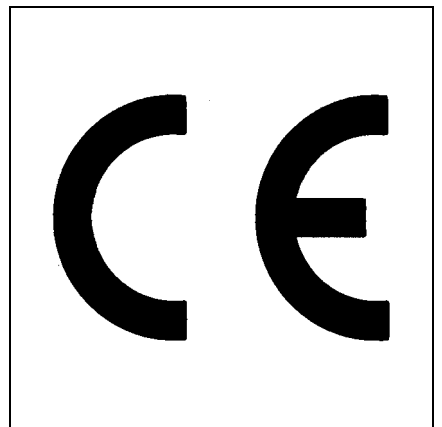
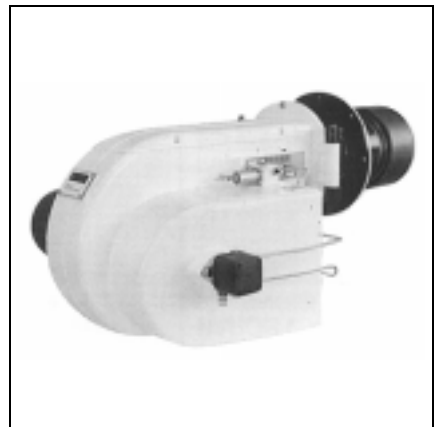
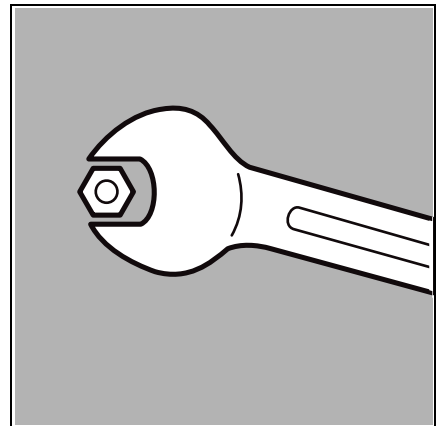


Operating Instructions
for Authorized Experts

Light Oil Burners
EK 5... L-Z(ZA)

**ELCO
KLOCKNER**

Heiztechnik



Designs:
Basis
DIN
TRD

Survey

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General information

The EK5 ... LZ series of ELCO light oil burners, featuring monobloc design and fully automatic two-stage operation, are suitable for the combustion of extra-light fuel oil. Design and performance of the burners comply with currently applicable guidelines and regulations. Burner installation and start-up must be performed by a qualified expert who is responsible for the proper execution of these tasks.

The burner complies with the standard

EN 267

Observe the following standards to ensure safe, environmentally friendly and energy-saving operation of the burner.

DIN 4755

Oil-burning installations in heating systems

DIN 4789

Connection of atomizing oil burners and blower gas burners to heat generators

EN 60335-1

Safety of electrical appliances for domestic use

Site of installation

The burner must not be operated in rooms with aggressive fumes, dust-laden air or high atmospheric humidity.

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 oil burning 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 oil burner must supply the user with a set of Operating and Service Instructions. These should be kept in the room where the heat generator 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.

Scope of delivery

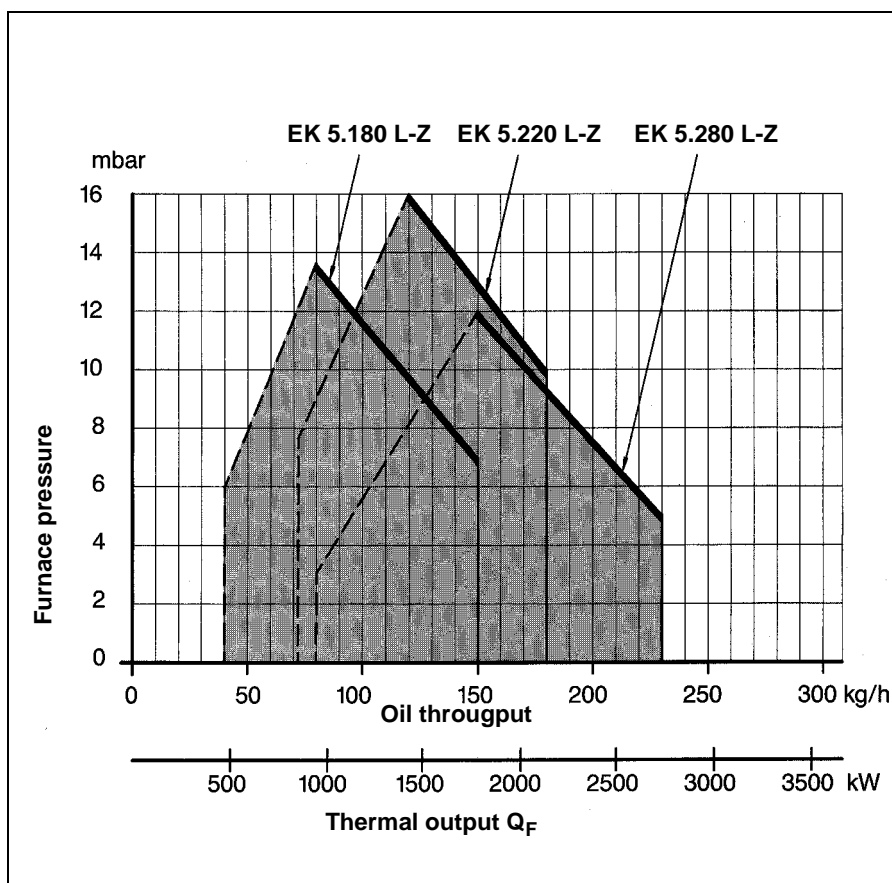
Each burner is delivered in a separate packing case. The following components are included in delivery:

- Burner with burner head, fixed mounting flange and insulating base
- Two oil tubes
- Automatic burner control unit with plug-in socket (mounted on the burner with model ZA)

Survey

Technical Data Performance Chart

Burner type		EK 5.180 L-Z(ZA)	EK 5.220 L-Z(ZA)	EK 5.280 L-Z(ZA)
Technical Data				
Thermal output	min	500 kW	855 kW	900 kW
Thermal output	max.	1780 kW	2135 kW	2730 kW
Oil flow	min	42 kg/h	72 kg/h	80 kg/h
Oil flow	max.	150 kg/h	180 kg/h	230 kg/h
Fuel oil		EL, DIN 51603	EL, DIN 51603	EL, DIN 51603
Hydraulic system		2-stage, 2 nozzles	2-stage, 2 nozzles	2-stage, 2 nozzles
Air regulation	suction side	Air cut-off valve	Air cut-off valve	Air cut-off valve
Air regulation	pressure side	in burner head	in burner head	in burner head
Control ratio	max.	60 / 100%	60 / 100%	60 / 100%
Voltage		230/400 V, 50 Hz	400/690 V, 50 Hz	400/690 V, 50 Hz
Power consumption		4,7 kW	4,7 kW	6,5 kW
Weight approx.		125 kg	130 kg	160 kg
Burner equipment				
Electric motor	2800 min. ⁻¹	4,0 kW	4,0 kW	5,5 kW
Automatic burner control unit		LAL 1.25	LAL 1.25	LAL 1.25
Flame monitor		QRB 3	QRB 3	QRB 3
Ignition transformer		ZM 20/14	ZM 20/14	ZM 20/14
Solenoid valves	Nozzle control	2-way	2-way	2-way
Solenoid valves	Air damper drive	3-way	3-way	3-way
Air damper drive		hydraulic	hydraulic	hydraulic
Oil pressure pump		RSA 125	RSA 125	NVBGR 600 l/h



Performance charts

The performance charts reflect the values approved during official homologation.

Determining the required thermal output:

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

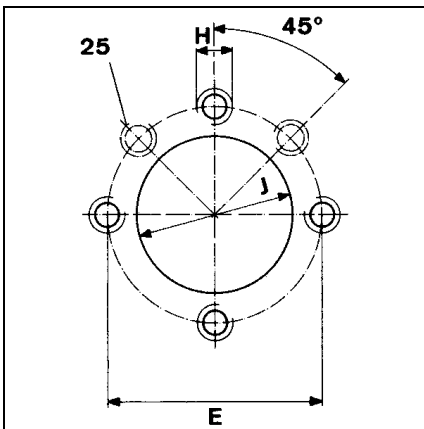
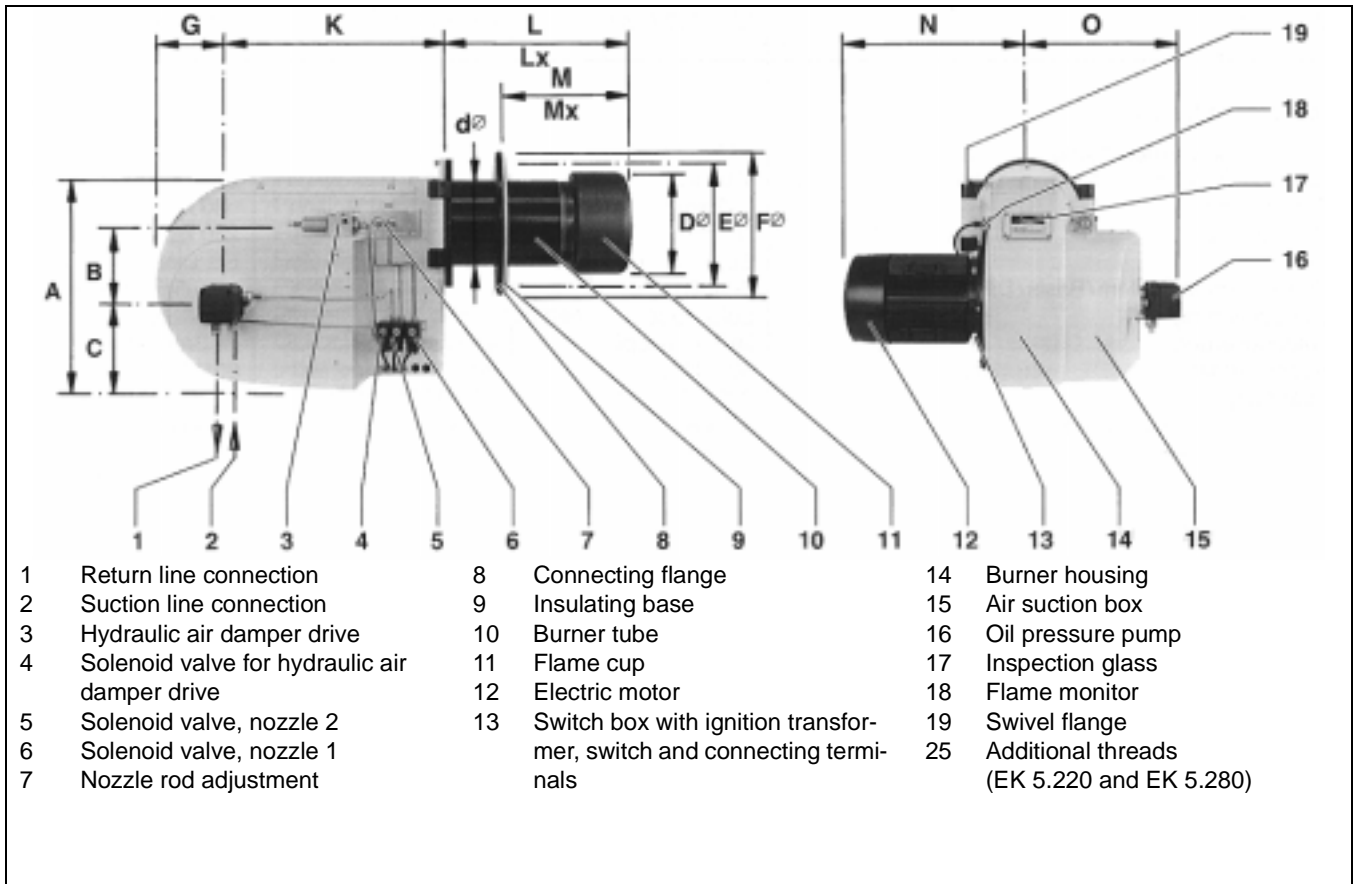
Q_F = Thermal output (kW)

Q_N = Rated boiler capacity (kW)

η_K = Boiler efficiency (%)

Survey

Dimensions



Boreholes in boiler connecting plate

Key

- EK = Manufacturer
- 5 = Size
- 180 = Performance rating
- L = Fuel oil extra light
- Z = Two stage
- A = Automatic burner control unit mounted on the burner

Models

- L-Z= Automatic burner control unit mounted externally
- L-ZA= Automatic burner control unit mounted on the burner

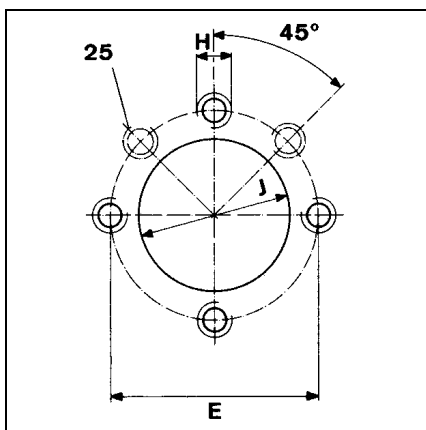
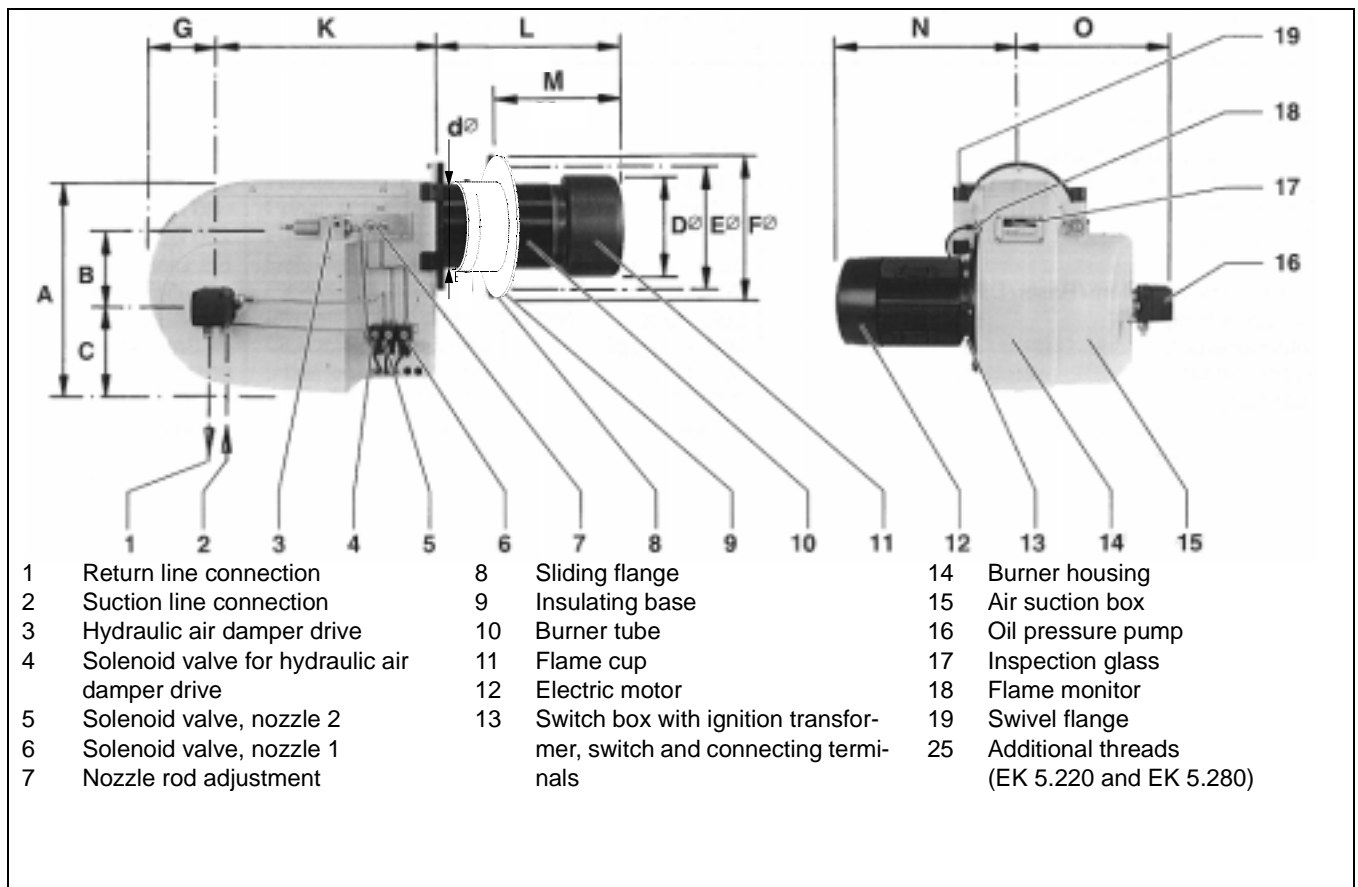
Burner type	Thermal output kW	A	B	C	dφ	Dφ	Eφ		Product-ID-no.
EK 5.180 L-Z(ZA)	500 - 1780	490	173	206	185	220	280		
EK 5.220 L-Z(ZA)	855 - 2135	490	173	206	220	260	340		
EK 5.280 L-Z(ZA)	950 - 2730	490	173	206	220	260	340		

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

Burner type	Fφ	G	H	J	K	L	Lx	M	Mx	N	O				
EK 5.180 L-Z(ZA)	310	242	M 12	230	500	420	685	270	450	420	470				
EK 5.220 L-Z(ZA)	370	242	M 12	290	500	440	715	290	450	420	470				
EK 5.280 L-Z(ZA)	370	242	M 12	290	500	440	715	290	450	470	470				

Dimensions

Sliding Flange Version



Boreholes in boiler connecting plate

Key

- EK = Manufacturer
- 5 = Size
- 180 = Performance rating
- L = Fuel oil extra light
- Z = Two stage
- A = Automatic burner control unit mounted on the burner

Models

- L-Z= Automatic burner control unit mounted externally
- L-ZA= Automatic burner control unit mounted on the burner

Burner type	Thermal output kW	A	B	C	dφ	Dφ	Eφ		Product-ID-No.				
EK 5.180 L-Z(ZA)	500 - 1780	490	173	206	185	220	280		5 G 654/96				
EK 5.220 L-Z(ZA)	855 - 2135	490	173	206	220	260	340		5 G 654/96				
EK 5.280 L-Z(ZA)	950 - 2730	490	173	206	220	260	340		19551/88				
Customized designs and voltages on request													
Burner type	Fφ	G	H	J	K	L	M	N	O				
EK 5.180 L-Z(ZA)	310	242	M 12	230	500	685	185 - 520	420	470				
EK 5.220 L-Z(ZA)	370	242	M 12	290	500	715	215 - 540	420	470				
EK 5.280 L-Z(ZA)	370	242	M 12	290	500	715	215 - 540	470	470				

Burner Functions

Functional Description Functional Diagram

Starting function

The automatic burner control unit automatically starts the burner when heat is required by the system.

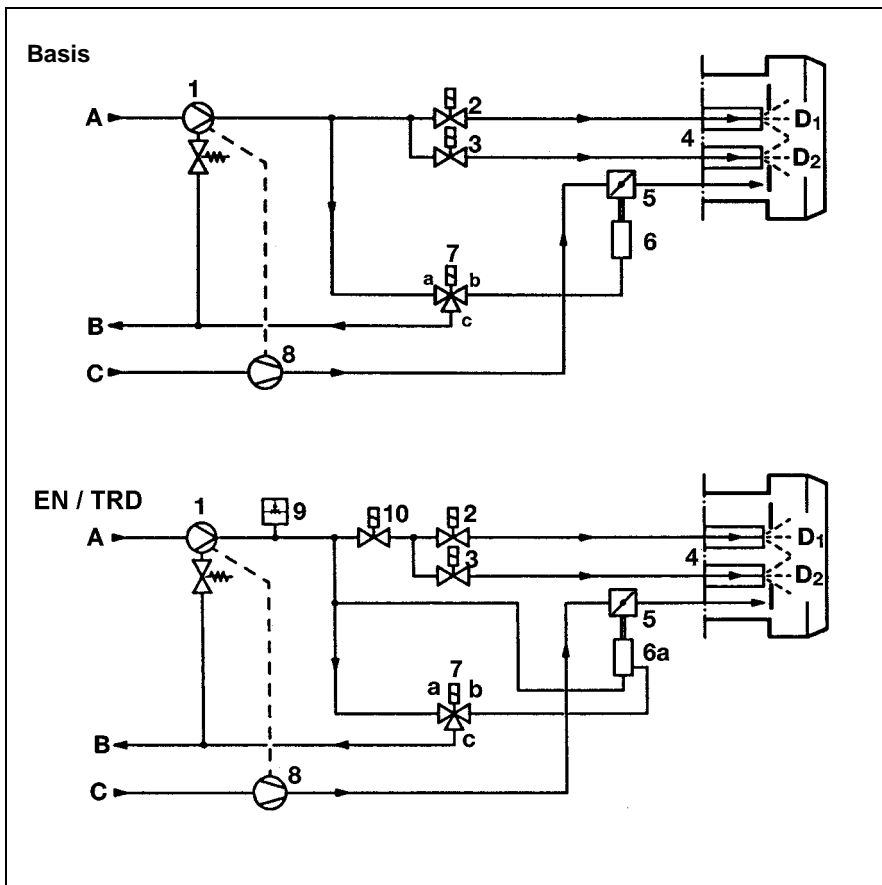
- The motor starts, the ignition is switched on
- The air damper drive (6a) switches the air damper (5) to the low-load position (in "Basis" design, the air damper is in the low-load position when the burner is idle)
- Preventilation
- The solenoid valve (2) opens nozzle 1
- The flame is formed (low load is in operation)

Switching over to full load

If required by the system, the automatic burner control unit switches the burner to full load.

- The solenoid valve (3) opens nozzle 2
- At the same time, solenoid valve (7) switches from passage **b-c** to **a-b**
- The hydraulic air damper drive (6) switches the air damper (5) to full load (full load is in operation).

The ignition is switched off again upon activation of full load.



Functional diagram

- | | |
|----------------|--|
| 1 | Oil pressure pump with pressure regulator |
| 2 | Solenoid valve for nozzle 1 |
| 3 | Solenoid valve for nozzle 2 |
| 4 | Nozzle rod with two nozzles |
| 5 | Air damper |
| 6 | Hydraulic air damper drive |
| 6a | Hydraulic air damper drive for air cut-off |
| 7 | Solenoid valve for air damper drive |
| 8 | Combustion air blower |
| 9 | Pressure monitor (only with TRD) |
| 10 | Safety solenoid valve |
| A | Supply oil connection |
| B | Return oil connection |
| C | Combustion air inlet |
| D ₁ | Nozzle 1 |
| D ₂ | Nozzle 2 |

Safety functions

A **fault shutdown** is effected if:

- a flame signal occurs during preventilation (extraneous light monitoring)
- no flame occurs within 5 seconds after starting the burner (initial oil release)
- the flame is extinguished during operation.

A fault shutdown is indicated by the flashing lamp in the reset button.

The program timer stops and the location of the malfunction is indicated (see Service Instructions, Malfunctions). After eliminating the malfunction, press the reset button to start the burner again.

A **controlled shutdown** is effected if:

- the medium temperature or pressure is reached
- the power supply fails

The burner starts again automatically as soon as the operating conditions have returned to normal.

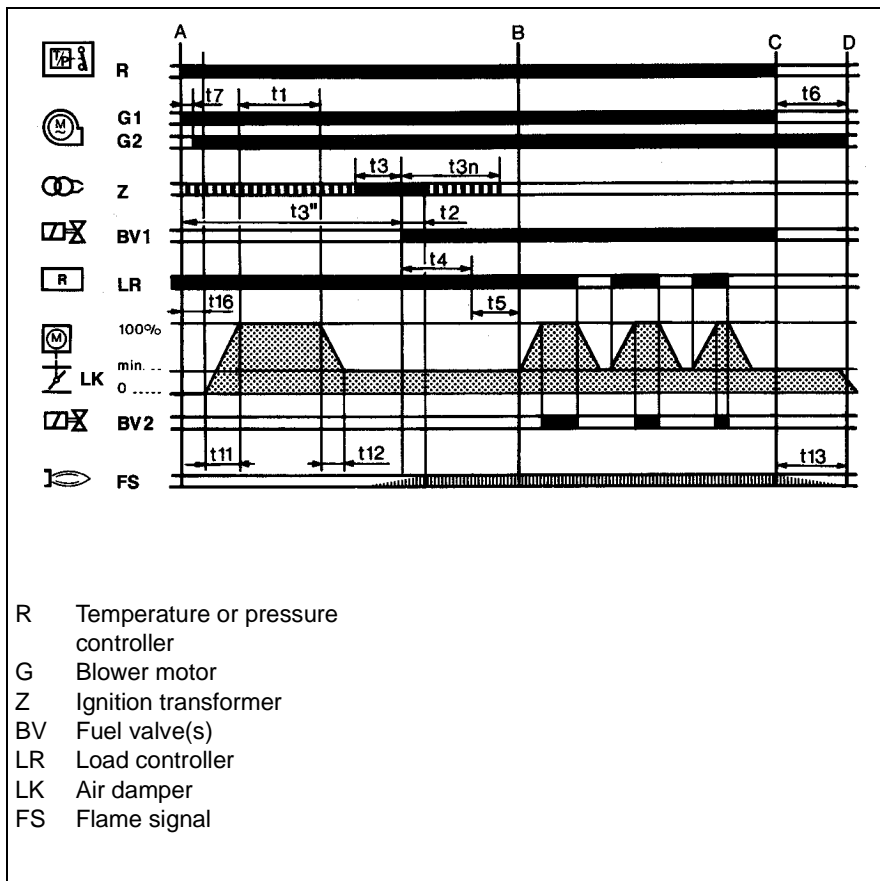
Burner Functions

Functional Sequence of Burner Control Units LAL 1...



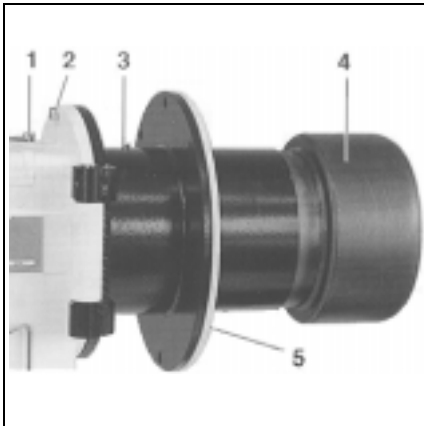
The burner control units LAL 1... are designed for controlling and monitoring burners with multi-stage or modulating control systems. For a detailed functional description of the burner control units, including technical data and planning information, refer to

Technical Documentation
LAL 1 L&G 7153 D



Installation

Mounting the Burner to the Heat Generator Electrical Connection



- 1 Hinge bolt
- 2 Locking screw (for swivelling the burner)
- 3 Fixing screw for flame cup
- 4 Flame cup
- 5 Insulating base

Mounting the burner to the heat generator

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

- Attach the studs to the boiler plate
- Secure the burner head

If required, the flame cup (4) can be removed or displaced.

- Release the screw (3).

Electrical connection

Electric wiring must be carried out by an **authorized electrician** according to the enclosed wiring diagram.

For cable connection, ensure the following:

- Connect to terminal strip (6/9)
- Provide sufficient length of cable so that the burner and the boiler door can be opened.
- Do **not** install the sensor lead in the multi-conductor cable.

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

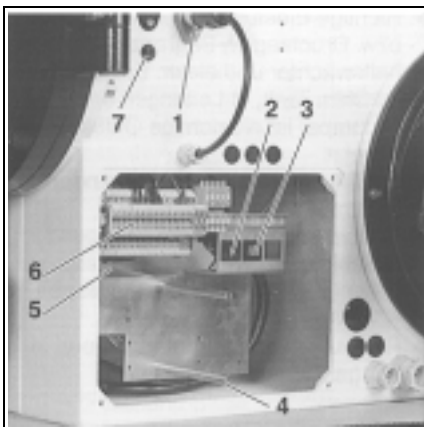
Disassembling the electric module

- Set the main switch to off, remove the fuse
- Release the lock nut (4/10)
- 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. Then start the motor for a short time to check its sense of rotation.



Model L-Z

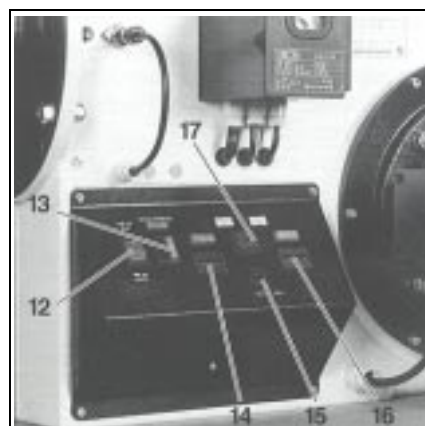
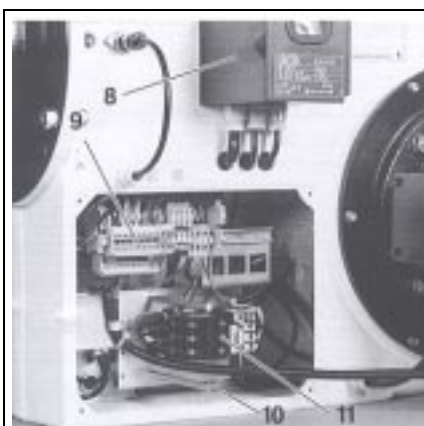
- 1 Flame monitor
- 2 Pushbutton On/Off
- 3 Pushbutton, stage 1 -stage 2
- 4 Fixing bolt for electric module
- 5 Ignition transformer
- 6 El. connecting terminals
- 7 Connection for inspection glass cooling

Inspection glass cooling

To keep the boiler inspection glass cool and clean, a cooling line may be connected to connection (7) R1/4".

The cooling line can be either 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.



Model L-ZA

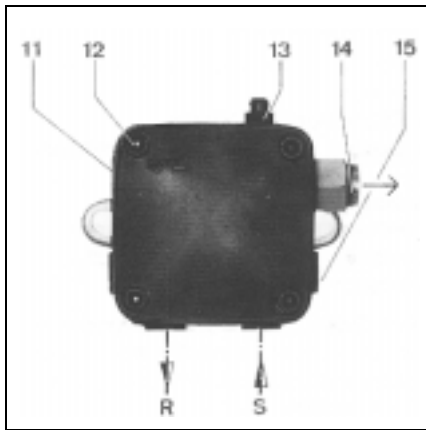
- 8 Automatic burner control unit
- 9 El. connecting terminal
- 10 Fixing bolt for electric module
- 11 Protective motor switch
- 12 Pushbutton On/Off
- 13 Reset button
- 14 Working hour meter, stage 1
- 15 Fuse
- 16 Working hour meter, stage 2
- 17 Pushbutton, stage 1 - stage 2

Installation

Oil Connection, Oil Pressure Pump Oil Pressure Regulation Start-Up

Oil connection

Hoses are used for connecting the oil pipes and the valve system. The hoses must be properly installed (suspended if possible) to avoid kinking and the risk of fracture. For the dimensions of the supply and return pipes from the valve system to the tank, please consult the relevant technical data sheets.



Attaching the measuring instruments

Suction line vacuum gauge to connection (15)

Oil pressure gauge to connection (13)

Filters

To protect the burner pump and the hydraulic system, suitable filters must be installed upstream of the burner.

Oil pressure regulation

The oil pressure is regulated by the pressure regulator incorporated in the pump. The correct setting is approx. 15-20 bar, depending on the burner capacity.

The pressure regulator is actuated by turning the screw (11).

Vacuum test (suction line)

The maximum permissible vacuum is 0.4 bar. A higher vacuum will cause the heating oil to vaporize and may cause malfunctions.

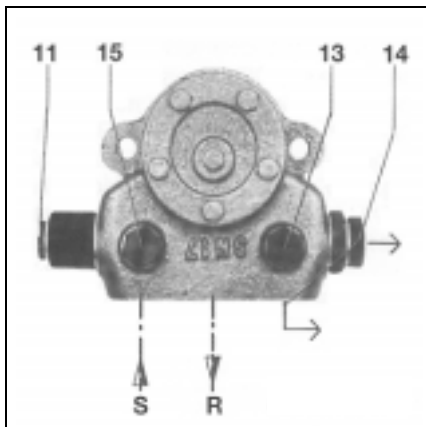
Pump type for

EK 5.180 L-Z

EK 5.220 L-Z

Oil pressure pumps

The burners are equipped with self-priming gear pumps with built-in pressure regulator. They operate according to the split-system principle, which means that the suction and return lines must be connected separately to the pump.



Pump type for

EK 5.280 L-Z

- 11 Supply oil pressure regulator
- 12 Screw for pump cover
- 13 Pressure gauge connection (supply oil)
- 14 Pressure output
- 15 Vacuum gauge connection (suction line)

S Suction line connection

R Return line connection

Fill the pump with oil **before starting** it for the first time.

To protect the pump, the oil pressure regulator is delivered with the **pressure removed**.

When starting the burner for the first time, slowly increase the oil pressure to the required rating (15-20 bar).

Start-up and ventilation

Switch on the burner for a short while and check whether the sense of rotation is correct. Loosen the oil pipe union at the pressure output (14), switch on the burner and run the burner until bubble-free oil emerges. Then reconnect the oil pipe.

Important!

The hydraulic system has been filled with test oil at the factory. This may cause ignition problems when starting the burner for the first time.

Adjustment sequence

- Start the burner
- Adjust the oil pressure (15-20 bar)
- Provisionally adjust low load
- Switch over to full load
- Finally adjust full load
- Switch back to low load
- Finally adjust low load

Start-Up

Burner Head Setting Dimensions

The setting dimensions are standard values which refer to 80% of the maximum burner capacity. They can be readjusted depending on operating conditions, flue gas analysis and combustion behaviour.

Important!

Check the settings by means of the table before starting the burner for the first time. Remove the nozzle connection for this purpose.

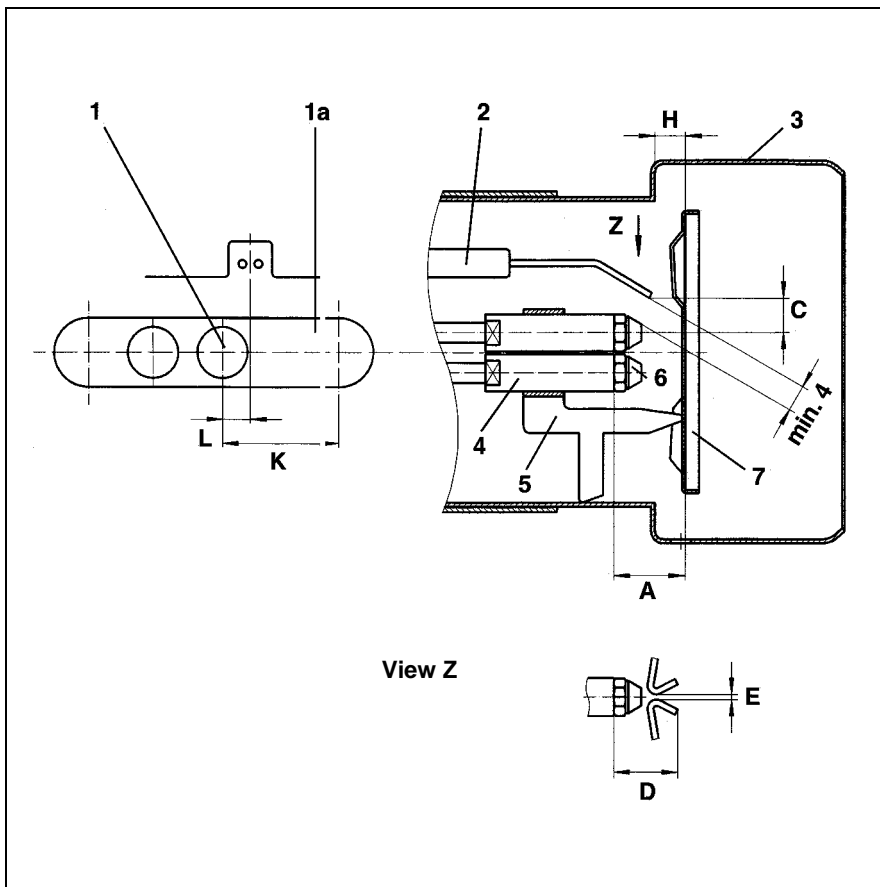
Ignition electrodes

The ignition electrodes are directed to nozzle 1.

Spare ignition electrodes must be bent for replacement (at an angle of approx. 30° to the nozzle).

Zero point adjustment, flame cup

Before the burner is operated for the first time, the zero point must be checked and adjusted, if necessary, so that the zero mark on the scale corresponds to the zero position in the burner head (H=0). Adjustment is made by displacing the flame cup.



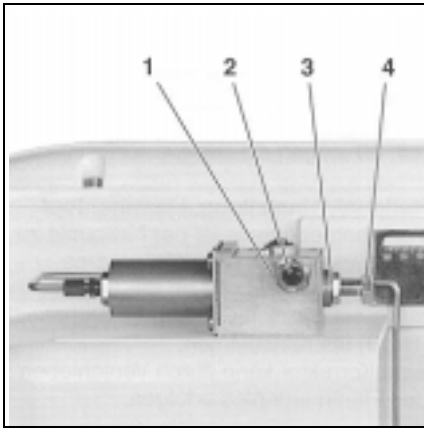
Burner head

- 1 Oil connection, minimum low load
- 1a Oil connection, maximum full load
- 2 Ignition electrode
- 3 Flame cup
- 4 Nozzle rod
- 5 Baffle plate holder
- 6 Nozzle
- 7 Baffle plate

Burner type	Standard settings						
	A	C	D	E	H	K	L
	Baffle plate/ nozzle rod	Electrode/ axis	Electrode/ nozzle rod	Electrode gap	Baffle plate/ flame cup	max. longitudinal adjustment	Oil filler neck/ scale plate 0
EK 5.180 L-Z(ZA)	30	9	20	3	28	50	-28
EK 5.220 L-Z(ZA)	30	9	20	3	25	50	-25
EK 5.280 L-Z(ZA)	30	9	20	3	28	50	-28

Start-Up

Air Regulation



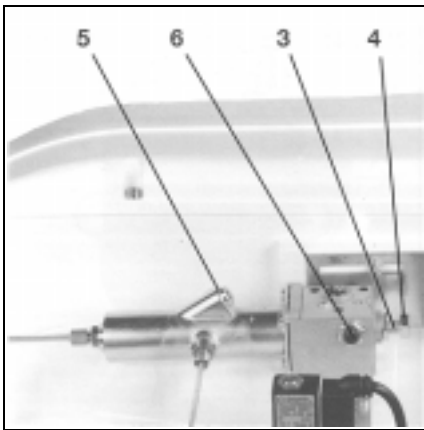
Design "Basis"

Low load

- Release the lock nut (1)
- Use the screw (2) to adjust the low-load air
- Tighten the lock nut after adjustment

Full load

- Release the lock nut (3)
- Use the screw (4) to adjust the full-load air
- Tighten the lock nut after adjustment



Design "DIN"

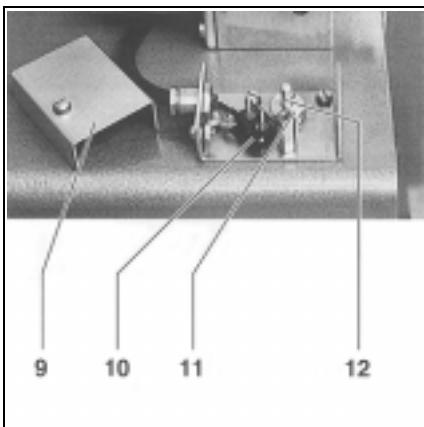
The **closed** air damper position is adjusted by means of the screw (6) (standard factory setting).

Low load

- Release the plug screw (5).
The screw behind it is now accessible for adjusting the low-load air
- Retighten the plug screw

Full load

- Release the lock nut (3)
- Use the screw (4) to adjust the full load air
- Tighten the lock nut after adjustment



- 1 Lock nut
- 2 Air regulator, low load (Basis)
- 3 Lock nut
- 4 Air regulator, full load
- 5 Air regulator, low load (CEN)
- 6 Air regulator, air damper closes(CEN)
- 7 Locking screws for longitudinal nozzle rod adjustment
- 8 Fixing screw, nozzle rod
- 9 Test switch cover
- 10 Test switch
- 11 Cam locking screw
- 12 Cam disk

Air regulation, suction side

The combustion air is adjusted on the hydraulic air damper drive.

Important!

Make sure that you do not turn the stops of the hydraulic drive forcefully towards each other, i.e. adjust the screws only **as long as** the air dampers move synchronously. Violent and excessive turning will destroy the pinion.

Adjusting the air damper test switch

The air damper test switch tests the air damper position at full load. It is used for switching the solenoid valve for the second nozzle. For precise adjustment of the switching point, adjust the cam disk (12) using a screwdriver. The cam disk is locked by means of the locking screw (11).

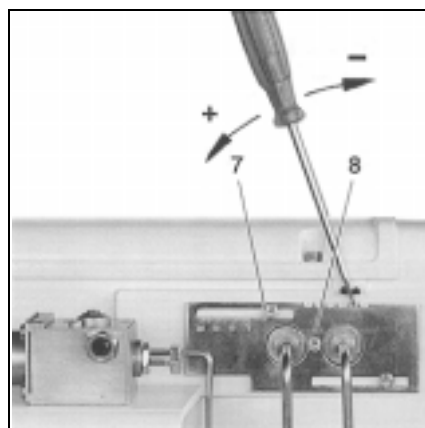
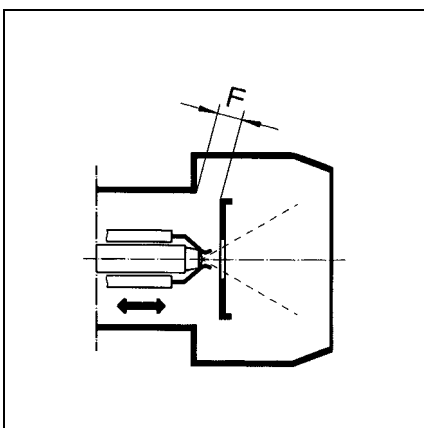
Air regulation, pressure side

Moving the nozzle rod changes the available sectional area (F) in the flame cup.

Adjusting the nozzle rod

- Release the screws (7)
- Adjust the nozzle rod
- Tighten the screws after adjustment

The ideal position of the nozzle rod is determined by analyzing the combustion quality at low and full load. To disassemble the nozzle rod, release the screw (8).



Service-Instructions

Maintenance Troubleshooting

Maintenance

Burner installations should be serviced once a year. The combustion and emission values should be checked and readjusted, if necessary. All mechanical and hydraulic functions should also be checked and wearing parts should be replaced, if necessary. **Any maintenance and repair jobs may be carried out by authorized experts only.**

Check for operating ability

If a malfunction occurs, check first whether all requirements for troublefree operation have been met.

1. Check fuel level.
2. Check power supply.
3. Check if all control and safety features, such as thermostat, safety limiter, low-water cutout, electric limit switches etc. are operative and properly adjusted.

Burner malfunction, electric

Burner malfunctions are indicated by a malfunction lamp. The automatic burner control unit LAL 1 is equipped with a malfunction indicator that is very useful for locating the cause of a malfunction.

Malfunction control program and malfunction indicator

Automatic burner control unit LAL 1; for detailed information, see L and G 7153.

Basically, the program timer and the malfunction indicator stop whenever a malfunction occurs. The symbol displayed above the reading mark indicates type of malfunction:

- ◀ **No Start**, e. g. because the CLOSED signal from limit reversing switch "Z" (or from auxiliary switch "M") is missing on terminal 8, or because a contact is open between terminals 4 and 5.
- ▲ **Start aborted** because the OPEN signal from limit reversing switch "A" is missing on terminal 8. Terminals 6, 7 and 15 remain energized until the fault is eliminated!

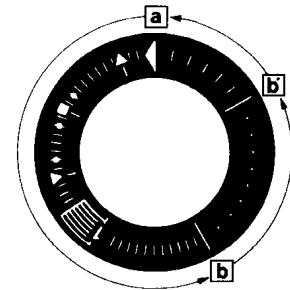
■ **Fault shutdown** because the flame supervising circuit is defective.

▼ **Start aborted** because the position signal from auxiliary switch "M" for the small flame position is missing on terminal 8. Terminals 6, 7 and 15 remain energized until the fault is eliminated!

1 **Fault shutdown** because no flame signal is present upon expiry of the safety time.

| **Fault shutdown** because the flame signal has failed during burner operation.

◀ **Fault shutdown on or after completion of the control program** because of extraneous light (e.g. flame not extinguished, leaky fuel valves or shutoff elements in the nozzle rod, defective flame supervising circuit, etc.).



- a-b Starting program
- b-b' „Blank spaces“ (no contacts actuated)
- b(b')-a Post-venting program

The automatic control unit can be **reset** immediately after a fault shutdown. After resetting (as well as after a power failure or after eliminating a malfunction which caused a fault shutdown), the program timer will always return to its starting position, supplying voltage to terminals 7, 9, 10 and 11 only, as determined by the control program. Only then will the control unit initiate another starting sequence of the burner.

Note:
Operate the reset button for 20 seconds at the most.

Burner malfunction, general

In the event of any burner malfunction whose cause is not immediately identifiable, check the program sequence by means of the applicable wiring diagram and the hydraulic system description until you locate the fault.

**ELCO
KLOCKNER**

Heiztechnik

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