing. Check and adjust the limit switch concerned.

◈ **Shut-off on trouble because there is not air pressure** signal at the beginning of the air pressure check. **Any air pressure failure after this time will also lead to a shut-off on trouble.**

■ **Shut-off on trouble** because of a fault in the flame monitoring circuit.

▼ **Operating stop** because the position signal of the „Partial Load“ limit switch (air damper in „Partial Load“ position) is not available on terminal (8). Check and adjust the limit switch concerned.

1 **Shut-off on trouble** because a flame signal is not available on the expiry of the (1st) safety time.

Any failure of the flame signal on the expiry of the safety time will also lead to a shut-off on trouble.

2 **Shut-off on trouble** because the flame signal has not occurred on the expiry of the (2nd) safety time (flame signal of main flame with burners having an ignition gas valve).

| **Shut-off on trouble** because the flame signal failed during burner operation or a lack of air has occurred.

◄ **Shut-off on trouble** during or after the control program flow due to external light (e.g. by flame not extinguished, leaking fuel valves) or a faulty flame signal (e.g. fault in flame monitoring circuit, or similar); see flame monitor.

If the shut-off on trouble occurs at any other time between start and pre-ignition that is not identified by a symbol as above, this will normally be due to an early flame signal which is considered to be a faulty flame signal.

The automatic furnace controller may be unlocked immediately after a shut-off on trouble using the unlock button with integrated fault signal lamp or an external switch. After it has been unlocked (and after a defect with resultant operating stop has been eliminated and after a voltage failure), the program unit will in any case return to its starting position with voltage being only supplied to terminals 7, 9, 10 and 11 as preset by the control program. It is only at this stage that the program of the automatic furnace controller will restart the burner.

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