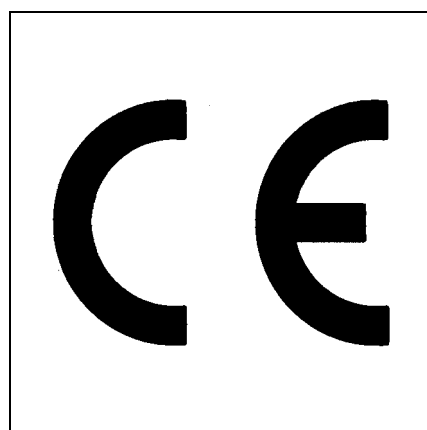
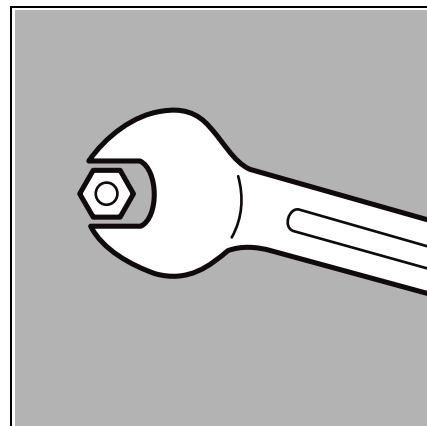


Operating Instructions
for Authorized Experts

Gas Burners
EK 5... G-RO

**ELCO
KLOCKNER**

Heiztechnik



Designs:
DIN
TRD

Survey

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General Informations

The ELCO EK5 ... G-RO series of gas burners is designed for the combustion of natural gas.

Design and performance of the burners comply with the European Standard

EN 676.

Installation, start-up and maintenance of the burner must be performed by a qualified expert in compliance with currently applicable guidelines and regulations.

DIN 4756

Gas-firing installations in heating Systems

TRG I

Technical regulations for gas fittings

DIN EN 298

Gas burners, flame monitoring Systems

EN 60335-1

Safety of electrical appliances for domestic use

Heat generator

The heat generator must meet the requirements for furnace loads stipulated in Pr EN 676.

| Thermal output kW | Furnace load MW/m ³ | |
|----------------------|---|------|
| | min. | max. |
| 12-24 | 1.2 | 1.7 |
| 24-70 | 0.95 | 1.63 |
| 70-190 | 0.92 | 1.51 |
| 190-480 | 0.97 | 1.53 |
| 480-1200 | 1.07 | 1.68 |
| 1200-2450 | 0.95 | 1.35 |
| > 2450 | Standard does not apply. Observe manufacturer's recommendations | |

Compare the performance data with the burner data. In case of discrepancies, contact the manufacturer.

Site of installation

The burner must not be operated in rooms with aggressive fumes (e.g. hair-spray, tetrachloroethylene, carbon tetrachloride), dust-laden air or high atmospheric humidity (e.g. laundry rooms). For supply of combustion air, ensure adequate ventilation of the heating room.

ELCO rejects all warranty claims for damage resulting from one of the following reasons:

- Improper use
- Inexpert installation or maintenance by the purchaser or third persons, including the installation of parts other than genuine parts supplied by the manufacturer.

Start-up

Initial start-up of the gas-firing installation must be performed by the installer, manufacturer, or by another expert designated by them.

Delivery and Operating Instructions

At the time of delivery at the latest, the company installing the gas burner must supply the user with a set of Operating and Service Instructions. These should be kept in the room where the heating unit is installed.

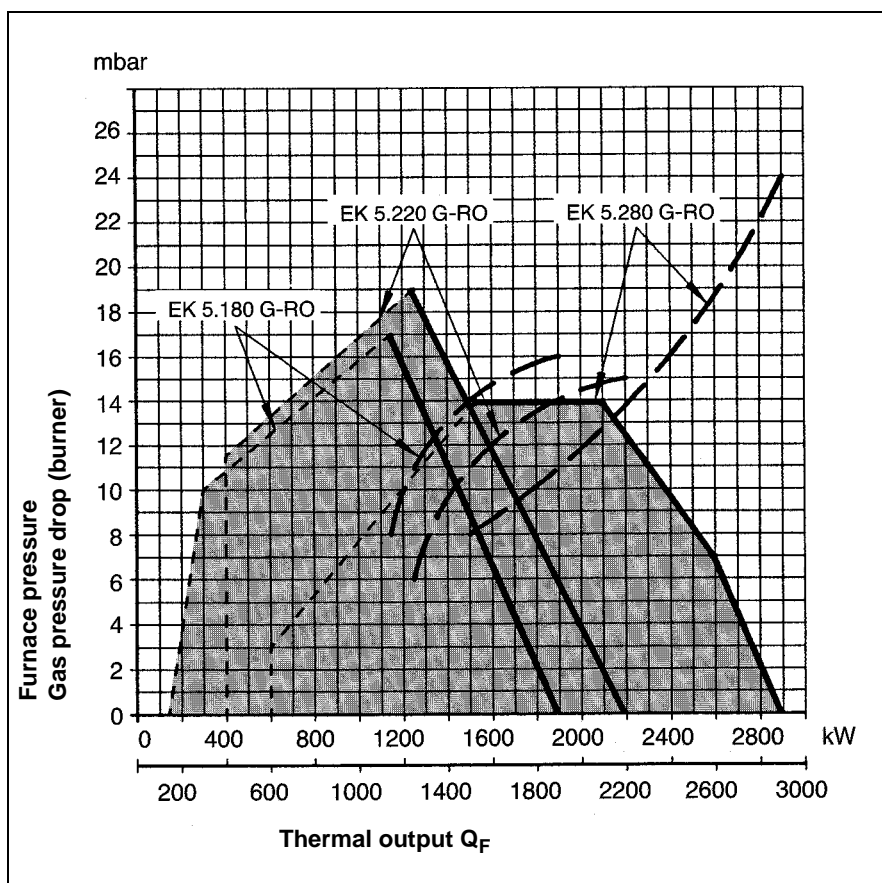
The address and telephone number of the nearest service representative must be entered in the Instructions.

Note for the User

The system should be serviced by an expert at least once a year. To ensure maintenance at regular intervals, we recommend you to conclude a service contract.

Technical Data

| Burner type | EK 5.180 G-RO | EK 5.220 G-RO | EK 5.280 G-RO |
|--|--|---|---------------------|
| Technical Data | | | |
| Thermal output min | 165 kW | 400 kW | 600 kW |
| Thermal output max. | 1850 kW | 2200 kW | 2900 kW |
| Gas type | Natural gas L+H* | Natural gas L+H* | Natural gas L+H* |
| Gas supply pressure | 20 – 100 mbar** | 20 – 100 mbar** | 20 – 100 mbar** |
| Regulation | Modulating | Modulating | Modulating |
| Air regulation suction side | Air cut-off valve | Air cut-off valve | Air cut-off valve |
| Air regulation pressure side | in burner head OAS° | in burner head OAS° | in burner head OAS° |
| Control ratio | max. 20 / 100% | 20 / 100% | 20 / 100% |
| Voltage | 230/400 V, 50 Hz | 230/400 V, 50 Hz | 400/690 V, 50 Hz |
| Power consumption | 4,7 kW | 4,7 kW | 6,5 kW |
| Weight approx. | 135 kg | 135 kg | 145 kg |
| °OAS Optimized Air Speed | | | |
| Burner equipment | | | |
| Electric motor 2800 min. ⁻¹ | 4,0 kW | 4,0 kW | 5,5 kW |
| Automatic burner control unit | LFL 1 / LGK 16 | LFL 1 / LGK 16 | LFL 1 / LGK 16 |
| Flame monitor | UV QRA 2 / QRA 53 | UV QRA 2 / QRA 53 | UV QRA 2 / QRA 53 |
| Ignition transformer | ZE 30/7 | ZE 30/7 | ZE 30/7 |
| EI. servomotor for air damper | EA 2, electr. | EA 2, electr. | EA 2, electr. |
| Air pressure monitor | DL 50A | DL 50A | DL 50A |
| * Gas types | CH I2H DE I2ELL AT I2H NL I2L | ** The minimum gas supply pressure required for burner operation must be calculated individually depending on the installation. | |



Performance charts

The performance charts reflect the values approved during official homologation.

Determining the required thermal output:

$$Q_F = \frac{Q_N}{\eta_K}$$

Q_F = Thermal output (kW)
 Q_N = Rated boiler capacity (kW)
 η_K = Boiler efficiency (%)

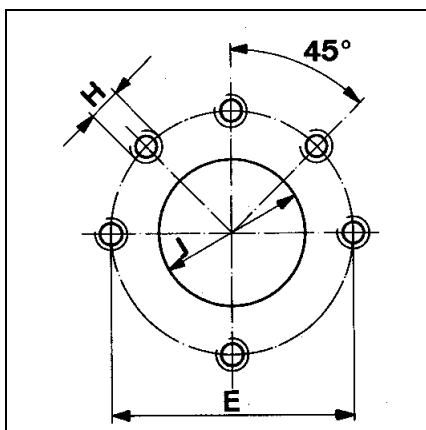
--- Gas pressure drop characteristics of burner head for natural gas
 $Hu_n = 9,9 \text{ kWh/m}^3$

Survey

Dimensiones

The image contains two technical drawings of a burner assembly. The left drawing is a side view showing dimensions G, K, R, L, Lx, M, Mx, Q, A, B, C, dφ, Dφ, Eφ, Fφ, and DN. The right drawing is a front view showing dimensions N and O, and components 13, 14, 15, and 16. Below the drawings is a numbered list of components:

| | | | | | |
|---|---|----|--------------------|----|-------------------------------------|
| 1 | Air pressure monitor | 5 | Gas connection | 12 | Air suction box |
| 2 | Scale, gas nozzle and baffle plate position | 6 | Connecting flange | 13 | Inspection glass |
| 3 | Swivel hinge | 7 | Insulating padding | 14 | Compound control |
| 4 | Switch box with ignition transformer, switch and connecting terminals | 8 | Burner tube | 15 | El. servomotor for compound control |
| | | 9 | Flame cup | 16 | Flame monitor |
| | | 10 | Electric motor | | |
| | | 11 | Burner housing | | |



Boreholes in boiler connecting plate

Key

- EK = Manufacturer
- 5 = Size
- 180 = Performance rating
- G = Natural gas
- R = Modulating, with mechanical compound control
- O = Optimized Air Speed
- A = Burner control unit mounted on the burner

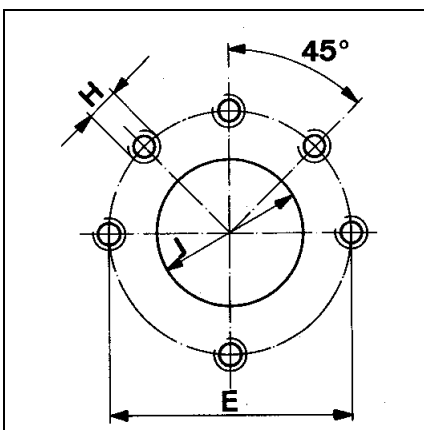
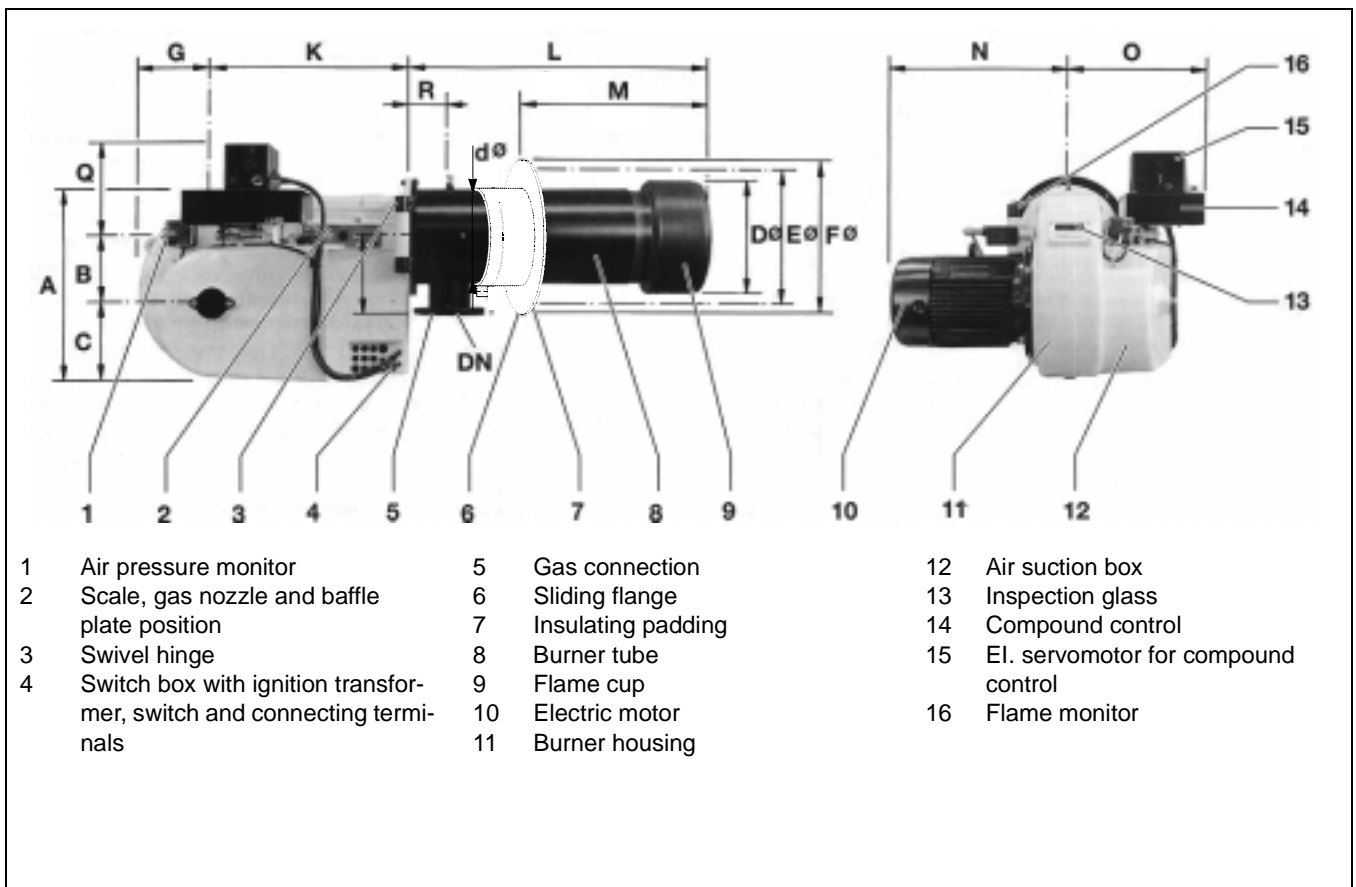
| Burner type | Thermal output kW | A | B | C | dφ | Dφ | Eφ | Fφ | Product-ID-No. |
|---------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----------------|
| EK 5.180 G-RO | 165-1850 | 490 | 173 | 206 | 220 | 220 | 340 | 370 | CE 0085 AQ 0947 |
| EK 5.220 G-RO | 400-2200 | 490 | 173 | 206 | 220 | 261 | 340 | 370 | CE 0085 AQ 0947 |
| EK 5.280 G-RO | 600-2900 | 490 | 173 | 206 | 270 | 323 | 406 | 436 | CE 0085 AQ 0947 |

Customized designs and voltages on request
Lx, Mx = Length of burner tube T₂

| Burner type | G | H | J | K | L | Lx | M | Mx | N | O | P | Q | R | DN |
|---------------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| EK 5.180 G-RO | 242 | M 12 | 230 | 500 | 565 | 765 | 250 | 450 | 420 | 360 | 300 | 230 | 100 | 80 |
| EK 5.220 G-RO | 242 | M 12 | 270 | 500 | 585 | 785 | 270 | 470 | 420 | 360 | 300 | 230 | 100 | 80 |
| EK 5.280 G-RO | 242 | M 12 | 330 | 500 | 571 | 802 | 250 | 481 | 470 | 360 | 333 | 230 | 100 | 80 |

Dimensiones

Sliding Flange Versions



Boreholes in boiler connecting plate

Key

- EK = Manufacturer
- 5 = Size
- 180 = Performance rating
- G = Natural gas
- R = Modulating, with mechanical compound control
- O = Optimized Air Speed
- A = Burner control unit mounted on the burner

| Burner type | Thermal output kW | A | B | C | dφ | Dφ | Eφ | Fφ | Produkte-ID-No. |
|---------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----------------|
| EK 5.180 G-RO | 165-1850 | 490 | 173 | 206 | 220 | 220 | 340 | 370 | CE 0085 AQ 0947 |
| EK 5.220 G-RO | 400-2200 | 490 | 173 | 206 | 220 | 261 | 340 | 370 | CE 0085 AQ 0947 |
| EK 5.280 G-RO | 600-2900 | 490 | 173 | 206 | 270 | 323 | 406 | 436 | CE 0085 AQ 0947 |

Customized designs and voltages on request

| Burner type | G | H | J | K | L | M | N | O | P | Q | R | DN | | | | |
|---------------|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|----|--|--|--|--|
| EK 5.180 G-RO | 242 | M12 | 230 | 500 | 765 | 165 - 455 | 420 | 360 | 300 | 230 | 100 | 80 | | | | |
| EK 5.220 G-RO | 242 | M12 | 270 | 500 | 785 | 185 - 475 | 420 | 360 | 300 | 230 | 100 | 80 | | | | |
| EK 5.280 G-RO | 242 | M12 | 330 | 500 | 802 | 200 - 470 | 470 | 360 | 333 | 230 | 100 | 80 | | | | |

Burner Functions

Functional Description

Starting Function

As soon as the firing system demands heat, the burner is switched on automatically via a controller. The burner motor and the blower wheel start. The automatic burner control unit controls and monitors the start-up sequence.

A gas valve leakage test is carried out automatically every time the burner is started.

The air damper is closed when the **burner is not operating.**

The electric servomotor moves the closed air damper to the full-load position so that the burner prepurges the combustion chamber and the flue gas ducts with the prescribed quantity of air. Shortly after prepurging has started, the air failure monitor must switch over to its working position within a predetermined period of time, i.e. the set minimum air pressure must be reached and maintained until the burner is switched off. When the set prepurging time has elapsed, the air damper is moved to **low load** or **start load*** in combination with the linear gas nozzle.

The electric burner control makes it possible to **start the burner at increased load** and then return to low load, which is advisable with some types of gas for safety reasons. Preignition is then initiated and gas is released by the gas valves. Within the safety period of 3 seconds a regular, steady flame must be established. On completion of the safety time, a flame signal must be transmitted to the burner control unit via the flame monitoring circuit. This signal must be maintained until controlled shutdown. The start-up sequence of the burner is completed.

Operating Function

After a regular flame has formed, the load control is activated, which means that the burner has reached its operating position. From now on the control unit automatically regulates the burner between low load and full load. Depending on heat requirements, the electric servomotor receives an OPEN or CLOSE command from the controller and then either increases or reduces the air and gas quantities.

This compound control system adjusts the linear gas nozzle and the linearized air damper and regulates the gas quantity in combination with the air. Burner regulation is possible in two ways; either **2-stage sliding** or, if an **appropriate controller is fitted, modulating**. With modulating control, the burner can operate at any level between low load and full load. The burner is always switched off in the low load position. When the burner is idle, the air damper is always closed, thus preventing a cold air stream from passing through the combustion chamber, the heat exchanger and the flue ducts. This reduces the cooling loss of the burner to a minimum.

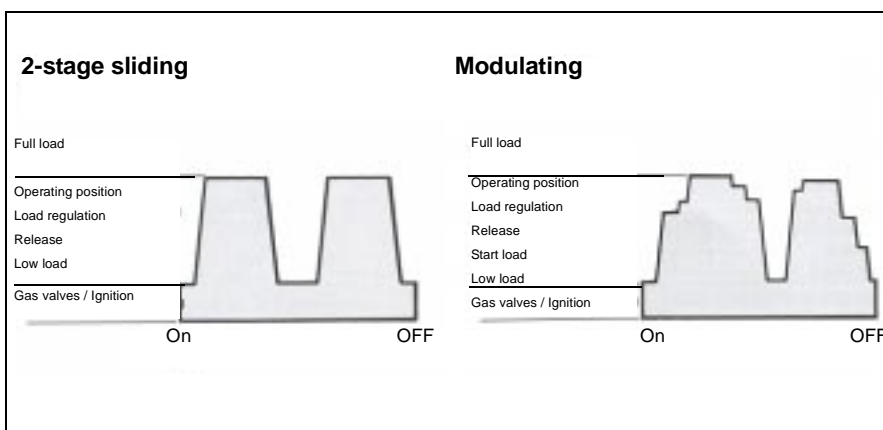
*Start load

Burner control units with a safety period of 3 seconds:

33% of full load or 120 kW

Burner control units with a safety period of 2 seconds:

50% of full load or 120 kW



Compound control

Safety Functions

A fault shutdown is effected

- if a flame signal occurs during prevention (extraneous light monitoring)
- if no flame has formed upon expiry of the safety period of 3 seconds after starting the burner (fuel release)
- if a flame failure occurs during operation
- if the blower pressure drops below the set safety pressure during operation

A fault shutdown is indicated by the flashing lamp in the reset button. The sequence switch stops and indicates the type of malfunction (see Troubleshooting in Maintenance). After rectifying the fault, press the reset button to release the shutdown and to start the burner.

A **controlled shutdown** is effected

- upon reaching the medium temperature or medium pressure
- if the gas pressure falls below the set safety pressure
- if the power supply fails

After restoring the operating conditions, the burner restarts automatically.

Burner Functions

Compound Control Fuel/Air Gas Fittings Group Functional Diagram

Compound Control Fuel/Air

The compound control system, which alters the gas and air quantities evenly and continuously, ensures that combustion values are maintained at almost identical levels across the entire control range.

Two-stage sliding control permits operation at either low or full load. These two load positions are reached gradually according to heat requirements, so that there is no sudden supply or cutoff of large amounts of fuel.

The modulating control system operates at any required level within the control range, depending on heat requirements.

The only difference between burners with two-stage sliding and burners with modulating control lies in the electric burner control, while mechanical regulation remains the same. The continuously variable and reversible electric servomotor moves the compound control segment according to the heat required.

This segment also controls the air damper and the air and fuel through, put in the burner head via the longitudinal adjustment lever.

To achieve an optimum ratio of air and fuel across the entire control range, the air damper must be positioned correctly via an adjustable steel segment and ball-bearing ratchet.

Linearization

Air regulation on the suction side is effected by the linearized air damper for all burner types.

This type of regulation allows the combustion air to be dispensed in line with the fuel quantity and thus ensures a wide adjustment range and a high combustion efficiency even at low loads.

Gas Fittings Group

The gas fittings group is determined according to customer-specific conditions.

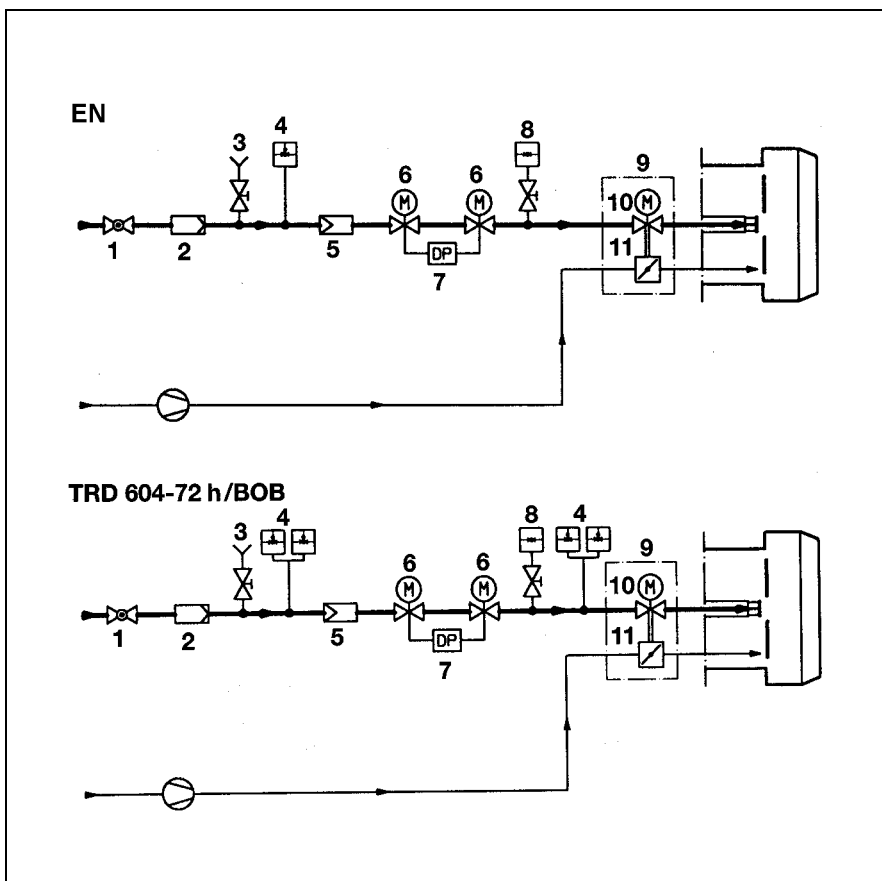
Important criteria are:

- Burner capacity
- Furnace backpressure
- Gas pressure drop of the burner head
- Gas pressure drop of the gas fittings

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

Important

Only gas fittings approved by official burner testing may be used.



Functional Diagram

- 1 Gas shut-off valve
- 2 Gas filter
- 3 Test burner
- 4 Gas pressure monitor*
- 5 Gas pressure regulator
- 6 Gas motorized valve
- 7 Valve leakage detector
- 8 Pressure gauge
- 9 Compound control segment
- 10 Gas regulator
- 11 Air regulator

* If the burner design complies with TRD 604-72h, the pressure monitors must either be tested for "special design" or two monitors must be installed.

A Gas connection
B Combustion air inlet

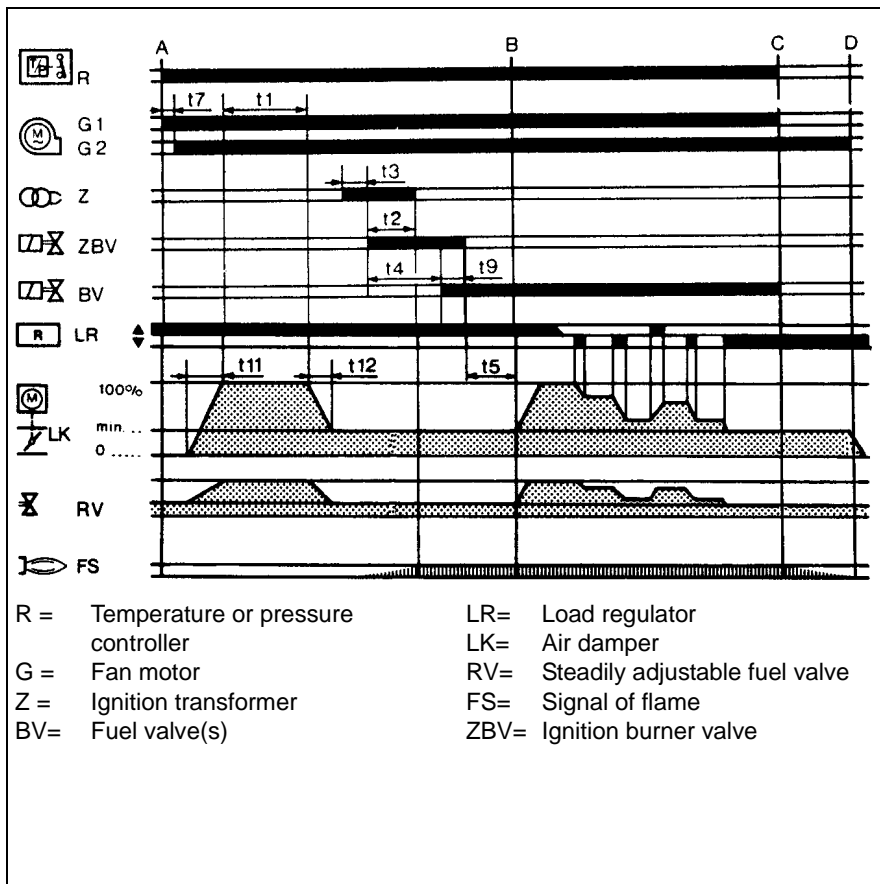
Burner Functions

Functional Sequence of Burner Control Units LFL 1... / LGK 16... Controller RWF 40



The automatic furnace controllers LFL... and LGK 16... are designed to control and monitor burners of stepping or modulating mode of operation. For a detailed functional description of the automatic furnace controllers with technical data and design information see the enclosure hereto and further descriptive material:

LFL 1...-7451 D
LGK 16...-7785 D

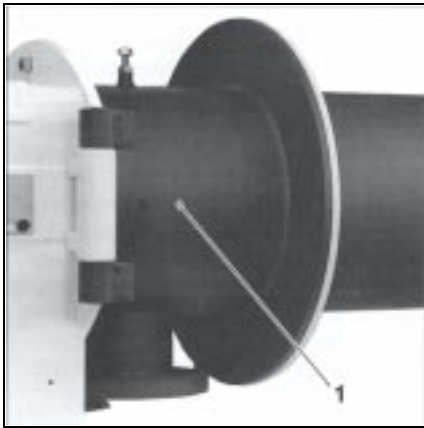


In steplessly variable burners use is made of the **RWF 40** industrial controller. This has specifically been designed for use with furnace systems, preferably for temperature and pressure controllers in conjunction with burners featuring steplessly variable fuel throughput rates. For adjusting the controller to the controlled condition, the desired set-point range and the way of detecting the actual value, the software configuration is structured accordingly.

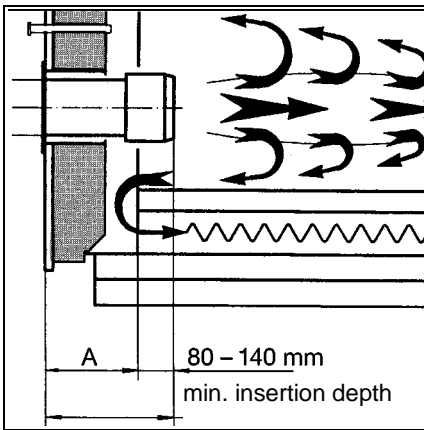
Technical Documentation
RWF 40 Landis & Staefa 7865

Installation

Mounting the Burner to the Heat Generator Electrical Connection



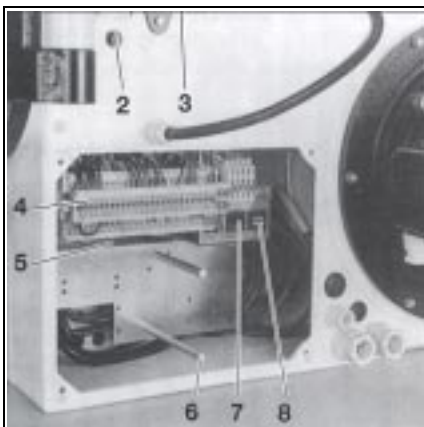
1 Fixing screw for flame cup



Burner tube insertion depth

In boilers with reverse furnaces, provide sufficient insertion depth of the burner tube to ensure troublefree operation.

A = Front of boiler to turning edge of second pass



- 2 Connection for inspection glass cooling
- 3 Flame monitor
- 4 Terminal strip
- 5 Ignition transformer
- 6 Lock nut
- 7 Service pushbutton
- 8 Pushbutton Higher/Lower

Mounting the burner to the heat generator

To mount the burner to the heat generator, prepare the connecting plate according to the dimensions given on page 4.

- Attach the studs to the connecting plate
- Attach the insulating base and the burner head and secure them with screws.

If necessary, release the screw (1) to displace the flame cup for correct adjustment of the burner head.

Boiler inspection glass cooling

To keep the boiler inspection glass cool and clean, a cooling line may be connected to connection (2) R 1/4".

The cooling line can either be a hose or a copper pipe. A hose union is enclosed with the burner.

To connect a copper pipe, a suitable clamping ring connection is required.

Electrical connection

Electric wiring of the burner and gas fittings must be carried out by an authorized electrician according to the enclosed wiring diagram.

For cable connection, ensure the following:

- Connect to terminal strip (4)
- Provide sufficient length of cable so that the burner and the boiler door can be opened
- Do not install the sensor lead in the multiconductor cable.

The electric module can be removed for connection, replacement or adjustment of components.

Disassembling the electric module

- Set the main switch to Off, remove the fuse
- Release the lock nuts (6)
- Carefully remove the electric module.

Caution!

Never apply voltage to the electric module after disassembly.

After making the connections, check all system components for correct wiring. Start the motor for a short time to check the sense of rotation.

Installation

Gas Connection

Gas Connection

For installation and start-up of the gas conduits and fittings, observe the applicable regulations of the supervisory authorities and institutions of your country.

Gas properties

Before installing the unit, ask your gas supply company for the following information:

1. Gas type (gas group I, II, III)
2. Calorific value $H_{un} = \text{kWh/m}^3$ (kJ/m^3)
3. Maximum CO_2 content of the flue gas
4. Gas supply pressure and static pressure

Checking the gas type

Before connecting the burner to the gas supply line, check whether the gas type and the burner type match (see type plate on the burner). The burner type and the gas type must coincide.

G = Natural gas

Gas supply pressure

To ensure optimum burner performance, a minimum gas supply pressure is required upstream of the burner gas fittings.

Minimum gas supply pressures

| | |
|----------|---------------|
| CH 12H | G20 = 20 mbar |
| DE 12ELL | G20 = 20 mbar |
| AT 12H | G20 = 20 mbar |
| NL 12L | G25 = 25 mbar |

Observe the installation and mounting instructions of the components manufacturers (enclosed with the fittings). The dimensions of the gas conduit depend on the throughput and the available pressure; the conduit must be installed so that the distance to the burner and the pressure drop are kept to a minimum.

When determining the nominal width DN of the gas fittings group, consider the **flue-gas side resistance of the heat exchanger as well as the gas pressure drop of the burner and the fittings group**.

Gas fittings group

The gas fittings group may be connected directly to the gas supply line. **The order and the direction of flow** (arrow on the housing) of the fittings **must be observed**. Remove dirt and foreign objects from the fittings and connection pieces prior to installation and start-up. **To ensure good start-up conditions, the distance between the burner and the gas shut-off valve must be kept to a minimum.**

Leakage test

The gas conduit upstream of the burner gas fittings group must be installed, tested for tightness, vented and certified by the installing company in accordance with applicable guidelines.

The tightness of the screw and flange connections must also be checked. The leakage test is to be carried out under pressure with approved foaming agents which do not cause corrosion. The results of the leakage tests performed on steam boilers also require certification.

Venting

Note. Before starting the burner or after repair work, the complete gas supply line and the gas fittings group must be vented to the outside (by means of a hose).

Never vent the gas conduit into the heating room or combustion chamber!

The test burner can be used for determining the presence of an inflammable mixture.

Support

The gas fittings group must be supported from below by means of the telescope support or a similar device after or even during installation (e.g. at the filter and/or valve).

Point of separation

To facilitate maintenance of the boiler (combustion chamber), a point of separation (flat sealing) should be provided for swivelling the boiler door.

Start-up

Burner Head Factory Settings

Factory Settings

The factory settings given below are standard values and refer to about 80% of the maximum burner capacity. Readjustment may be necessary depending on local circumstances, flue gas analysis and combustion behaviour.

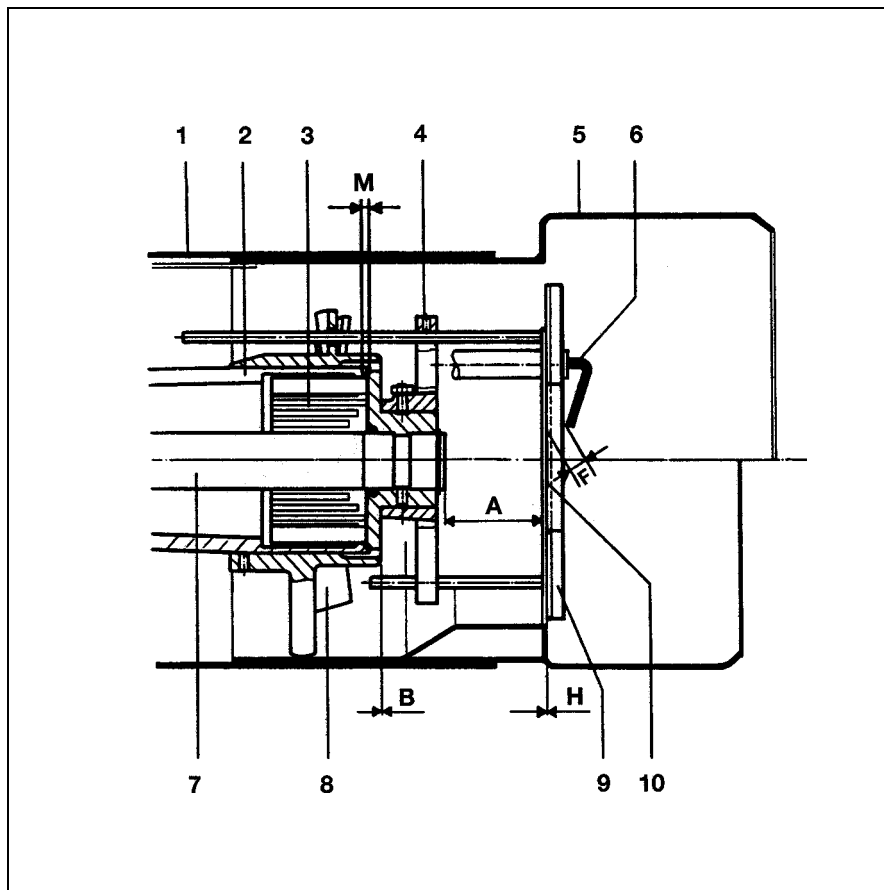
The values are set from the zero position.

Zero position signifies:

- Scale value zero
- Baffle plate - Flame cup H = 0
- Gas tube - Gas nozzle M = 16

Important

Check the settings by means of the table prior to start-up. To check, remove the nozzle assembly (see Servicing the Burner in Maintenance).



Burner head

- 1 Burner tube
- 2 Gas tube
- 3 Linearized gas nozzle
- 4 Electrode holder
- 5 Flame cup
- 6 Ignition electrode
- 7 Nozzle adjustment lever
- 8 Sleeve tube with swirl plate
- 10 Perforated baffle plate

| Burner type | Factory settings in mm | | | | |
|---------------|-----------------------------------|--------------------------|----------------------------|----------------------------|-------------------------|
| | A | B | F | H | M |
| | Baffle plate/ adjustment lever | Gas tube/ swirl plate | Electrode/ baffle plate | Baffle plate/ flame cup | Gas tube/ gas nozzle |
| EK 5.180 G-RO | 58 | 0 | 3 | 20 | 36 |
| EK 5.220 G-RO | 58 | 0 | 3 | 20 | 36 |
| EK 5.280 G-RO | 58 | 0 | 3 | 20 | 36 |

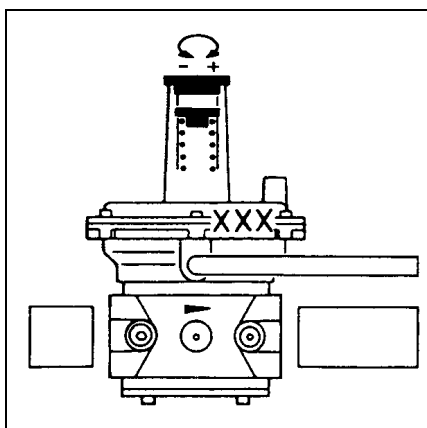
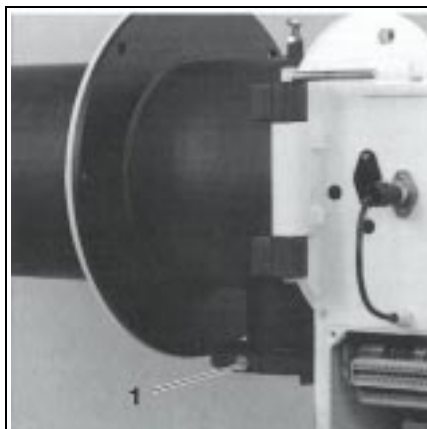
Start-up

Gas Pressure Regulation

Start-up

The following checks must be performed before the system is first put into operation:

- Observe the operating instructions of the boiler manufacturer; the boiler must be installed ready for operation.
- Fill the heating system with sufficient water.
- Check the entire system for correct electric wiring of all components and fittings.
- Check the sense of rotation of the blower motor.
- Check the settings of the temperature or pressure controllers, limiters, safety devices and electric limit switches.
- Ensure adequate gas supply pressure. The gas supply pressure must be between 20 mbar and 100 mbar. Higher connection pressures require additional gas fittings.
- Carry out a leakage test on the gas elements.
- Ensure unobstructed flue gas paths and adequate fresh air supply.
- Burner in starting position; air damper closed.
- Burner control unit reset and in start-up position.



Check the performance of the burner program sequence before fuel is first released: If gas is used, check the gas section as follows:

- Make sure that the gas shut-off valve of the valve group is closed.
- Bridge the gas pressure monitor (see wiring diagram).
- Start the burner and check for correct sequence of the start-up program:
 1. Blower
 2. Air damper in preventing position
 3. Air pressure check
 4. Air damper in low-load position
 5. Ignition spark
 6. Valves open
 7. Fault shutdown after safety period (see Burner Control Unit)
- Unlock (reset) the burner control unit, remove the bridge from the gas pressure monitor.

Start-up with gas

- Connect the measuring instruments for gas chamber pressure (1) and air pressure (connect to inspection glass cooling).
- Connect the measuring instruments for the flame monitoring current.
- Open the gas shut-off valve upstream of the valve group; check the gas pressure at the pressure gauge.
- Set the service switch to position 1
- Set the Manual/Automatic selector switch to Manual.

Gas Pressure Regulation

The gas pressure is adjusted by changing the spring pressure which acts on the control diaphragm.

Thermal output

When calculating the thermal output, the calorific value of the individual gases must be taken into account. If low-grade gas is used, for example, the gas pressure for high-grade gas must be multiplied by the factor 1.5 to achieve the required burner capacity.

If applicable, wait for the leakage test of the gas valves to complete. If the valves are leaky, the burner start-up sequence will stop. The burner starts according to the burner start-up sequence.

Note

The gas output pressure (gas control pressure) must always be lower than the gas entry pressure **but higher than the total pressure drop of the system.**

Adjustments

Adjustment Sequence Adjusting the Gas Throughput

Adjustment Sequence

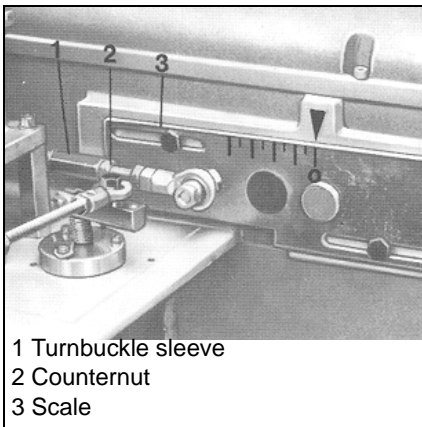
- Set the selector switch to Manual
- Use the service switch to switch on the burner
- Adjust the gas throughput (low load)
- Move the Higher/Lower switch to full load
- Adjust the gas throughput (full load)
- Move the Higher/Lower switch to low load

- Gradually adjust the combustion air (suction side) to the gas throughput
- Switch off the burner
- Set the selector switch to Auto

Adjusting the Gas Throughput

The gas throughput is adjusted by means of the gas control nozzle in the burner head. The nozzle can be opened and closed continuously by means of the longitudinal adjustment lever.

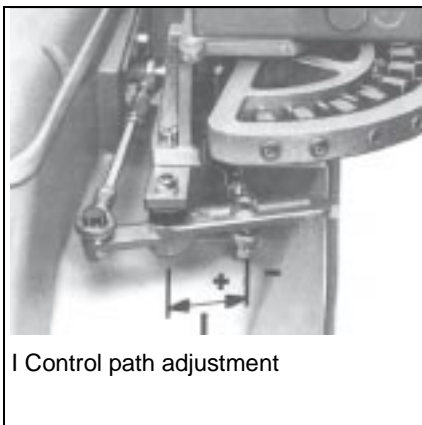
The gas throughput for low load must be $\leq 50\%$.



1 Turnbuckle sleeve
2 Counternut
3 Scale

Gas throughput for low load

- Burner in low-load position
- Release the counternut (2)
- Use the turnbuckle sleeve (1) to move the gas nozzle towards the open or closed position
- Tighten the counternut (2) after adjustment
- **Mark the low-load position on the scale (3)**



1 Control path adjustment

Gas throughput for full load

- Move the burner to full load
- Use the control path adjustment to move the gas nozzle towards the open (+) or closed (-) position
- After adjustment, move the burner to low load **and reset the low-load position as marked on the scale** (turnbuckle sleeve [1])

Adjustments

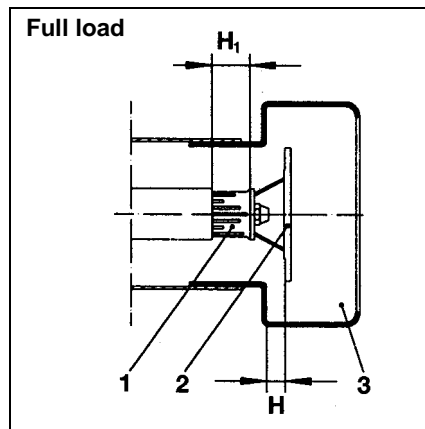
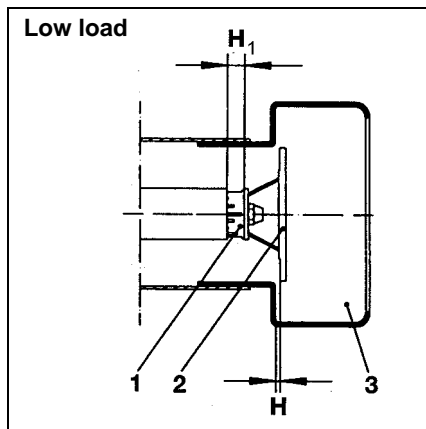
Combustion Air

Combustion air (pressure side)

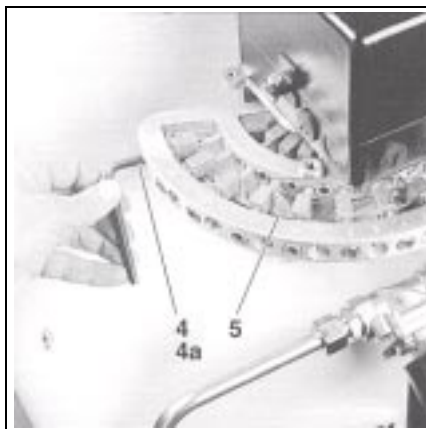
The distance H is given automatically by the control path H1 of the gas nozzle.

Normally, the factory-set position of the baffle plate requires no further adjustment. If necessary, minor corrections can be made for optimum combustion

- by moving the baffle plate in the baffle plate holder
- and/or by moving the flame cup



- 1 Gas control nozzle
- 2 Baffle plate
- 3 Flame cup



- 4 Adjusting screws
- 5 Cam strip

Combustion air (suction side)

The combustion air on the suction side is set by means of the air damper which moves on an adjustable cam strip.

- Burner in full-load position (selector switch to Manual)
- Gradually move the Higher/Lower switch to low load and perform combustion and air quality measurements
- If necessary, readjust the cam strip (5). To do this, release the "external" hexagon socket screws (4) by 1/4 turn and adjust the cam strip using the internal screws (4a) (5 mm hexagon socket screws)

Make sure that the control curve of the cam strip rises evenly. The segment path should be fully utilised at each burner load level.

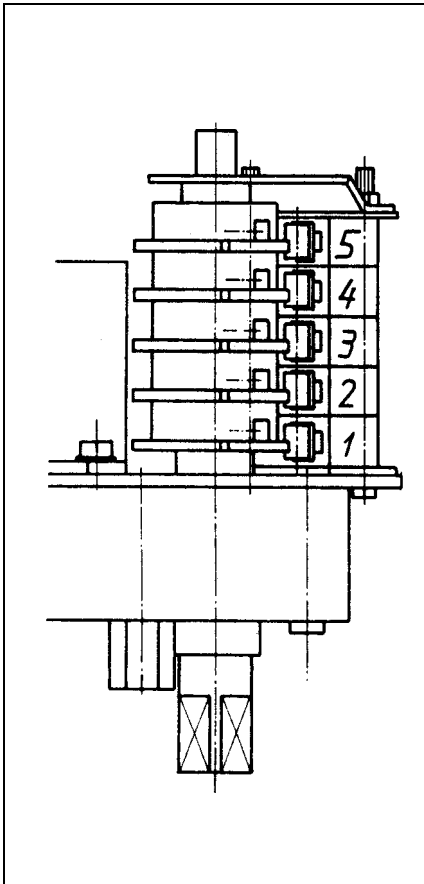
After adjustment, move the burner again to each load level from full load to low load and repeat the measurements.

Turn clockwise = less air

Turn anti-clockwise = more air

Adjustments

Adjusting the Limit Switches at the electric Servomotor



Limit switches

The limit switches are actuated by trip cams which are factory-set to standard values.

Limit switch 1
Air damper closed

Limit switch 2
Full load

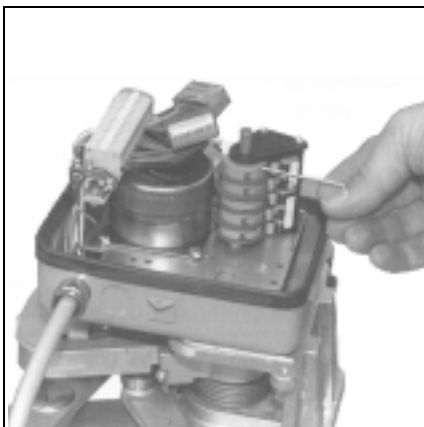
Limit switch 3
Low load

Limit switch 4
Start load

Limit switch 5
Preventilation

Note

- **Limit switch 1** indicates that the **air damper** is **CLOSED** when the burner is idle; it is factory-set to scale position 0.
- Limit switch 5 for preventilation can be adjusted according to individual system requirements in compliance with applicable regulations. The top switching point of this limit switch must always be set below the switching point for full load. During preventilation, the air damper must be fully open for at least 20 seconds.



Adjusting the trip cams

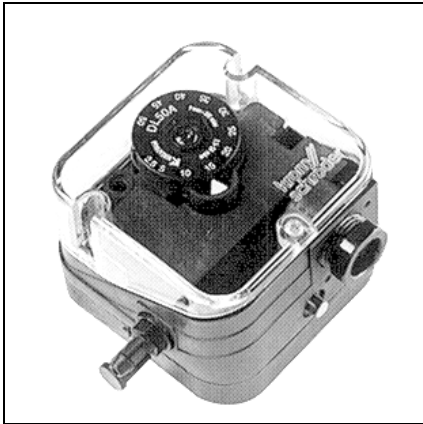
If necessary, the trip cams can be readjusted during burner adjustment. To facilitate access to the locking screw, the complete cam can be adjusted after releasing the setscrew with the Allen key incorporated in the servomotor.



Adjustment is made by means of a screwdriver.

Adjustments

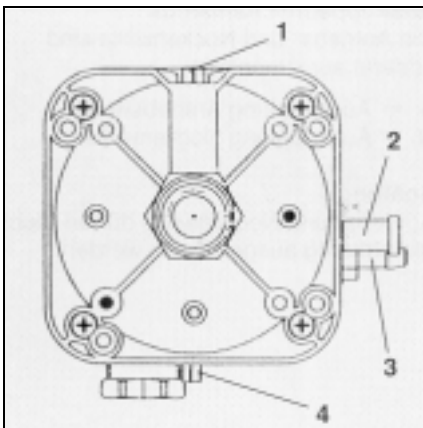
Air Pressure Monitor



Air Pressure Monitor

The air pressure monitor is used to monitor the pressure of blower burners and of ventilation and air-conditioning equipment.

The pressure monitor DL 50 A is suitable for making, breaking and switching a contact when the actual pressure deviates from the preset values. It can be used as an overpressure, negative pressure or differential pressure monitor for air and non-aggressive gases, but not for the gases described in the DVGW worksheet G 260/1.



Determining the prepurging differential pressure and adjusting the differential pressure monitor

- Burner in preventing phase
- Measure pressure at measuring outlet 2
- Measure vacuum at measuring point 3
- Add up the measured pressures
- Set the scale to 90% of the calculated value

Approvals

The pressure monitor complies with DIN 3398, Part 2, and is DIN-DVGW approved. Other approvals in major gas consumption countries.

Checking the performance of the switches

The switches can be checked for proper performance by means of test keys. Pressing the keys will change the set differential pressure (pressure monitor switches, burner in fault shutdown condition).

Key 4 tests the vacuum side of the blower

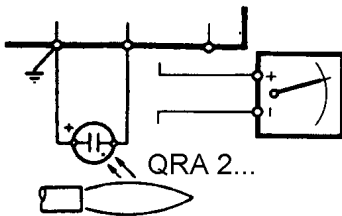
Key 1 tests the overpressure side of the blower*

* This test may be unsuccessful owing to certain system and performance conditions. Proper performance of the switches is, however, guaranteed as long as the test causes a fault shutdown on the vacuum side.

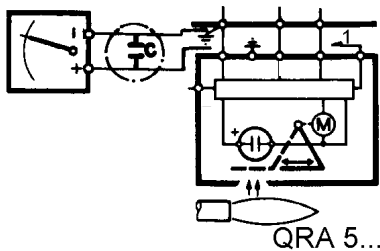
Adjustments

Flame Monitoring Sensor Current Measurement

Burner control unit LFL 1...
UV monitoring with QRA 2...



Burner control unit LGK 16...
UV monitoring with QRA 5...



Flame monitoring with UV detector

This monitoring method uses the UV radiation of hot flame gases for obtaining the flame signal.

The radiation detector is a UV-sensitive tube which is constantly under voltage and which consists of two electrodes; the tube fires when it is exposed to light of the spectral range between 190 ... 270 nm, thus transmitting a current to the flame signal amplifier.

The UV tube does not react to afterglowing chamotte in the furnace, to sunlight, daylight or heating room illumination.

The tube has a service life of about 10,000 hours at ambient temperatures of up to 50°C; higher ambient temperatures will considerably reduce the tube life.

The tube is tested automatically in conjunction with the burner control unit during interruptions of operation and with increased supply voltage.

If the tube misfires, a lockout will be effected immediately at the next start. Burners designed for continuous operation or intermittent operation at strong heat for more than 24 hours (e.g. multi-boiler cascade systems) or burners which are operated with steam boilers must be equipped with the burner control unit LGK 16... and the corresponding self-checking flame monitoring system (QRA 5 ...). For a detailed technical description, specifications and planning information, see Burner Control Units

LFL 1 ... No. 7451 D

LGK 16... No. 7785 D

Measuring the UV current with ORA 5

For precise measurement of UV currents, we recommend using the **test unit KF 8832**.

If you use a **standard measuring instrument** (microammeter) to measure the **UV current**, we recommend proceeding as shown in the illustration. Integrate a capacitor $C = 470 \mu\text{F}$, 15 V (or higher electric strength) into the measuring connections.

Measuring instrument: $100 \mu\text{A}/R_i = 3 \text{ k}\Omega$

Connect the measuring instrument between the burner control unit and the UV flame detector ORA 5... (terminal 22 (-), terminal 5 (+)).

Ensure correct polarity!

Aligning the UV Detector ORA 5...

The fixing flange can be moved along the feeler tube and allows precise alignment of the detector window with the incident UV radiation.

Note

Terminal 22 must be earthed at all times!

Cleaning the detector

The UV detector window must be cleaned at regular intervals.

Keep the window free from dust.

If cleaning is unsuccessful, replace the UV tube.

| Burner control unit | minimum | maximum |
|---------------------|------------------|-------------------|
| Monitoring type | with UV | with UV |
| * LFL 1... | 70 μA | 630 μA |
| * LGK 16... | ** | ** |

Recommended measuring range:
UV monitoring 0 – 1000 μA

Sensor currents

* See also specifications of burner control unit LFL 1... /LGK 16 ...

** See data on device KF 8832 for sensor current measurement

Servicing Instructions

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:

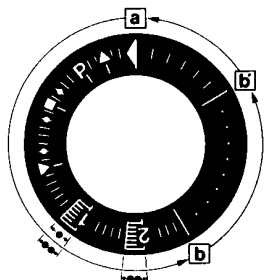
The burner will be found to be out of operation and in faulty and interlocked position.

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.

P **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.

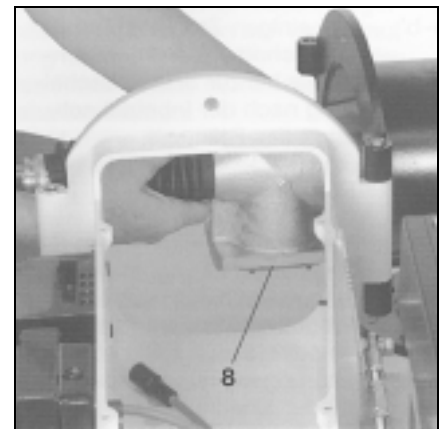
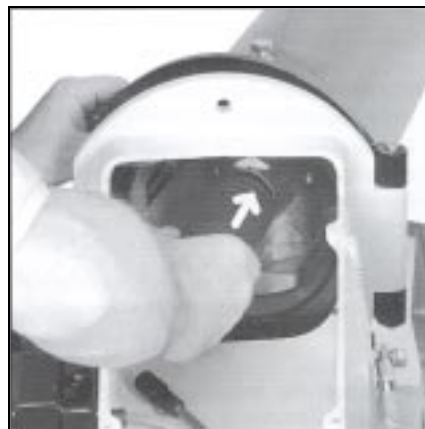
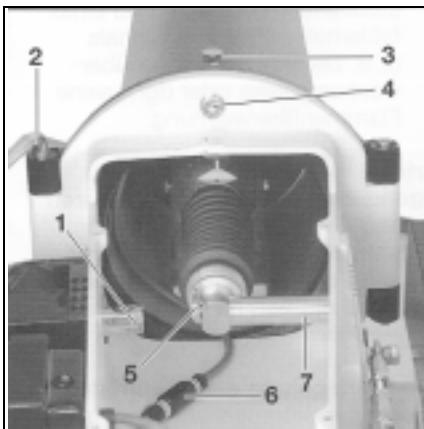
Maintenance

Servicing the Burner

Burner installations should be checked once a year. According to DIN 4755, 4756, "to ensure the troublefree operation, performance, safety and efficiency of the installation, the user should have the installation checked once a year by a representative of the manufacturer or other qualified personnel. The entire installation is to be tested for faultless performance, and defects are to be repaired with-out delay. If is expedient to carry out an inspection in addition".

Inspection should include the following items:

1. Clean the filters and strainers.
2. Check the ignition electrodes and the ignition spark; readjust, if necessary.
3. Check the gas valves for tightness and cleanness.
4. Check all electrical connections.
5. Clean the UV flame detector.
6. Check the pressure monitors for proper adjustment and performance.
7. Check the control units for correct performance and adjustment.
8. Check the burner head setting. Check the flat O-ring seal between the gas and burner tube for tightness.
9. Inspect the boiler components and insulation and replace, if necessary. Check the boiler for cleanness.
10. Clean the burner inside and outside.
11. Check the gas fittings for tightness.
12. Check the combustion and make flue gas measurements:
 - Adjust gas throughput
 - Heating room temperature
 - Flue gas temperature
 - Furnace pressure/pressure in the flue gas tube
 - CO₂/O₂ content
 - CO measurement
 - Measure the UV current
13. Enter the measured values in the test certificate.



Removing the Gas Tube

For replacement or adjustment of the baffle and ignition arrangement, the complete gas tube must be removed from the burner pipe. Proceed as follows:

- Disconnect the power supply; set main switch to OFF.
- Close all shut-off valves upstream of the burner.
- Remove the cover from the housing.
- Loosen the supply and return oil lines (6) at the scale plate. Turn out the connecting sleeve (5) from the nozzle rod, plug the boreholes.
- Release the locking screw (3).
- Disconnect the UV cell (2).
- Disconnect the ignition cables (7).
- Pull out the hinge bolt (1).
- Push the nozzle rod forwards in the direction of the arrow and swivel the burner.
- Release the fixing screw (4) of the gas tube, push the gas tube upwards and pull it off backwards.

Be careful with the baffle plate!

Before reassembly, check the seal and replace it, if necessary.

**ELCO
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Heiztechnik

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