FB 3 K LN

LOW NOx
KEROSENE BURNERS

ErP READY

Instructions to Assembly, Commissioning and Maintenance

Before installing and using the burner, read this manual carefully and keep it close to the burner.

Firebird by elco

EN

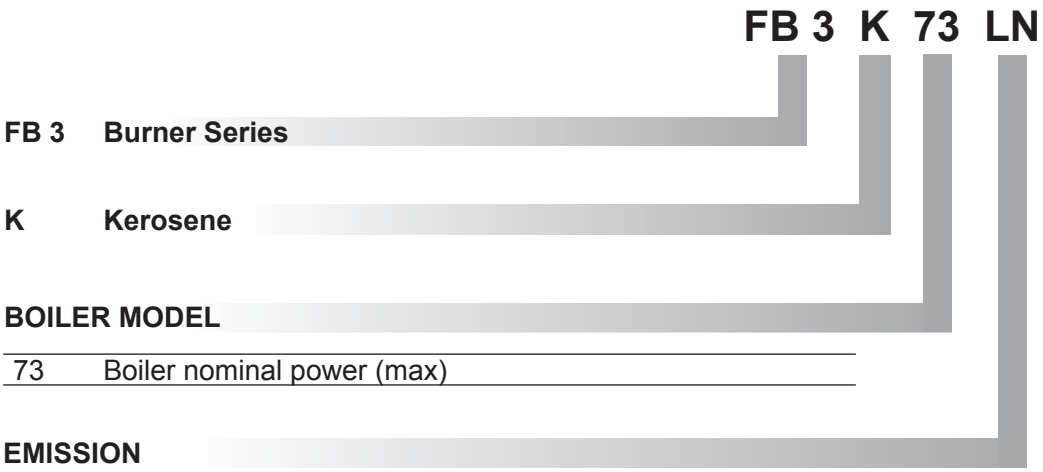
Dear Client,
We would like to thank you for having chosen a FIREBIRD product.
The model chosen by you is a high-performance product with an advanced technological conception, high reliability and excellent construction quality.
We advise you to entrust the running and maintenance of this appliance to know qualified professionals, and also to use only original spare parts when needed.
This manual contains important guidelines and suggestions which should be complied with in order to obtain a simple installation and the best possible use of the appliance.

RANGE

This manual refers to the following products:

BURNER MODEL	FIREBIRD CODE	ELCO CODE
FB 3 K 73 LN	414851	3146164
FB 3 K 100 LN	414857	3146165

BURNER DESIGNATION



NOx < 120 mg/kWh according to European Commission Regulation No 813/2013 and to pr EN267/2016 Class 4.

CONTENTS

1 SAFETY

1.1 Overview

These instructions for the installation, commissioning and maintenance of the burner are for use by technicians from professional heating companies that are qualified to carry out these activities. The instructions contain indications and information on how to move, handle, activate, adjust, maintain and remove the appliance and how to dispose of the components at the end of the their useful life.

The instructions must be followed and all applicable legislation complied with in order to ensure safe working conditions.

This manual should be stored near the product and made available to all operators involved in its use.

1.2 Intended use

The burner is designed to act as a heat source for heating and DHW generation systems in which water is the heating fluid.

Any other or wider application is outside of the specified intended use.

To avoid risks, the burner should only be used:

- for its specifically intended use
- under the appropriate safety conditions
- following the instructions for installation, commissioning and maintenance
- in compliance with the max. and min. operating values
- in compliance with the required maintenance activities
- immediately repairing any malfunctions that could compromise safety
- maintaining all notes and notices applied to the product so that they remain legible over time

the burner cannot be installed outdoors, unless installed in a boiler specifically designed for that use. If installed outdoors, climatic conditions could cause direct damage to the burner due to the presence of water or frost or cause the components to overheat.

1.3 Symbols used

1.3.1 Key to symbols used in the manual

DANGER
Maximum danger. Indicates operations that cause serious injury, death or long-term health risks if performed incorrectly.

DANGER
Indicates a dangerous situation that could cause serious injury, death or long-term health risks, caused by electricity, if handled without due care or incorrectly.

WARNING
Indicates operations that could cause serious injury, death or long-term health risks if performed incorrectly.

PRECAUTION
Indicates potentially dangerous situations and operations that could cause damage to the device or things and minor injury to persons, if handled without due care or performed incorrectly.

CAUTION
Indicates operations that could cause damage to the device or nearby things.

IMPORTANT INFORMATION
This symbol indicates important information that you must bear in mind.

1.3.2 Other symbols

DANGER FLAMMABLE MATERIAL
Indicates a dangerous situation that could cause serious injury, death or long-term health risks, caused by the presence of flammable substances near the equipment, if handled without due care or incorrectly.

CAUTION
Indicates potentially dangerous situations, caused by the presence of surfaces at high temperatures that could cause minor injuries, or burns, if handled incorrectly.

PERSONAL PROTECTION
Several symbols are used to remind operators of the need to use all the personal protective equipment required by applicable legislation during all installation, commissioning and maintenance operations.

ENVIRONMENTAL PROTECTION
Reminds operators of the need to apply a suitable recycling procedure to replaced components.

ENVIRONMENTAL PROTECTION
Reminds operators of the need to deliver the product or its components to a suitable separated waste collection centre at the end of its working life.

1.4 Requirements for personnel or operators

CAUTION
It may be hazardous to assign activities to personnel that are not sufficiently qualified. It may harm the operators themselves if they perform manoeuvres or operations incorrectly, with a serious impact on personal safety, things and property.

CAUTION
Installation, commissioning and maintenance activities must only be carried out by the personnel of dedicated heating companies specifically qualified to perform these tasks.

CAUTION
Operators should explain to the proprietor and person responsible for the domestic heating system the burner is installed on, the importance of ensuring good inflow of combustion air and combustion product evacuation. They should also highlight that no modification should be made to the heating system (comprised of air intake, burner, boiler and flue pipe) that could alter the correct operation of the system.

1.5 Primary hazards

The following indications refer to “residual risks”, which must be highlighted for the full understanding and responsibility of the proprietor, users and operators.
These risks derive from risk analyses carried out by Research and Development staff as required by European Standard EN 267 and applicable directives (Machine directive, LVD, EMC).

DANGER
Danger of death!
- Contact with live electrical components may cause serious incidents.
- Only professionally-trained and qualified personal can operate on the electrical system.
- Before any operation, switch off the power supply to the system by operating the main switch. Check there is no power and ensure restart is impossible.
- In the event of damage to the electrical insulation on the product, act immediately to restore the correct level of insulation.

CAUTION
Hot surfaces - Risk of burns!
- Contact with components at high temperatures may cause more or less serious superficial burns.
- Operators should wear suitable clothing and personal protective equipment.
- They should ensure that all components are at ambient temperature before carrying out any maintenance operations.

FUEL LEAKS
- Fuel leaks may cause fire to break out.
- They may be toxic via inhalation and cause skin irritation.
- Act swiftly to remove the cause of the leak. If it is connected to a maintenance operation, use the dedicated personal protective equipment.

2 GENERAL

2.1 Burner description

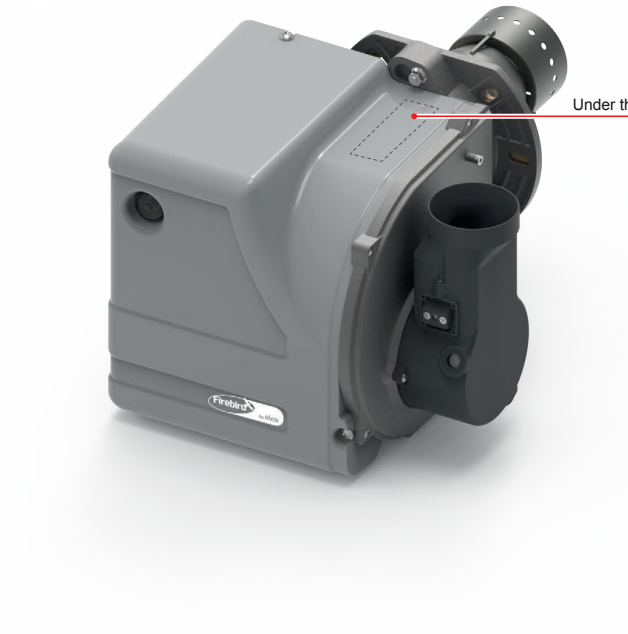
FB 3 K LN is a latest generation single-stage burner fuelled by kerosene. The innovative combustion head ensures low NOx and CO emissions within the emission limits set out by European Regulations for energy related products (ErP).
The burner uses functional components that, in addition to ensuring a long working life, also allow for easy installation, adjustment and maintenance. The high-performance electrical components ensure low fuel consumption.
The ventilation system ensures a high level of efficiency and, thanks to a powerful transformer, cold starts don't cause problems. The operation of **FB 3 K LN** burners is reliable even in the event of persistent or intermittent wind, ignition takes place effectively and with smoke-developed index control.
The contained dimensions, low noise and ease of installation make it possible to apply the burner to boilers installed in domestic spaces.

2.2 Supply

The burner **FB 3 K LN** includes the following equipments:
- n°1 flange with fixing bolt
- n°1 gasket
- n°1 flexible oil pipe
- n°1 nipple G3/8-1/4 (for flexible oil pipes)
- cable kit with 7 and 5 pin connectors (already mounted)
- n°1 hex key 4 mm
- gauge for checking the settings
- instruction manual

2.3 Identification

Check the identification label of the burner (“Fig. 1”).



A	Burner ELCO code	**F**	Electrical supply
B	Week and year of manufacture	**G**	Protection level
C	Burner model	**H**	Electrical consumption
D	Burner output (factory setting)	**I**	Type of fuel used
E	Burner output	**J**	Serial number

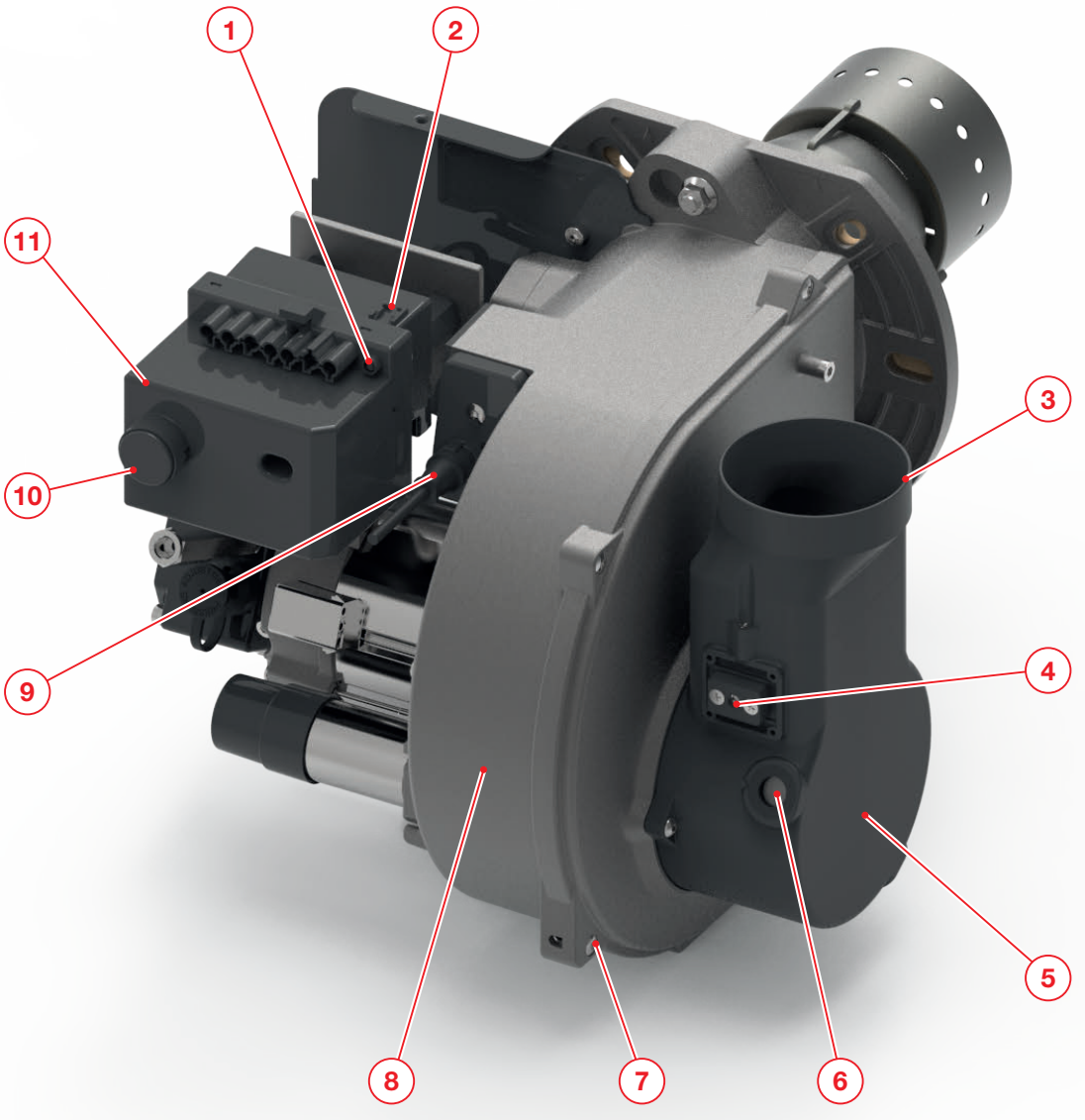
Fig. 1

CAUTION

CAUTION
It is strictly forbidden to remove the identification label.
Tampering, removal or absence of the data plate burner or anything that prevents the secure identification of the burner will create difficulties for any installation and maintenance work.

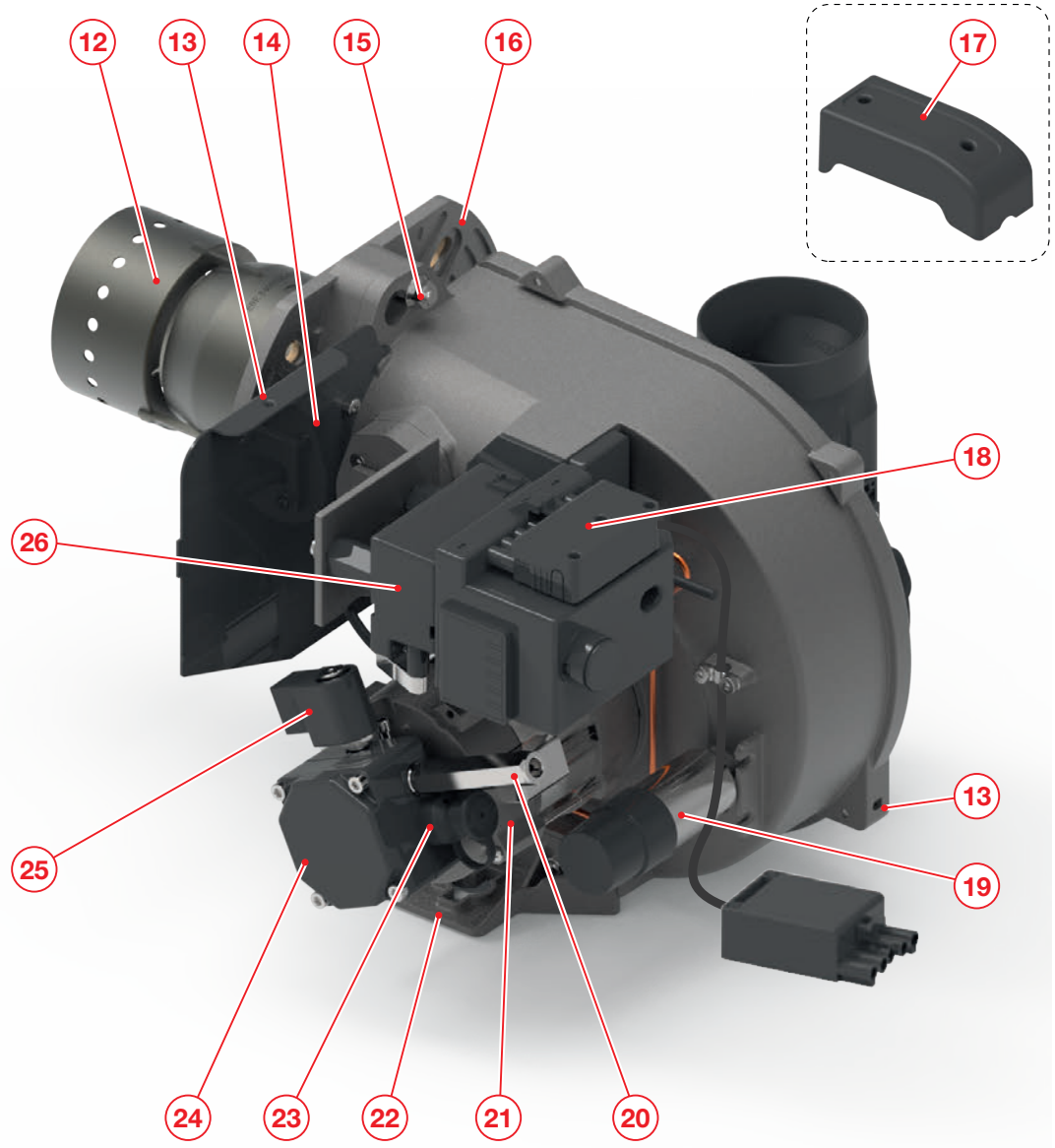
2.4 Structure

2.4.1 Structure of the burner



1	Heat demand LED	**7**	Fastening screws for equipment plate
2	Connection PLUG-IN between equipment and ignition transformer	**8**	Fan housing
		9	Flame sensor
3	Snorkel	**10**	Reset button
4	Air setting screw	**11**	Control box
5	Air box		
6	Air valve indicator		

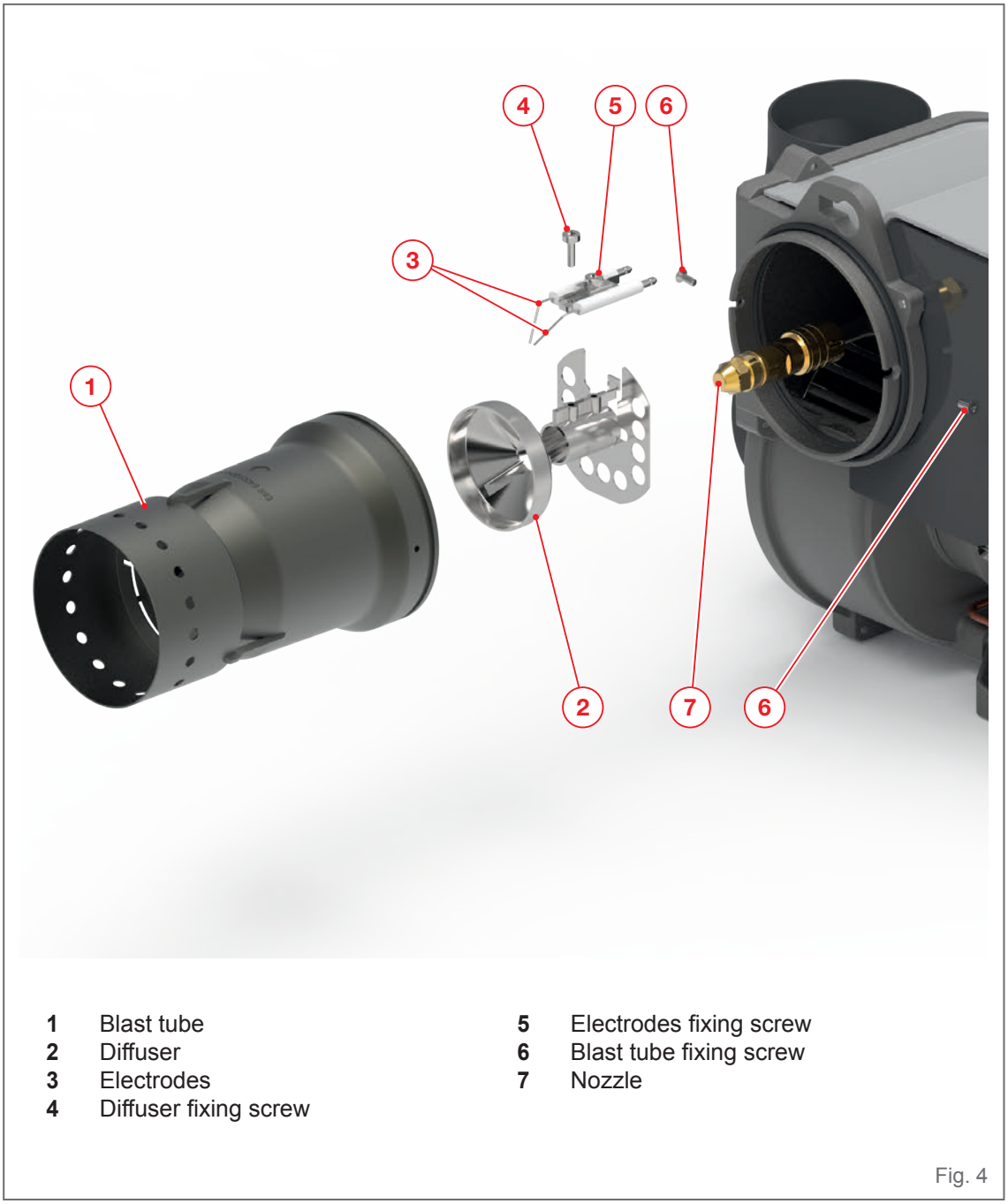
Fig. 2



12	Combustion head	**20**	Extended pressure port
13	Cover fixing screw	**21**	Electric motor
14	Front panel	**22**	Maintenance position plate
15	Burner fixing screw	**23**	Oil pressure regulator
16	Burner flange	**24**	Oil pump
17	Conventional flue carter (optional)	**25**	Solenoid valve
18	Cable kit with 7 and 5 pin connectors	**26**	Ignition transformer
19	Capacitor		

Fig. 3

2.4.2 Structure of the combustion head



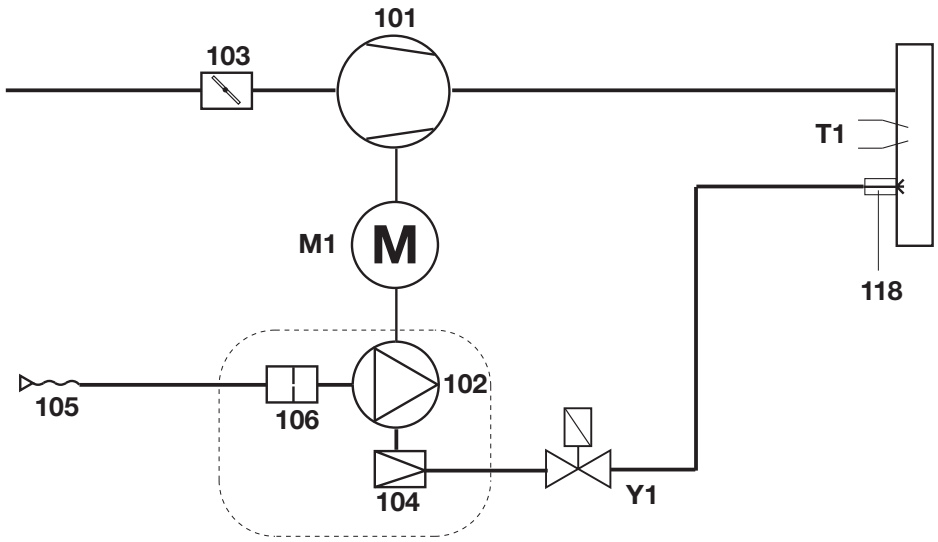
1	Blast tube	**5**	Electrodes fixing screw
2	Diffuser	**6**	Blast tube fixing screw
3	Electrodes	**7**	Nozzle
4	Diffuser fixing screw		

Fig. 4

2.5 Control box

The EBR-M1 control box, controls and monitors the forced draught burner. The microprocessor-controlled program sequence ensures maximum stability of time periods, regardless of fluctuations in the power supply or ambient temperature.
The design of the control box protects it from the effects of flame outs. Whenever the supply voltage drops below its rated minimum level (170 ± 8 V), the control box shuts down - even in the absence of a fault signal.
The control box switches itself back on again once the voltage has exceeded the 190 ± 8 V.

2.6 Operating logic



M1 Burner motor
T1 Ignition transformer
Y1 Solenoid valve
101 Fan
102 Oil pump
103 Air flap
104 Oil pressure regulator
105 Flexible oil pipe
106 Filter
118 Nozzle

Fig. 5

2.6.1 Operating function

- If heat is requested by the heating controls, the control box starts the program sequence.
- The motor starts, the ignition transformer is switched on and the preventilation period of 20 s starts.
- During the preventilation period, the furnace is monitored for flame signals.
- At the end of the preventilation period, the fuel-oil solenoid valve opens and the burner starts.
- The ignition transformer remains switched off while the burner is in operation.

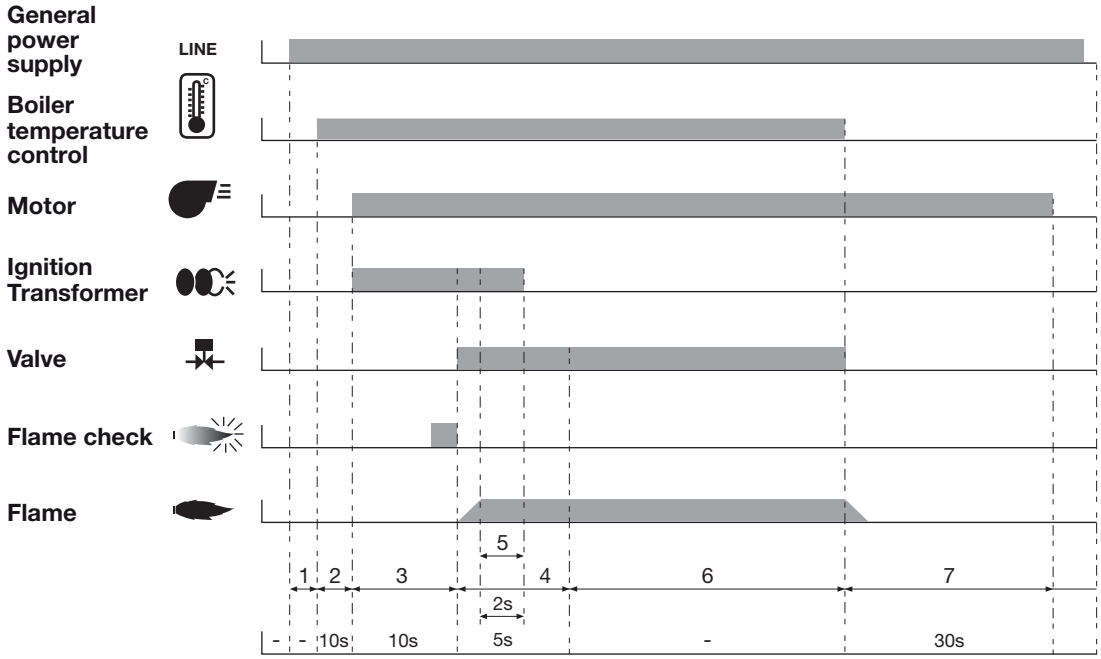
2.6.2 Controlled shutdown

- Boiler temperature control interrupts heat request.
- The fuel-oil solenoid valve closes and the flame is extinguished.
- The post-ventilation starts: time factory-set at 30 s. After the burner motor switches off.
- Burner enters standby.

2.6.3 Safety function

A safety shutdown occurs:
- if a flame signal is present during preventilation (flame monitoring)
- if no flame is produced within 5 seconds (safety time) from oil valve opening.

A safety shutdown is indicated by the malfunction lamp lighting up and it is then only possible to reset the burner by pressing the reset button after the cause of the malfunction has been rectified. For further information, see the automatic combustion control unit description.



1 Stand-by
2 Circuit stabilisation period
3 Prepurge time
4 Safety time
5 Post-Ignition time
6 Working phase
7 Post-purge

Fig. 6

IMPORTANT INFORMATION
After a maximum number of 3 ignition attempts (full recycles), burner in case of loss of flam goes to lockout not volatile.

3 TECHNICAL DATA

3.1 Dimensions and weights

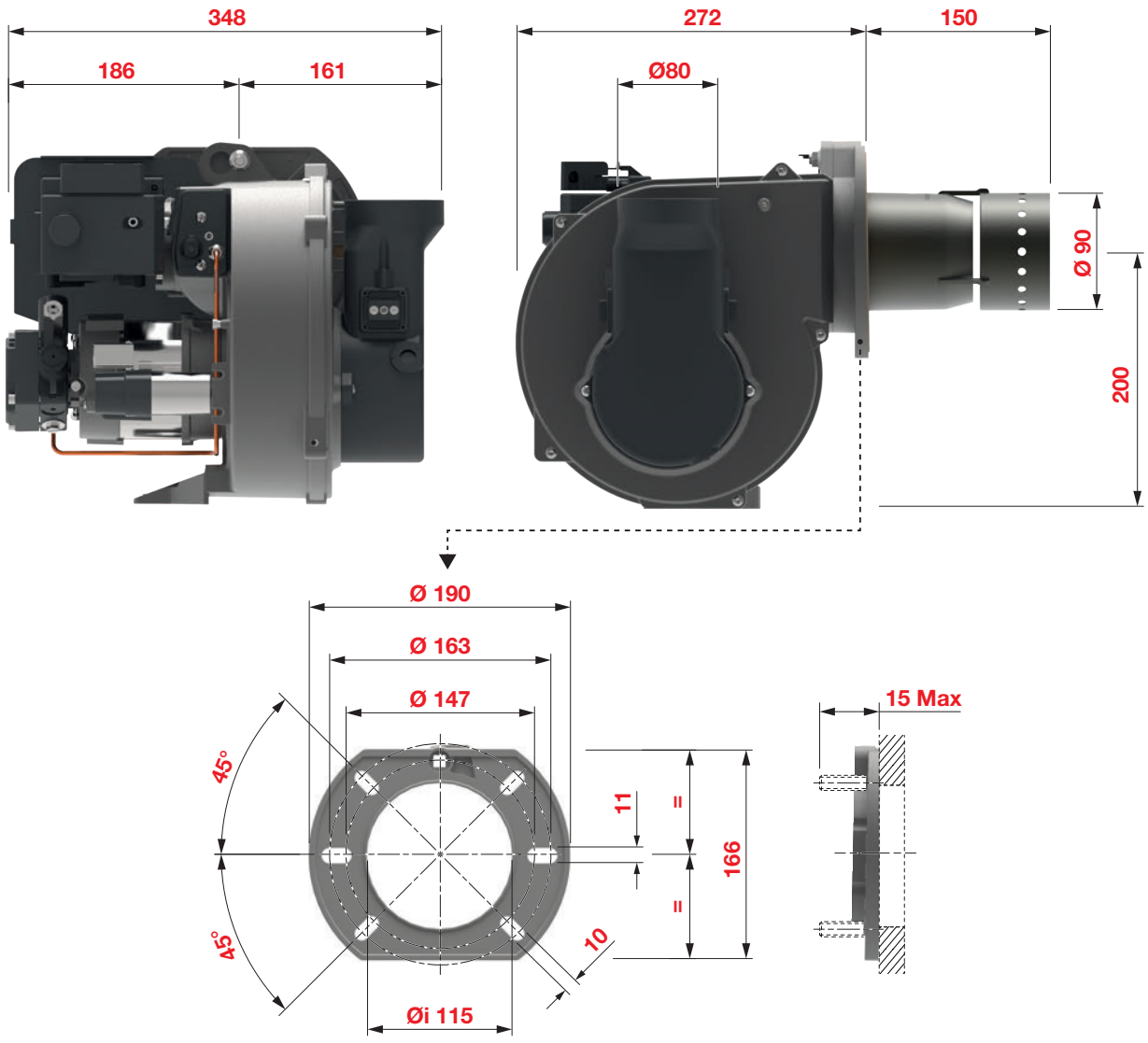


Fig. 7

Model	Weight (kg)	
	net	with packaging
FB 3 K 73 LN	10,1	12,8
FB 3 K 100 LN	10,1	12,8

All measurements are given in millimetres.

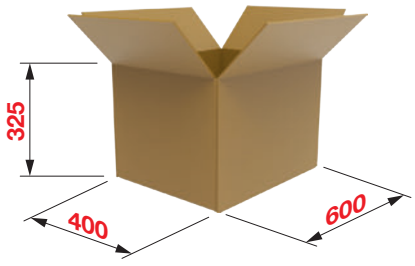


Fig. 8

3.2 Technical data

	FB 3 K 73 LN	FB 3 K 100 LN
Burner output factory setting (1)	68,0 kW	92,8 kW
	58.480 kcal/h	79.808 Kcal/h
Oil throughput factory setting (1)	5,7 kg/h	7,7 kg/h
Fuel oil (2)	Kerosene, visc 1÷2,5 mm^2/s at 20°C (Hi=11,97 kWh/kg)	
NOx emissions	< 120 mg/kWh (according to European Commission Regulation No 813/2013 and to pr EN267/2016 Class 4)	
Control box	EBR-M1 10-30	
Flame sensor	E.B.R. FTEB (GREEN)	
Ignition transformer	Fida 2P 26 kV pp-35 mA rms	
Fuel-oil pump	Danfoss BFP special	
Pump coil	BFP T85	
Electric motor	EBR 150 W, 2800 rpm	EBR 200 W, 2800 rpm
	150 watt	200 watt
Capacitor	Inco 5,0 µF, TEKNO 45T (T = top series)	Inco 6,3 µF, TEKNO 45T (T = top series)
Electrical supply	1 Ph / 230 V / 50 Hz	
Power consumption (+/- 10W) (3)	285 W	285 W
Protection level	IP40	
Sound pressure level	70 dB(A)	70 dB(A)
Ambient temperature for storage	-20°C ... +70°C	
Temperature for use	-10°C ... +60°C	

(1) Reference conditions: Ambient temperature 20 °C – Barometric pressure 1013 mbar – Altitude 0 m. a.s.l.
(3) Value measured with burner operation at regime.

WARNING
(2) The burner is suitable for kerosene with bio content up to 30%. It is a minimum requirement that the fuel blend (up to 30% Bio) is obtained with kerosene in accordance with the relevant standards and regional regulations.
In case of Bio oil content higher that 30% please contact the manufacturer.

3.3 Electrical diagram

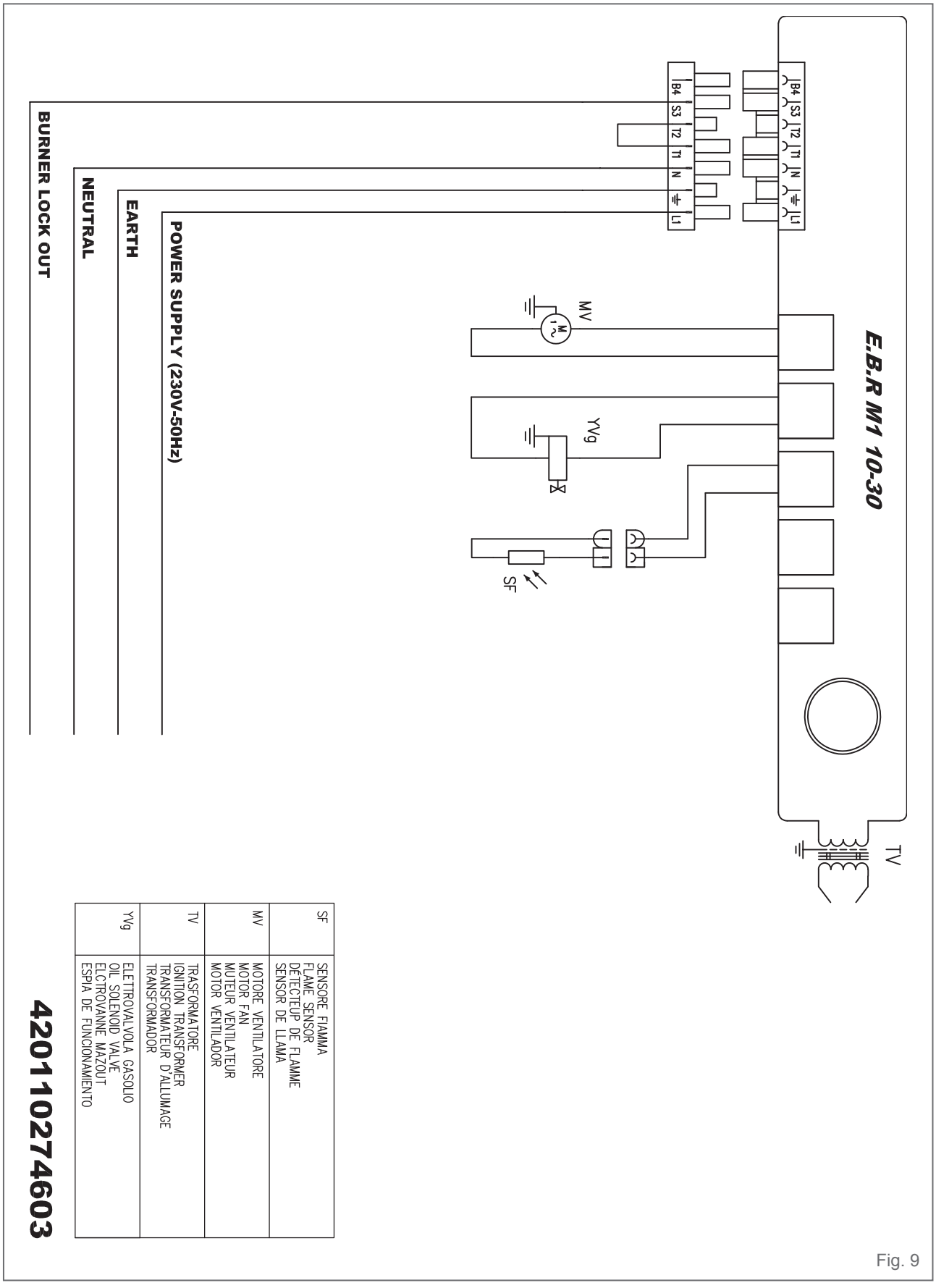


Fig. 9

4 INSTALLATION

4.1 Safety during assembly

DANGER
Danger of death!
- Contact with live electrical components may cause serious incidents.
- Only professionally-trained and qualified personal can operate on the electrical system.
- Before any operation, switch off the power supply to the system by operating the main switch. Check there is no power and ensure restart is impossible.
- In the event of damage to the electrical insulation on the product, act immediately to restore the correct level of insulation.

WARNING
Danger of death due to contact with fuel oil!
Risk of lung damage caused by inhalation or ingestion of fuel oil; take the following precautions:
- observe the instructions on the safety data sheets for the fuel oil and any additives (available from the associated suppliers)
- in the event of the formation of an oil mist, use a protective mask with filter for organic vapours and particulate filter
- do not eat, drink or smoke when working on the heating system.

WARNING
Danger of injury due to contact with fuel oil!
Repeated and prolonged skin exposure to fuel oil can damage and irritate the skin; take the following precautions:
- as far as possible, avoid contact with the skin
- use personal protective equipment, such as a protective gloves and suitable clothing
- do not put rags soaked with oil in your pockets
- change clothes stained with oil as soon as possible.

CAUTION
It may be hazardous to assign activities to personnel that are not sufficiently qualified. It may harm the operators themselves if they perform manoeuvres or operations incorrectly, with a serious impact on personal safety, things and property.

CAUTION
Installation, commissioning and maintenance activities must only be carried out by the personnel of dedicated heating companies specifically qualified to perform these tasks.

CAUTION
Operators should explain to the proprietor and person responsible for the domestic heating system the burner is installed on, the importance of ensuring good inflow of combustion air and combustion product evacuation. They should also highlight that no modification should be made to the heating system (comprised of air intake, burner, boiler and flue pipe) that could alter the correct operation of the system.

4.2 Installation area

Before installation, make sure that the installation area satisfies the following requirements:
- operating temperature between -10°C and +60°C
- dry, frost resistant, well-ventilated
- no accumulation of heavy powders
- no high levels of humidity
- no atmospheric pollutants created by halogenated hydrocarbons (contained in solvents, adhesives, aerosols, etc.)
- no atmospheric pollutants created by sulphurous gases
- no vibration.

WARNING
Danger of death caused by fire!
Highly flammable materials or liquids can catch fire
- do not use or store explosive or highly flammable substances (such as petrol, paint, paper, wood, etc.) in the installation area of the appliance
- do not dry clothing within the boiler installation area
- do not use the equipment in an explosive atmosphere.

CAUTION
Flammable materials or liquids should not be stored or used near the burner.

IMPORTANT INFORMATION
Failure to observe these instructions will invalidate the warranty with respect to any damages caused by any of these causes.

4.2.1 Flue gas system

Before installation, check the design suitability of the combustion flue system with respect to the type of boiler to be installed and with respect to the applicable standards and regulations.

CAUTION
Operators should explain to the proprietor and person responsible for the domestic heating system the burner is installed on, the importance of ensuring good inflow of combustion air and combustion product evacuation. They should also highlight that no modification should be made to the heating system (comprised of air intake, burner, boiler and flue pipe) that could alter the correct operation of the system.

4.3 Assembly tools

The most common and frequent operations on the burner are carried out simply using only the hex key supplied. This key can be used to:
- remove the burner cover
- remove the diffuser
- adjust the electrodes group
- adjust the fuel pressure
- adjust the air setting
- operate on the pump.

4.4 Burner assembly

CAUTION

CAUTION
Install the burner on the boiler according to the installation position shown in “Fig. 10”.
Installation 2,3 and 4 are forbidden for safety reason.

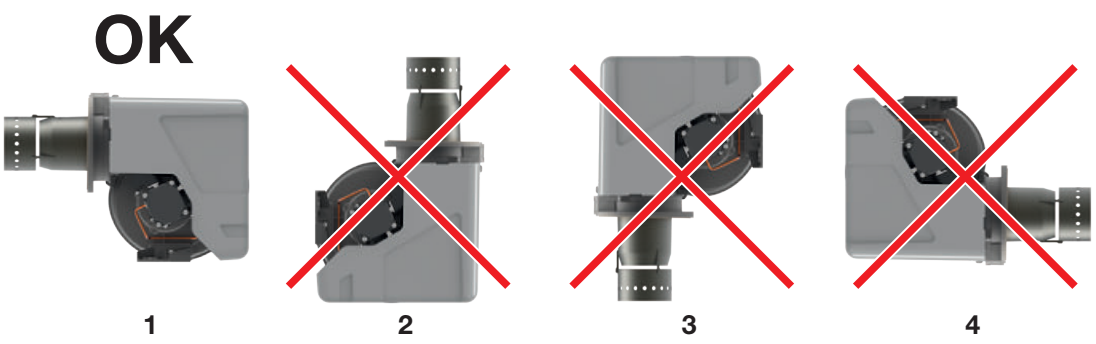


Fig. 10

The burner is secured to the boiler using the connection flange supplied with the burner.
Follow the instructions below:
- couple the gasket (2) supplied with the connection flange (1).

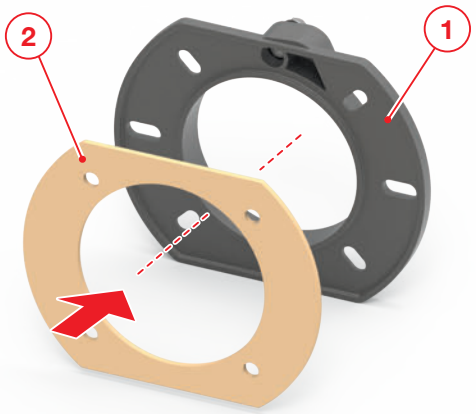


Fig. 11

- position the gasket and the flange (2), with the screw (1) facing upwards, onto the boiler and secure it with the four nuts (5) supplied
- **tighten the nuts (5) of the flange evenly and diagonally with a tightening torque of 3,5 Nm max.**
- insert the burner combustion head (6) with care inside the flange

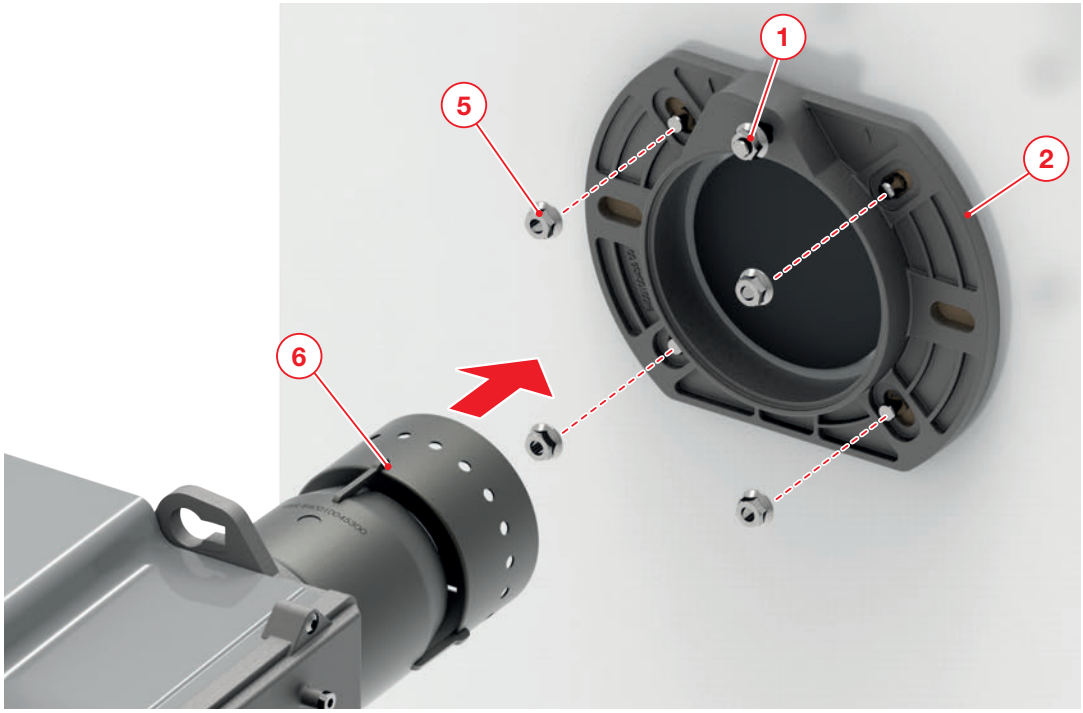


Fig. 12

- rotate the burner counterclockwise to insert the fastening screw (1) into the housing (7) on the burner
- fully tighten the nut (3) and at the same time press the burner in the lower part towards the boiler to ensure maximum seal between the burner itself and the boiler

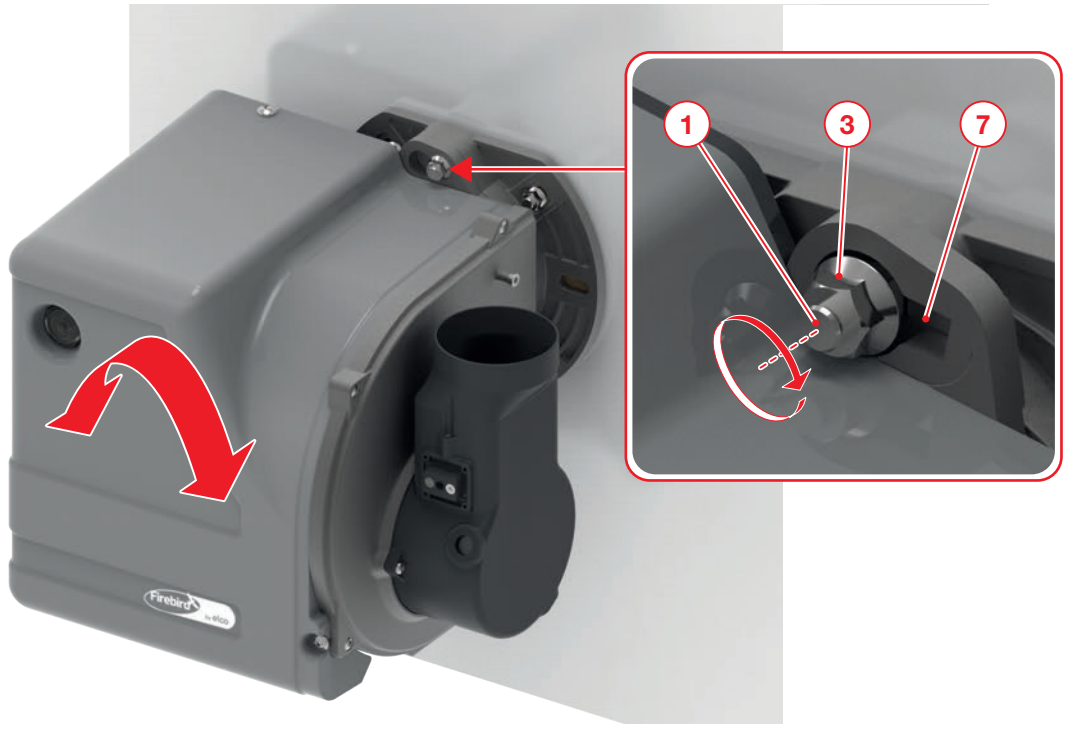


Fig. 13

- in case of balance flow, insert the air intake pipe (8) on the snorkel (10) and fix it by a clamping collier (9), not supplied
- in case of conventional flue applications remove snorkel (10) and replace with the conventional flue carter (11) (optional) after removing the front side (12).

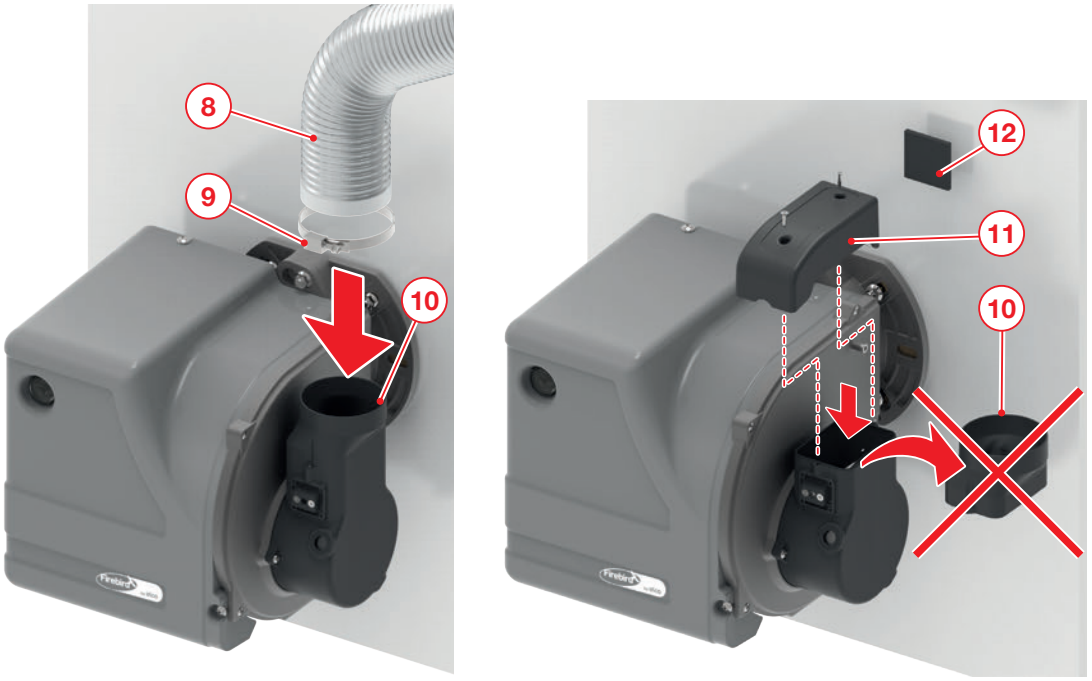


Fig. 14

4.5 Removing and fitting the burner cover

- To remove the burner cover (2), loosen the two screws (1) and then slide out (A→B) the burner cover (2) taking care not to damage it.
- To refit it, invert the procedure above.

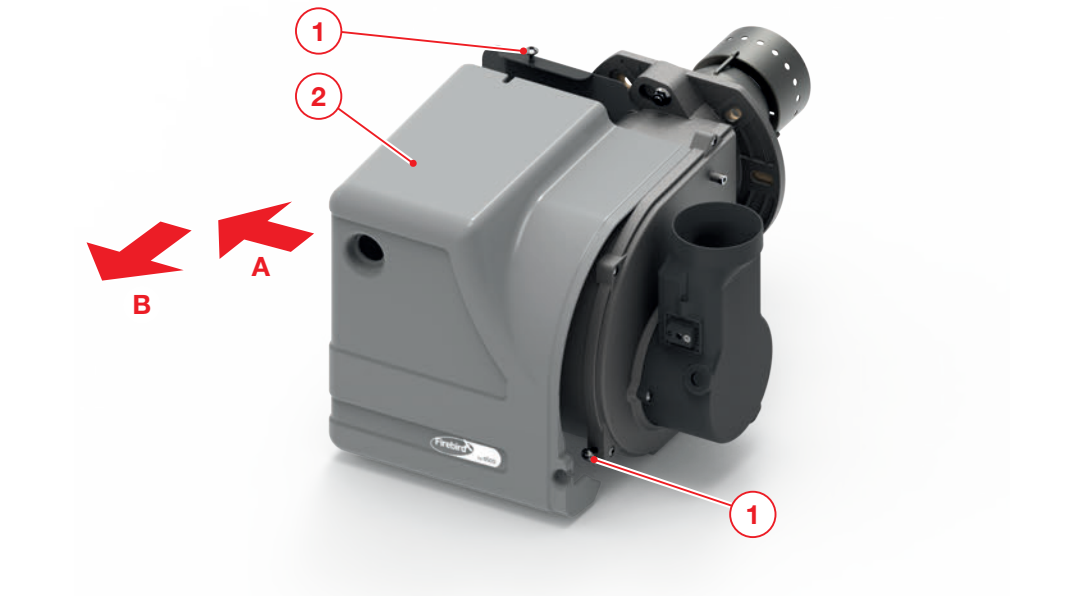


Fig. 15

4.6 Oil systems

FUEL LEAKS
- Fuel leaks may cause fire to break out.
- They may be toxic via inhalation and cause skin irritation.
- Act swiftly to remove the cause of the leak. If it is connected to a maintenance operation, use the dedicated personal protective equipment.

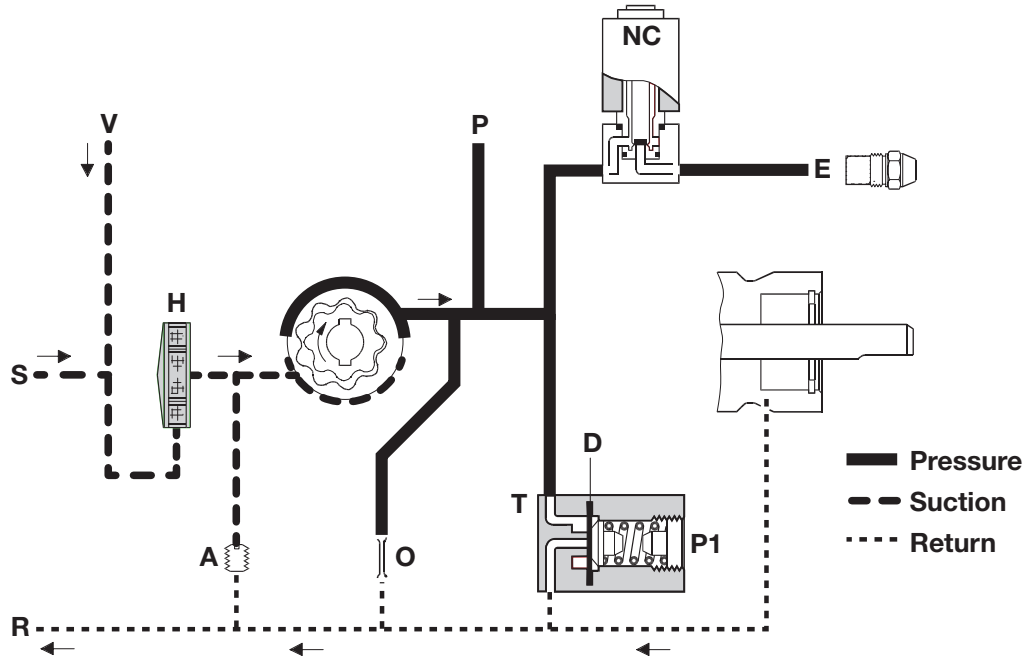
WARNING
Danger of injury from gas in the atmosphere!
To prevent the formation of gas caused by worst combustion/deflagration:
- when filling the tank, switch off the burner and leave it switched off for approximately 3 hours to ensure degassing of the fuel and the deposit of suspended particles
- have any damage to the oil pipes repaired immediately by a specialised technician
- never operate the burner with the oil tank empty.

IMPORTANT INFORMATION
Corresponding legislation pertaining to water resources and the installation of fuel pipes must be observed.

IMPORTANT INFORMATION
Leaks in the fuel supply system can cause combustion problems and malfunctions in the burner.

When the burner is replaced, also replace the fuel filter.

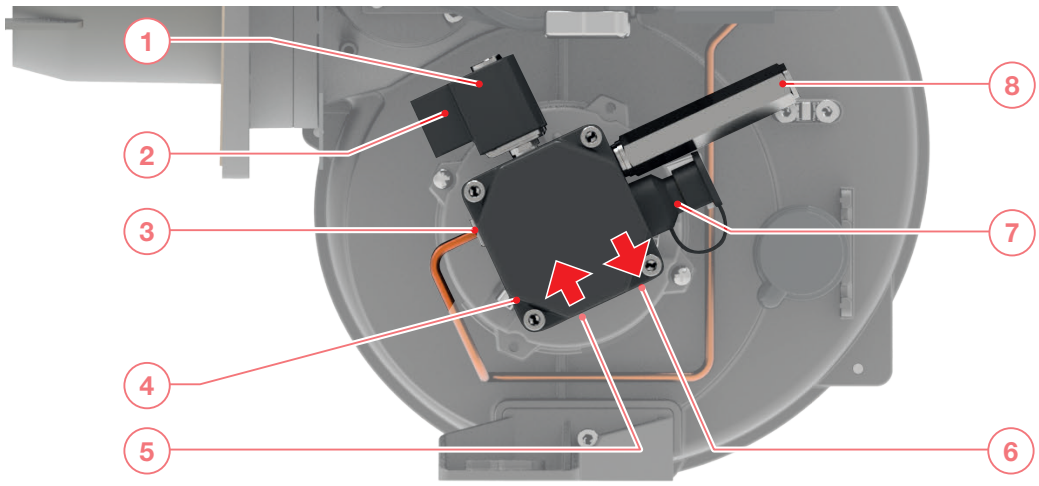
4.6.1 Hydraulic diagram



A	Bypass screw	**P**	Pressure gauge port
D	Diaphragm	**P1**	Pressure adjustment
E	Nozzle outlet	**R**	Return outlet
H	Filter	**S**	Suction inlet
NC	Valve	**T**	Pressure regulator
O	Constriction	**V**	Vacuum gauge port

Fig. 16

4.6.2 Oil pump



1	Fuel-oil solenoid valve	**5**	Suction connection
2	Solenoid valve electrical connection	**6**	Return connection
3	Fuel delivery pipe	**7**	Oil pressure regulator
4	Vacuum port pressure gauge connection	**8**	Oil pressure gauge connection

Fig. 17

- **One-pipe system (standard)**

The pump is supplied for operation with one pipe. The return connection is capped. Inside the pump, there is a screw with a by-pass washer (10) which allows the fuel to recirculate inside the pump.
To apply the fuel delivery pipe, proceed as follows:
– remove the plastic cap (12) and screw in the delivery pipe (13) supplied with the burner.

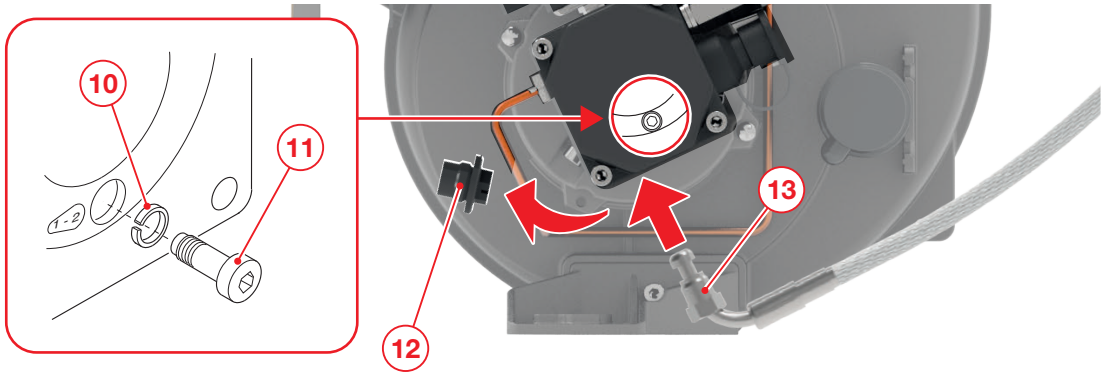


Fig. 18

CAUTION

CAUTION
- Only approved fuel lines are to be used.
- In case of one-pipe systems only one flexible pipe is required.
- The second flexible oil pipe is to be used in case of two-pipe systems.

- **Two-pipe system (optional)**

For two-pipe operation it is necessary to remove the by-pass washer.
To apply the fuel return pipe, proceed as follows:
– remove the cap (14) from the connection and screw in the additional return pipe (15), supplied with the burner
– unscrew the four screws (17) and remove the cover (16) from the pump
– unscrew screw (11) and remove the by-pass washer (10)
– fasten the screw (11) and the cover (16).

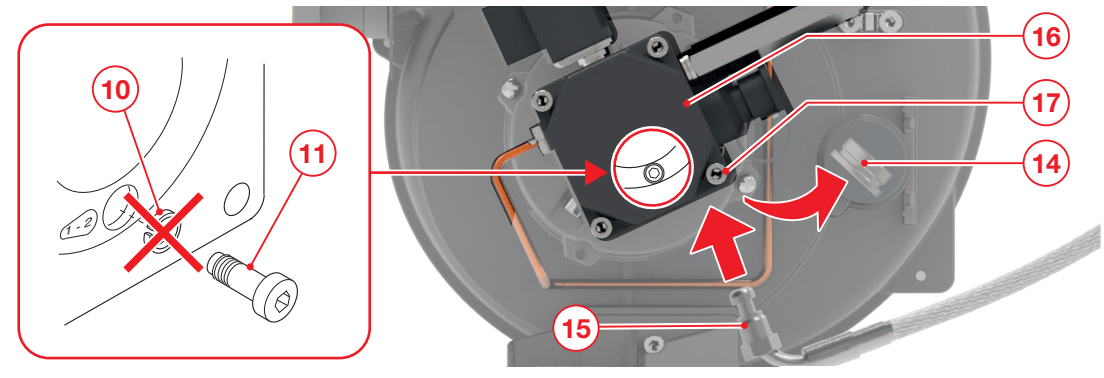


Fig. 19

IMPORTANT INFORMATION
There is an intake filter and an oil pressure regulator integrated in the pump. Pressure gauges for negative pressure (vacuum) measurement must be connected before the equipment is commissioned.

WARNING

WARNING
The pump vacuum should not exceed a maximum of 0.4 bar (30cm Hg).
Beyond this limit gas is released from the oil.

CAUTION

CAUTION
Before starting the burner, check that the return pipe is open. An eventual obstruction could damage the pump sealing device.

4.6.3 Oil feed and suction line with one-pipe system

Burner lower than tank

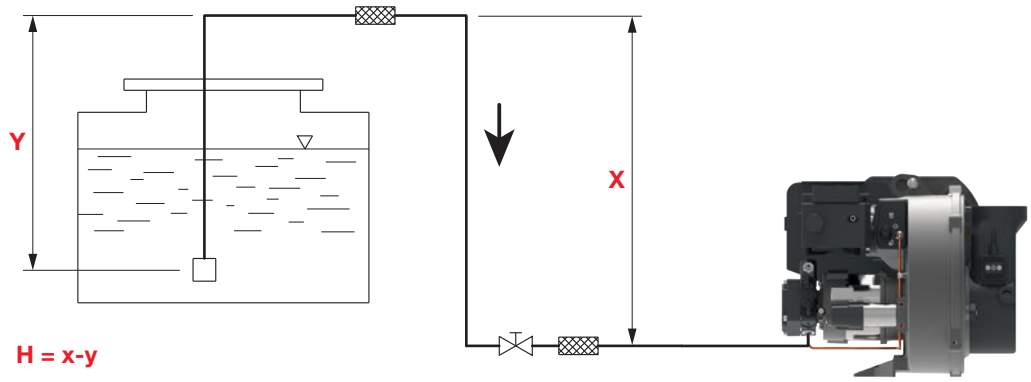


Fig. 20

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
0,5	19	60	100
1	21	66	100
1,5	23	72	100
2	25	79	100

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
2,5	27	85	100
3	29	91	100
3,5	31	98	100
-	-	-	-

CAUTION
- X < 20 m
- Y must be kept as lower as possible in order to avoid cavitation. Anyway Y< 4 m.

CAUTION
ELCO recommends a good quality fuel filter at the tank and a secondary filter (15µ) are used to protect the burner pump from contamination.

Burner higher than tank

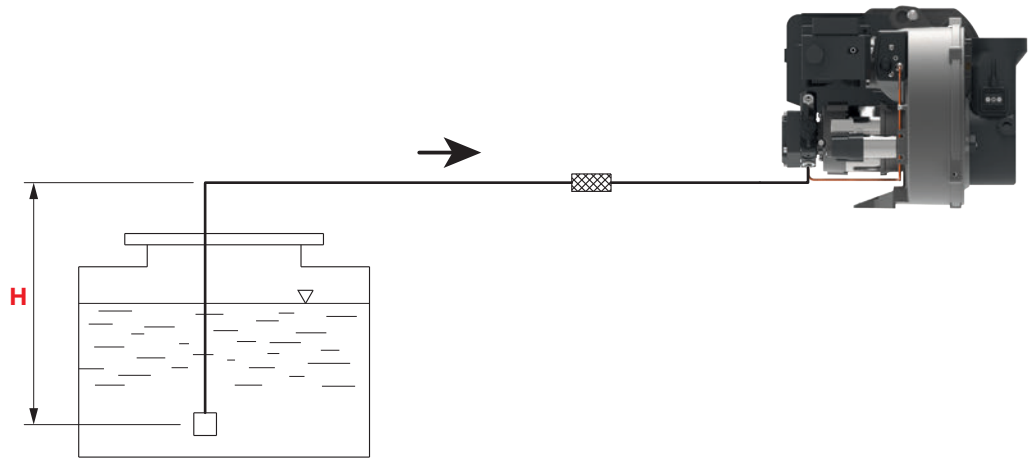


Fig. 21

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
0,5	15	47	100
1	13	41	99
1,5	11	34	84
2	9	28	68

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
2,5	7	22	53
3	5	15	37
3,5	-	9	22
-	-	-	-

4.6.4 Oil feed and suction line with two-pipe system

Burner lower than tank

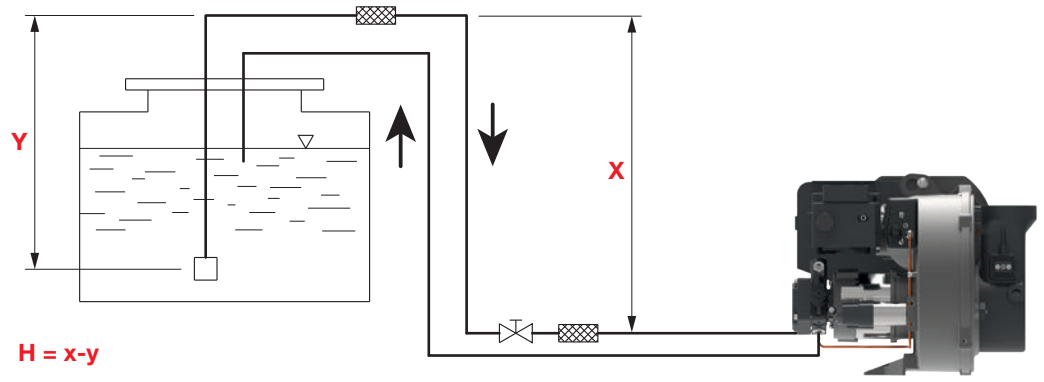


Fig. 22

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
0,5	19	60	100
1	21	66	100
1,5	23	72	100
2	25	79	100

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
2,5	27	85	100
3	29	91	100
3,5	31	98	100
-	-	-	-

CAUTION

CAUTION
- X < 20 m
- Y must be kept as lower as possible in order to avoid cavitation. Anyway Y< 4 m.

CAUTION

CAUTION
ELCO recommends a good quality fuel filter at the tank and a secondary filter (15µ) are used to protect the burner pump from contamination.

Burner higher than tank

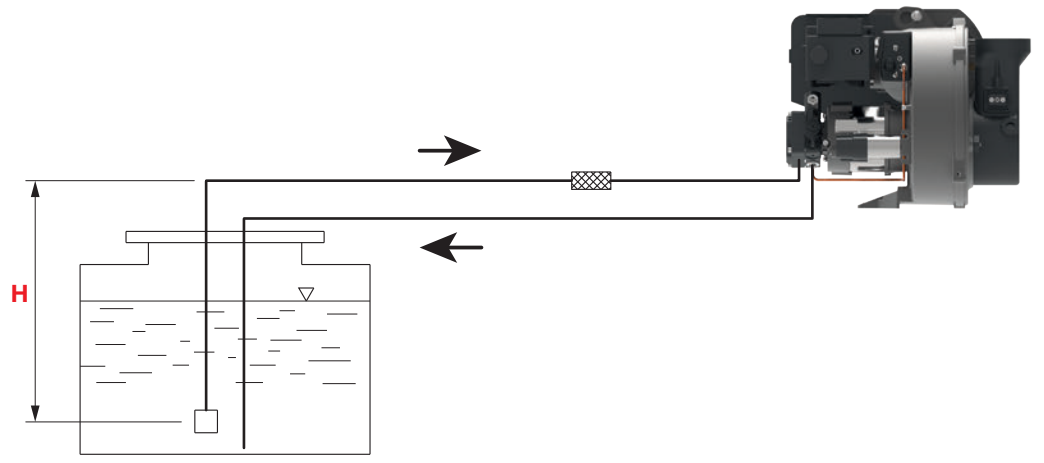


Fig. 23

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
0,5	15	47	100
1	13	41	99
1,5	11	34	84
2	9	28	68

H (m)	Pipe length (m)		
	Ø6 mm	Ø8 mm	Ø10 mm
2,5	7	22	53
3	5	15	37
3,5	-	9	22
-	-	-	-

4.7 Electrical connection

DANGER
Danger of death caused by live components!
Contact with live parts can lead to serious injury, take the following precautions:
- ensure that the power is switched off for all electrical parts
- electrical wiring installation must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the wiring diagrams.

CAUTION
- The electrical installation should include a minimum of a type A MCB.
- Check to ensure that the power supply voltage is as specified in the electric diagram and in data plate.
- Burner fuse: 3 Amps.

WARNING
- Use flexible cables in compliance with the EN 60 335-1 standard. Assure a correct earth connection.
- The wiring section must be minimum 1 mm^2 (in any case verify with the standard and local rules).
- This control flame is equipped with the post ventilation function. Other versions of the burner are not to be fitted.
- Check operation of boiler thermostatic control.
- Check operation of Photocell by withdrawing from burner and then covering to simulate flame out condition.

4.7.1 Electrical connection to the boiler

Burner **FB 3 K LN** leaves the factory configured for connection to a 7 pin electrical cable.
An adaptor cable kit from 7 pins to 5 pins is also supplied and factory mounted.

Proceed as follows to connect the burner to the boiler:
- remove the burner cover (1) as described in paragraph “4.5 Removing and fitting the burner cover” on page 22
- cut the band (2) and unwind the cable (3).

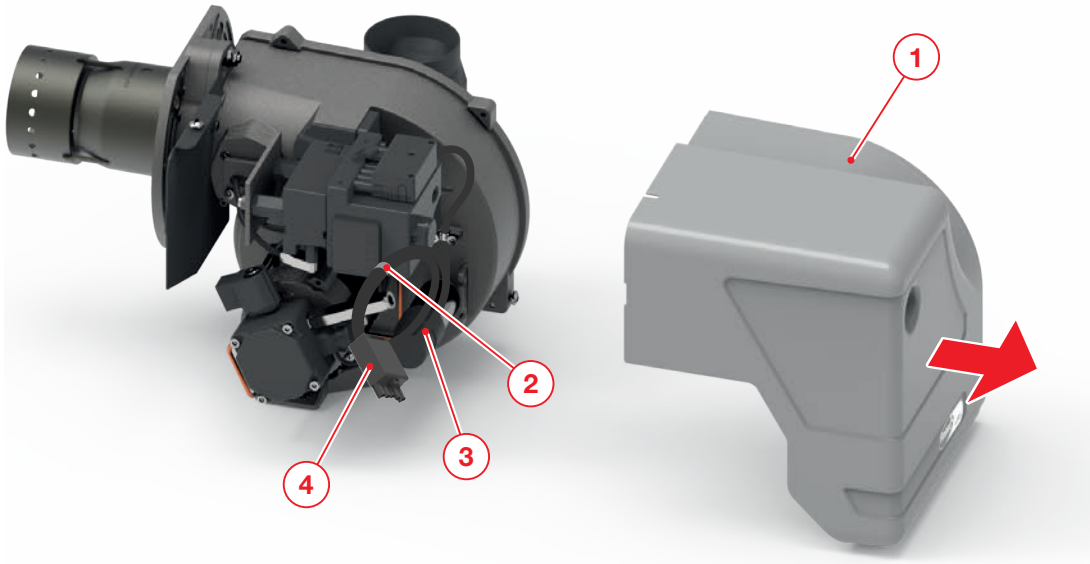


Fig. 24

- refit the burner cover (1), inverting the procedure above
- connect the 5-pin plug (4) to the boiler.

Removing the burner

DANGER
Danger of death caused by live components!
Before carrying out any operations on the burner, operate the main power switch for the system to cut off the power supply.

If it becomes necessary to remove the burner, proceed as follows:
- close the fuel taps upstream of the burner
- loosen the two screws (1) and then slide out (A→B) the burner cover (2) taking care not to damage it.

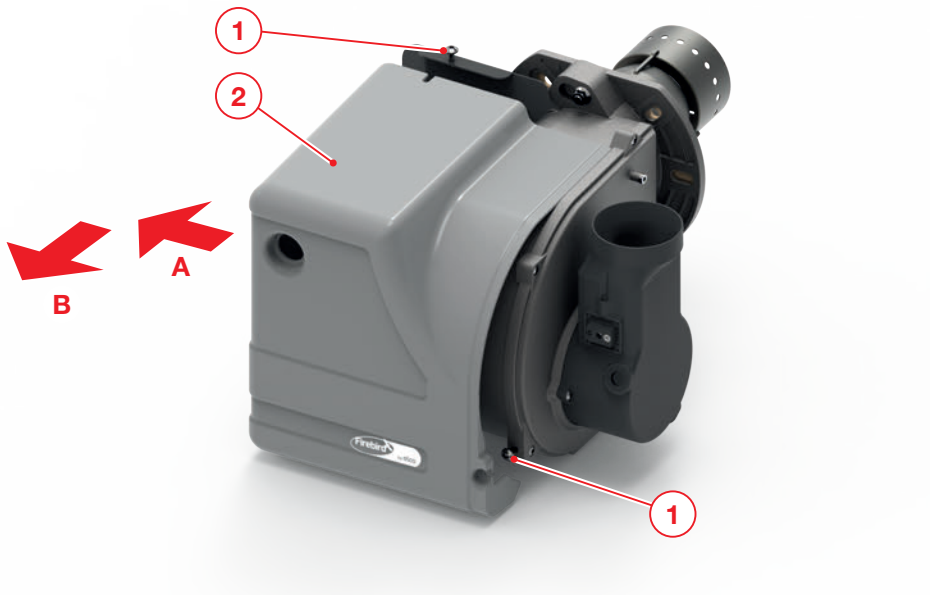


Fig. 25

- detach the electrical cable (3) from the boiler

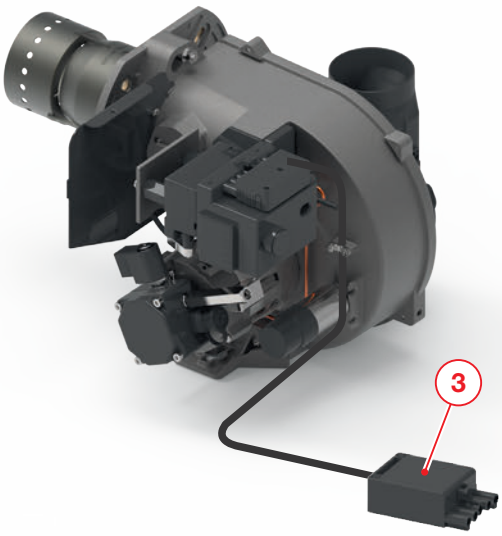


Fig. 26

– remove the fuel delivery pipe (5) and the return pipe (6), only for two pipes system

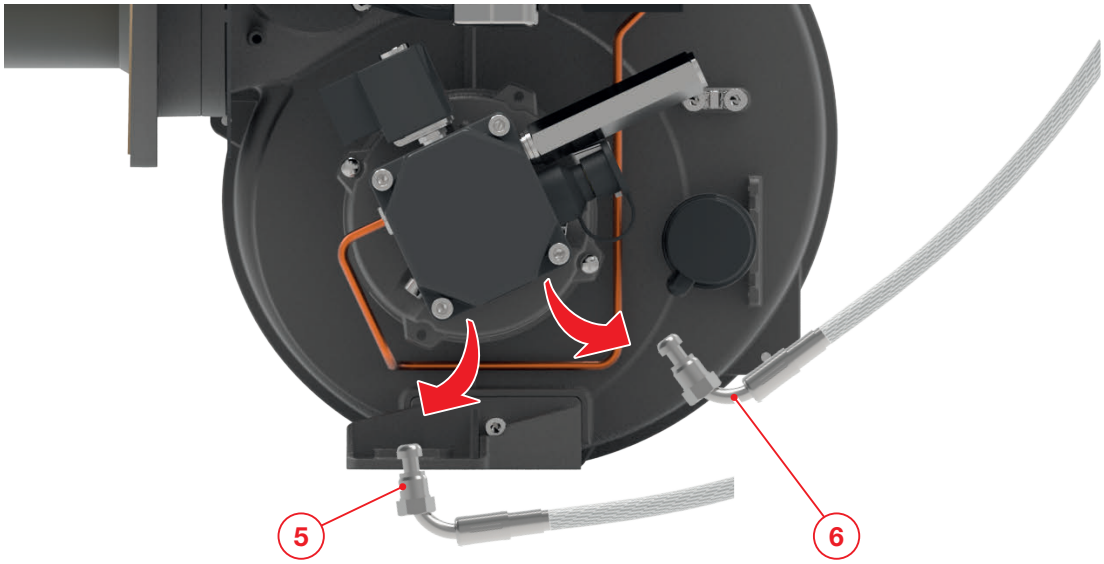


Fig. 27

– drain any fuel still inside the burner and in the fuel delivery pipe and collect it in a basin
– loosen the clamping collar (7) and remove the air intake pipe (8) from the snorkel (9), if present

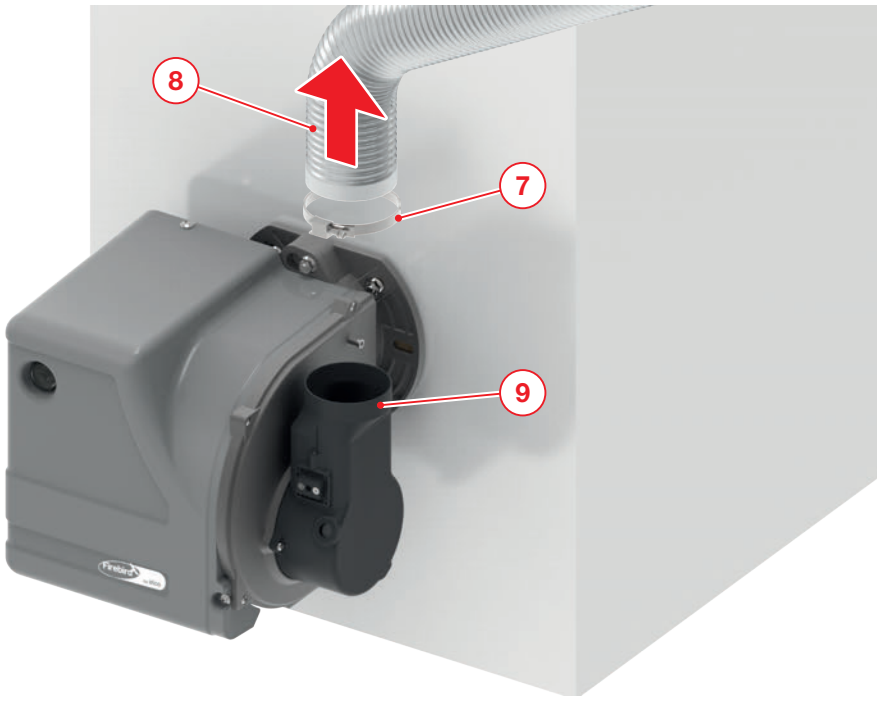


Fig. 28

– loosen the nut (9) securing the burner to the boiler and, rotating the burner (10) slightly to the right, slide it off the boiler.

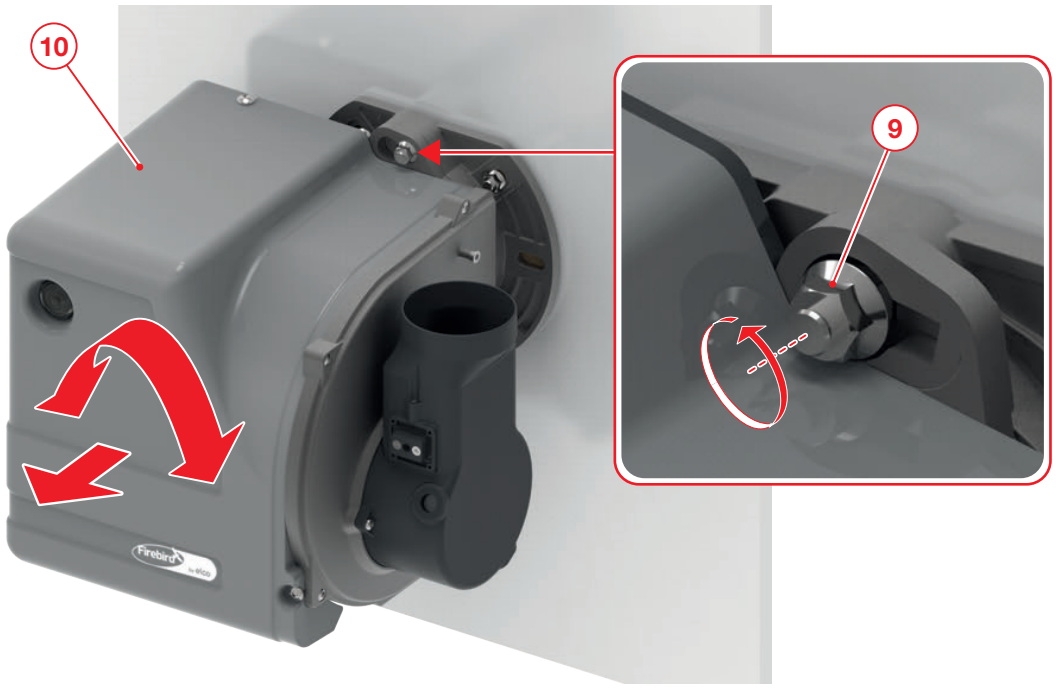


Fig. 29

CAUTION

CAUTION
Dispose of any fuel that comes out of the burner in accordance with applicable legislation in the destination country. Separated waste management avoids potential damage to the environment and peoples' health. It also allows many recyclable materials to be recovered, with significant economic and energy savings.

5 COMMISSIONING

5.1 Safety during commissioning

CAUTION
It may be hazardous to assign activities to personnel that are not sufficiently qualified. It may harm the operators themselves if they perform manoeuvres or operations incorrectly, with a serious impact on personal safety, things and property.

CAUTION
Installation, commissioning and maintenance activities must only be carried out by the personnel of dedicated heating companies specifically qualified to perform these tasks.

CAUTION
Hot surfaces - Risk of burns!
- Contact with components at high temperatures may cause more or less serious superficial burns.
- Operators should wear suitable clothing and personal protective equipment.
- They should ensure that all components are at ambient temperature before carrying out any maintenance operations.

FUEL LEAKS
- Fuel leaks may cause fire to break out.
- They may be toxic via inhalation and cause skin irritation in some individuals.
- Act swiftly to remove the cause of the leak. If it is connected to a maintenance operation, use suitable personal protective equipment.

5.2 Checks before commissioning

The following must be checked before initial commissioning:

- That the burner is assembled to the boiler in accordance with the instructions given here
- Setting the combustion components
- The boiler must be ready for operation, and the operating regulations for the heater must be observed
- All electrical connections must be correct
- The boiler and heating system must be filled with water and the circulating pumps must be in operation
- The thermostats and any other safety or limiting devices that might be fitted must be connected and operational
- The flue system must be unobstructed and the secondary air system, if available, must be operational
- An adequate supply of fresh air must be guaranteed in case of conventional flue system
- The heat request must be available
- Fuel tank must be full
- The fuel supply lines must be correctly dimensioned, assembled correctly, checked for leaks and bled
- In the event the burner does not start on initial start-up following a long period of storage, the pump should be checked to ensure it is not blocked.
- A standard-compliant measuring point and analyser test point must be available, the flue system to the measuring point must be free of leaks to prevent anomalies in the measurement results.

5.3 Factory pre-setting

The combustion head and pump pressure are pre-set to obtain the proper output and head drop pressure. The air flap is adjusted to set CO2% according to the curve (“Fig. 31”) with a tollerance of ± 0,2%.

Kerosene version					
Burner	**Nozzle**			**Pump***	**Combustion head position A (±0,1)**
Type	gph	spray	type	bar	mm (Fig. 43)
FB 3 K 73 LN	2,0	60° S	Danfoss	7,0	39,5
FB 3 K 100 LN	2,5	60° S	Danfoss	9,3	44,5

Reference conditions

- Conventional Flue system: diameter 80 mm / length 1.5 m

(*) The pump pressure (± 0,3 bar) is referred to a stability period of 5 min.

- Burner installed at the same level of the oil tank.

Note.
All the burners are factory tested and adjusted. The air flap and combustion head are set to have the CO2 % within the above limit.

Light oil version								
Burner	**Output**	**Oil flow rate**	**Nozzle**			**Pump pres-sure***	**Head setting**	**Diffuser - nozzle distance**
Type	kW	kg/h	gph	spray	type	bar	mm	mm
FB 3 K 73 LN	76,2	6,3	1,5	60° H	Danfoss	11,5	42	3,5
FB 3 K 100 LN	101,2	8,66	2,25	60° S	Danfoss	10,2	50	3,5

Reference conditions

- Conventional Flue system: diameter 80 mm / length 1.5 m

(*) The pump pressure (± 0,3 bar) is referred to a stability period of 5 min.

- Burner installed at the same level of the oil tank.

Note.
All the burners are factory tested and adjusted. The air flap and combustion head are set to have the CO2 % within the above limit.

5.3.1 Burner start

Before starting the burner, draw oil in until the filter is completely filled. Then start the burner by creating a heat demand on the boiler (refer to boiler installation manual). Open the bleed screw on the oil filter to allow the oil line to bleed fully during the preventilation phase. The negative pressure (vacuum) must not fall below 0.4 bar. Close the bleed screw when the filter is completely filled with oil and oil is flowing out without bubbles. Boiler has to maintain in operation at least 15 min. or reach a steady condition of operation, then check the combustion values.

5.3.2 Burner adjustment

Check and, depending on the system, eventually adjust the oil pressure (“Fig. 30”) in accordance with the table 5.3. Adjust the air flow gradually, operating on air flap setting (“Fig. 31”), if necessary.

Note.
Do not adjust the combustion head, factory scaled.

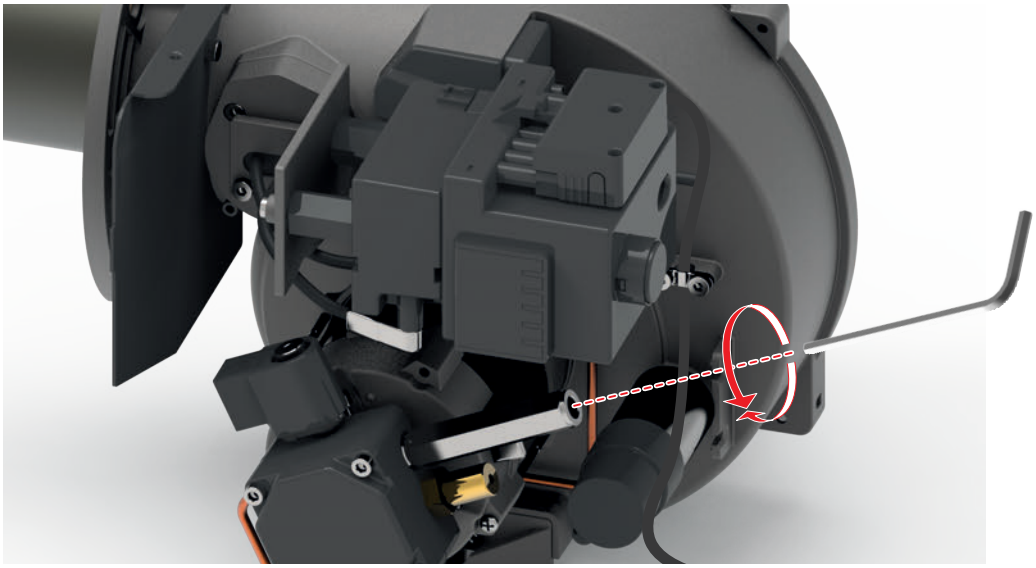
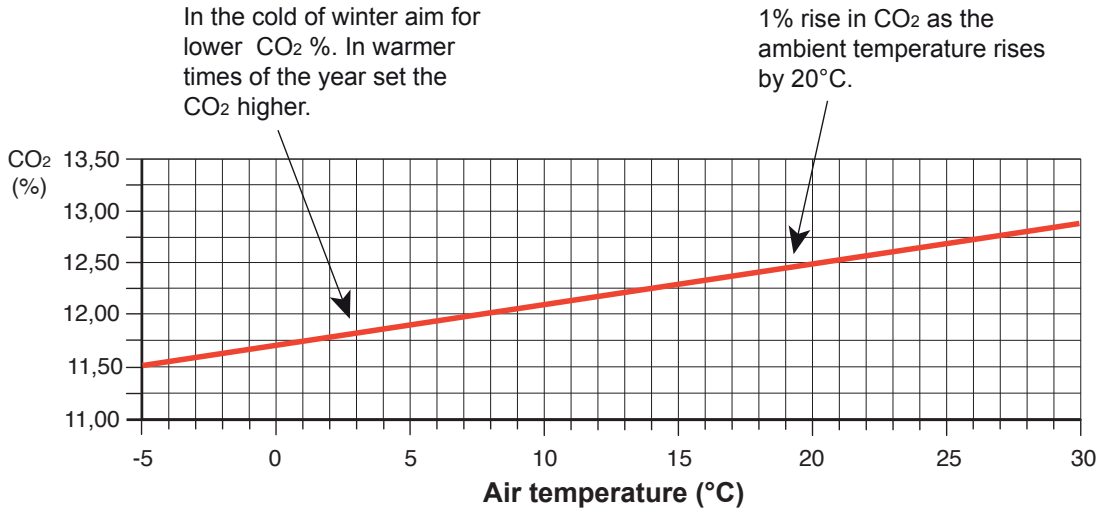


Fig. 30



Conventional flue system: appliance room air temperature
Balance flue system: external air temperature

Fig. 31

5.3.3 Air flap position

Turn the hex key (1) supplied:
- clockwise to increase the air flap opening (O_2 rises, CO_2 decreases).
- counterclockwise to reduce the air flap opening (O_2 decreases, CO_2 rises).

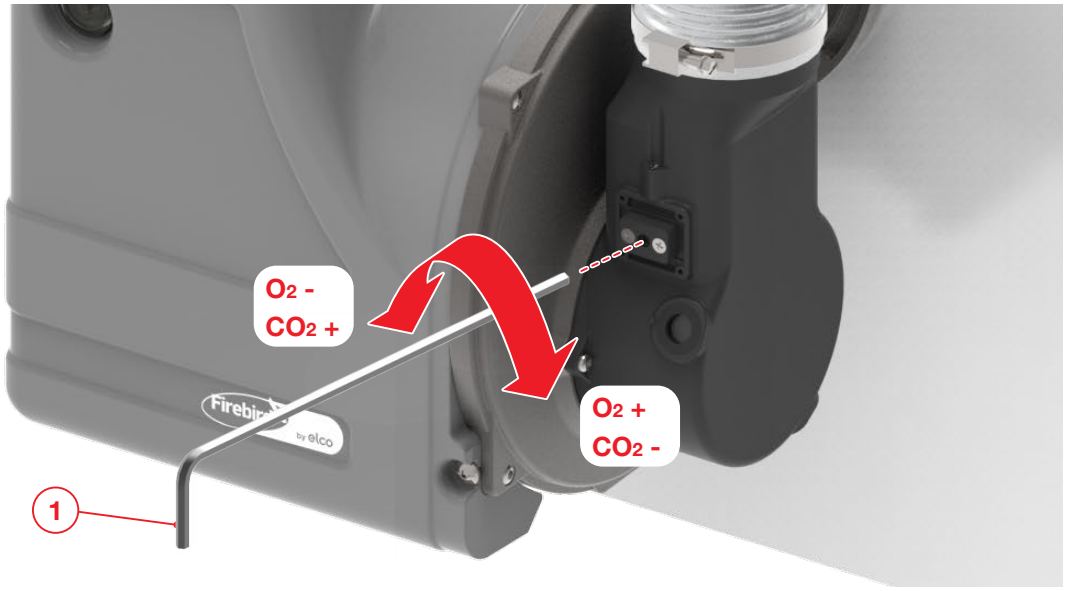


Fig. 32

5.4 Commissioning record

Confirm the work carried out in the commissioning report below by marking and X or an ✓.

Commissioning work	Note	Done
Check the heating system has been filled correctly and the air has been removed		
Check the flue system		
Check there are no leaks in the fuel supply system		
Start the burner and check that it is operating normally		
Measure the parameters of the combustion system and record all the main data pertaining to the first ignition		
Explain to the proprietor and person responsible for the domestic heating system the burner is installed on, the importance of ensuring good inflow of combustion air and combustion product evacuation. They should also highlight that no modification should be made to the heating system (comprised of air intake, burner, boiler and flue pipe) that could alter the correct operation of the system		

Confirmation of correct commissioning:

Stamp / date / company signature: _____

5.4.1 Setting and values recorded

Customer: _____

Heating system:_____

BOILER		
Type		
Output	kW	
	kcal/h	

BURNER			
Type		**FB 3 K 73 LN**	**FB 3 K 100 LN**
Serial number			
Output	kW		
Nozzle size	gph		
Spray angle/cone type			
Fan pressure	mbar		
Combustion chamber pressure	mbar		
Air flap	scale		
Oil throughput	kg/h		
Oil pressure (oil pump)	bar		
CO_2	Vol.%		
CO	mg / kWh		
	ppm		
NOx	mg / kWh		
	ppm		
Room temperature	°C		
Flue gas temperature (gross)	°C		
Pressure at the base of chimney	mbar		
Firing Efficiency factor	%		

Date: _____

Signature: _____

6 MAINTENANCE

6.1 Safety during maintenance

The periodic maintenance is important for safety, good operation and long life cycle of the burner, reducing also consumption and polluting emissions.

The burner must be serviced at least once a year. Only qualified and authorised personnel shall carry out maintenance and the calibration of the burner, in accordance with this manual and in compliance with the local standards and regulations.

DANGER
Danger of death!
- Contact with live electrical components may cause serious incidents.
- Only professionally-trained and qualified personal can operate on the electrical system.
- Before any operation, switch off the power supply to the system by operating the main switch.

CAUTION
Hot surfaces - Risk of burns!
- Contact with components at high temperatures may cause more or less serious superficial burns.
- Operators should wear suitable clothing and personal protective equipment.
- They should ensure that all components are at ambient temperature before carrying out any maintenance operations.

FUEL LEAKS
- Fuel leaks may cause fire to break out.
- They may be toxic via inhalation and cause skin irritation.
- Act swiftly to remove the cause of the leak. If it is connected to a maintenance operation, use the dedicated personal protective equipment.

PRECAUTION
Danger of injury caused by improper use!
Danger of personal injury such as contusions, bruises and cuts due to incorrect handling.
- Use personal protective equipment as required by applicable legislation, such as safety shoes and gloves.

CAUTION
Installation, commissioning and maintenance activities must only be carried out by the personnel of dedicated heating companies specifically qualified to perform these tasks.

IMPORTANT INFORMATION
- Inspect threaded joints to identify leaks during annual maintenance checks.
- Replace defective or worn gaskets.

6.2 Removing the burner

DANGER
Danger of death caused by live components!
Before carrying out any operations on the burner, operate the main power switch for the system to cut off the power supply.

To remove the burner from the boiler, proceed as follows:
- close the fuel taps upstream of the burner
- loosen the two screws (1) and then slide out (A→B) the burner cover (2) taking care not to damage it.

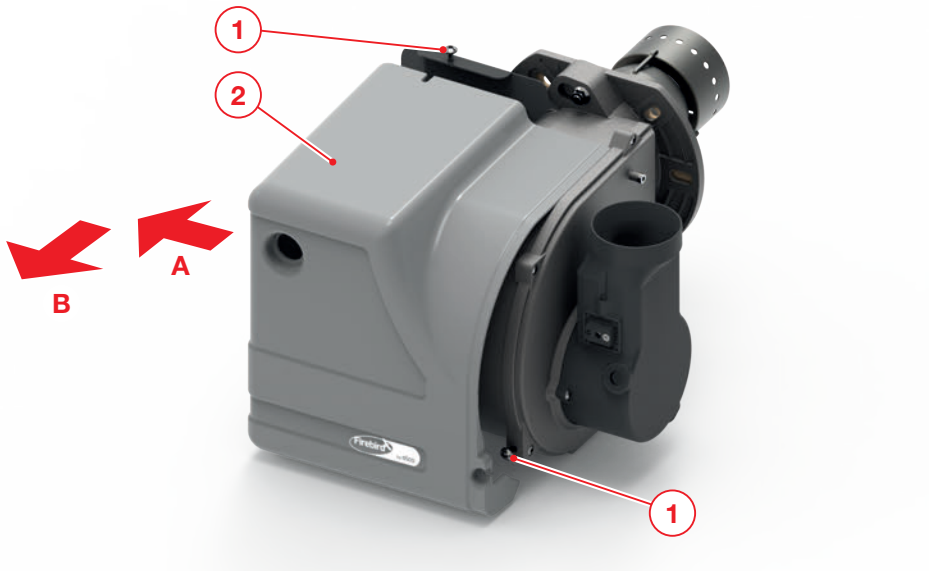


Fig. 33

- detach the electrical cable (3) from the boiler

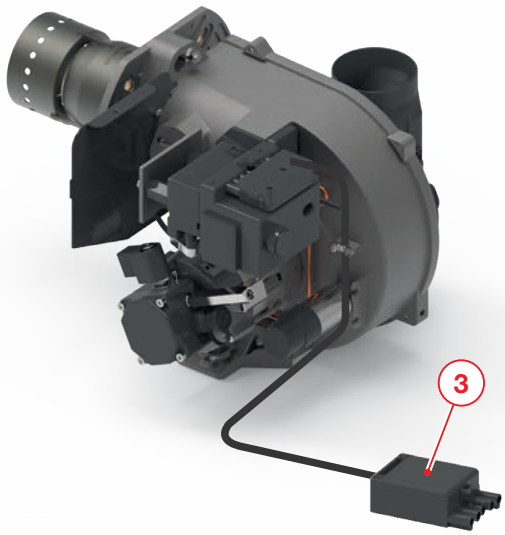


Fig. 34

– remove the fuel delivery pipe (5) and the return pipe (6), only for two pipes system

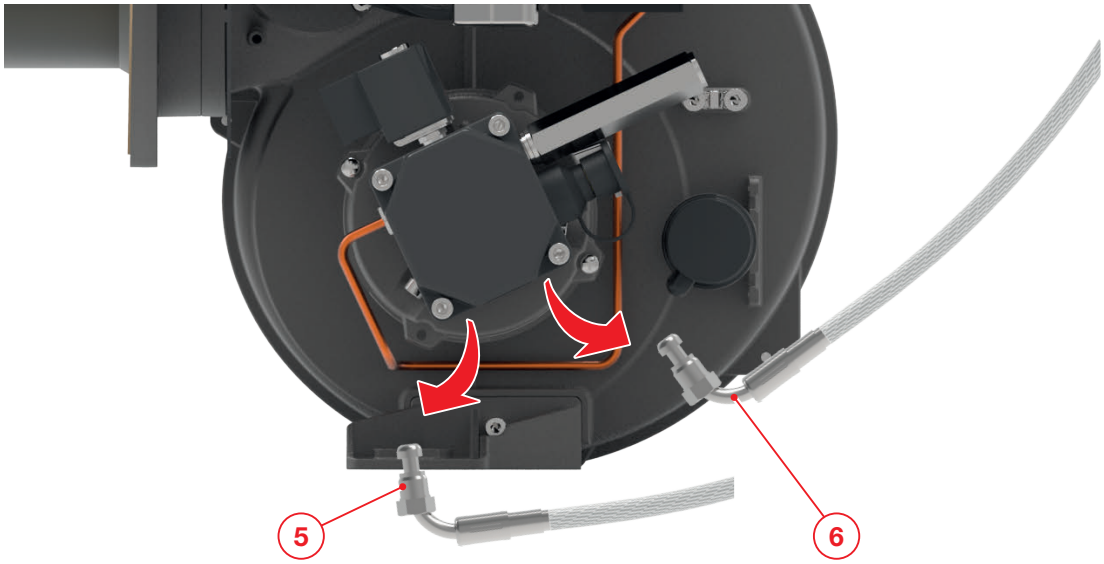


Fig. 35

– drain any fuel still inside the burner and in the fuel delivery pipe and collect it in a basin
– loosen the clamping collar (7) and remove the air intake pipe (8) from the snorkel (9), if present

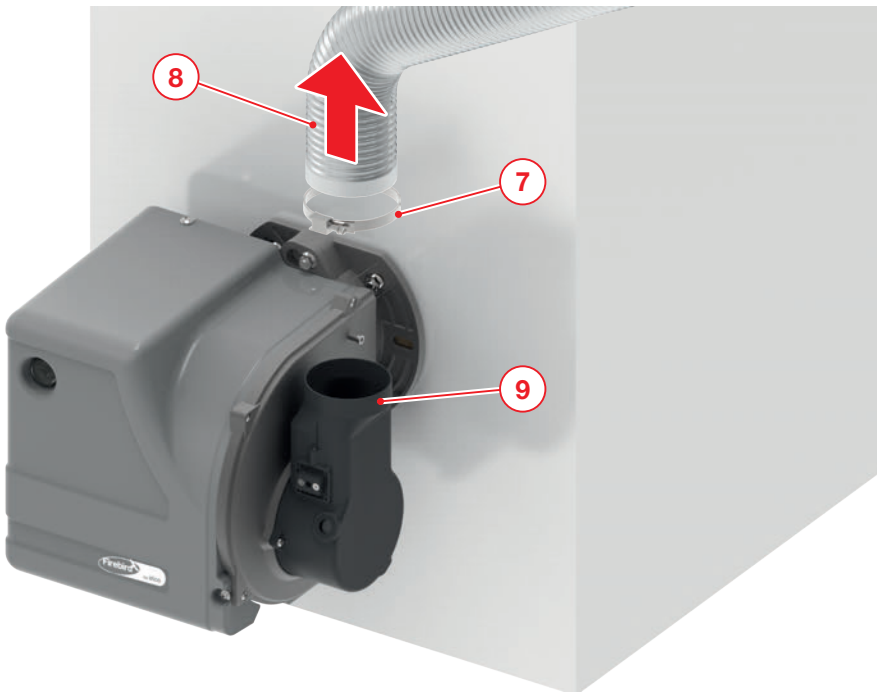


Fig. 36

– loosen the nut (9), rotate the burner clockwise (10) slightly to the right, slide it off the boiler.

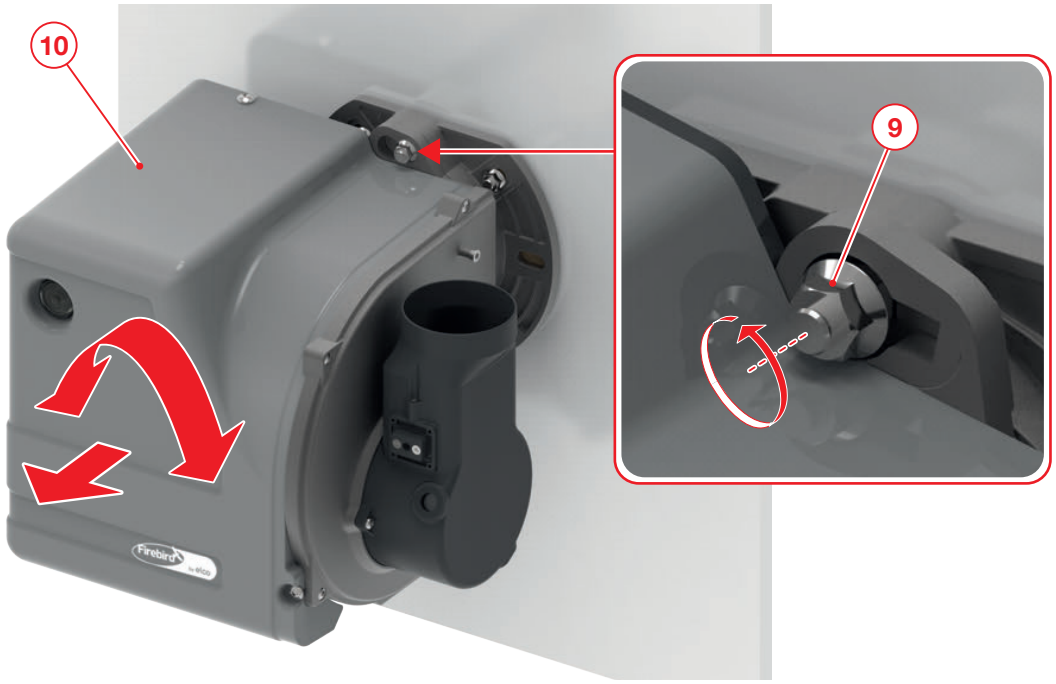


Fig. 37

CAUTION

CAUTION
Dispose of any fuel that comes out of the burner in accordance with applicable legislation in the destination country. Separated waste management avoids potential damage to the environment and peoples' health. It also allows many recyclable materials to be recovered, with significant economic and energy savings.

IMPORTANT INFORMATION
Once the burner has been removed from the boiler, it can be rested on a rigid, level surface. The burner should be placed on the ground only if resting on the burner base and should never be turned upside down.

To facilitate maintenance operations, secure the burner to the boiler by inserting the fastening screw (11) into the hole (12) on the burner base. Use one of the three square grooves on the burner base to secure the burner, which should be rotated to the best position for the maintenance operation to the carried out.

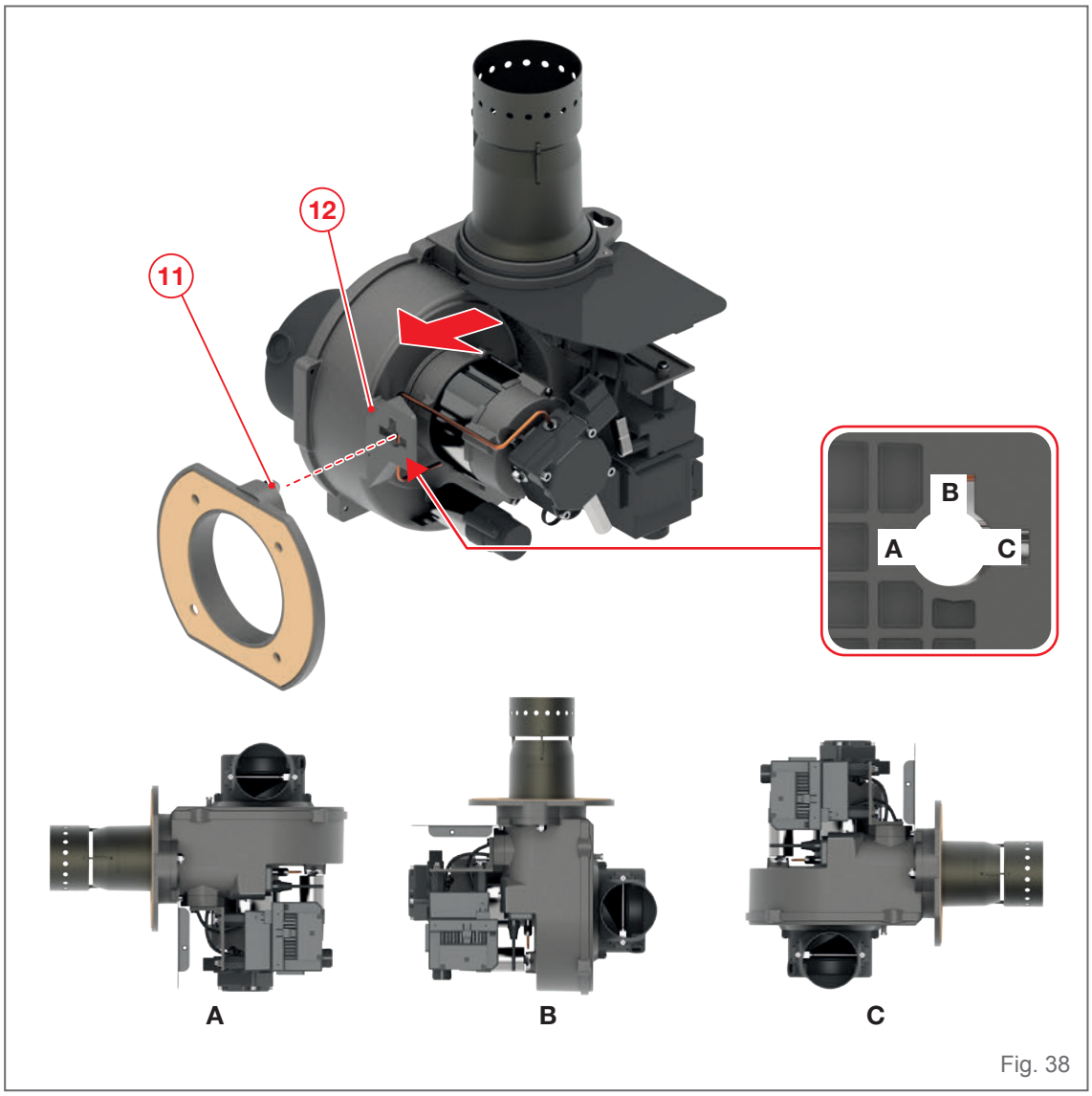


Fig. 38

Position A:
- inspection and cleaning of the internal rotor.

Position B:
- inspection of the combustion head
- inspection and maintenance of the nozzle
- inspection and maintenance of the electrode group.

Position C:
- inspection and maintenance of the pump
- inspection and maintenance of the coil
- inspection and maintenance of the capacitor.

6.3 Burner maintenance

- Check the fuel supply components (pipe, pump, fuel delivery pipe) and their connections for leaks and signs of wear, replace parts as necessary.
- Check that the electrical connection and connection cables are not damaged, replace them if necessary.
- Check the pump filter and clean it if necessary.
- Clean the fan and its housing and check for damage.
- Check and clean the combustion head.
- Check the ignition electrodes, adjust or replace them if necessary.
- Replace the nozzle.
- Fit the combustion head. Observe the adjustment dimensions.
- Mount the burner.
- Start the burner, check the exhaust gas data, adjust the burner settings if necessary.
- Fuel pipes should be checked annually and replaced after 2 years.
- Check and clean the components on the main burner.

6.3.1 Cleaning and replacing combustion head components

- Remove screws (1) using a screwdriver and slide out the blast tube (2)
- loosen screw (3) using the hex key supplied and remove the diffuser (4) together with the electrode group (5)
- a suitable spanner of the correct size should be used on the fuel line for removing the nozzle (6)

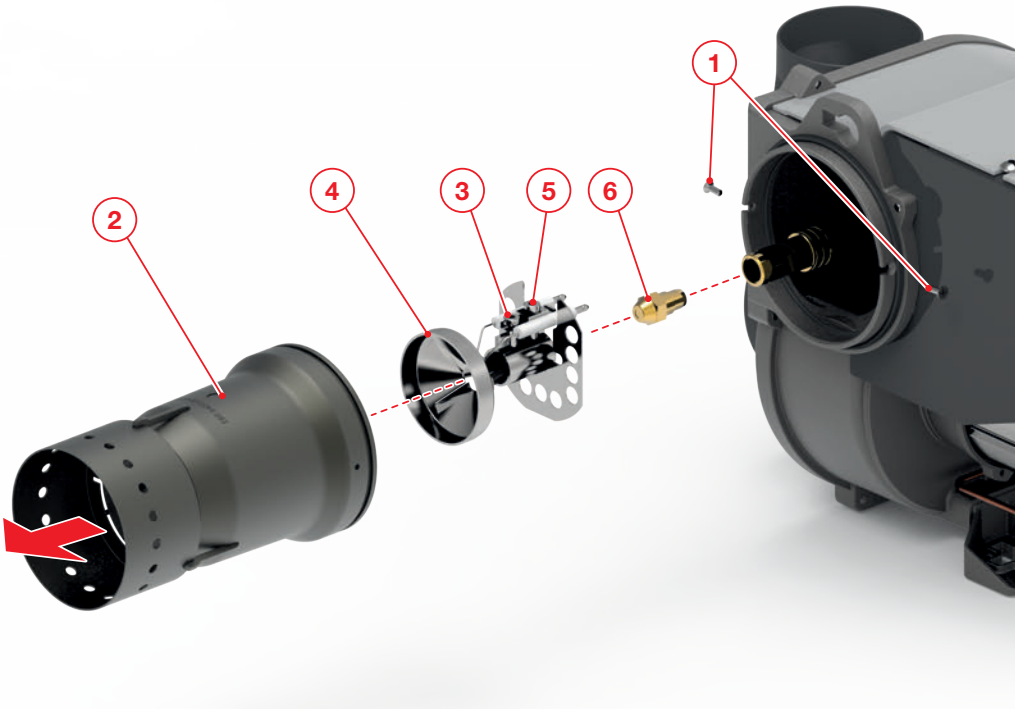


Fig. 39

- ensure that all components are in good condition, undamaged by high temperatures, clean and soot-free. Replace if damaged
- clean all components thoroughly
- refit the components, reversing the procedure above.

6.3.2 Diffuser position check

To check the position of the diffuser:

- remove the blast tube as described in paragraph “6.3.1 Cleaning and replacing combustion head components” on page 44
- use the key provided to loosen screw (8) and allow the diffuser position check. One turn of the key is sufficient.

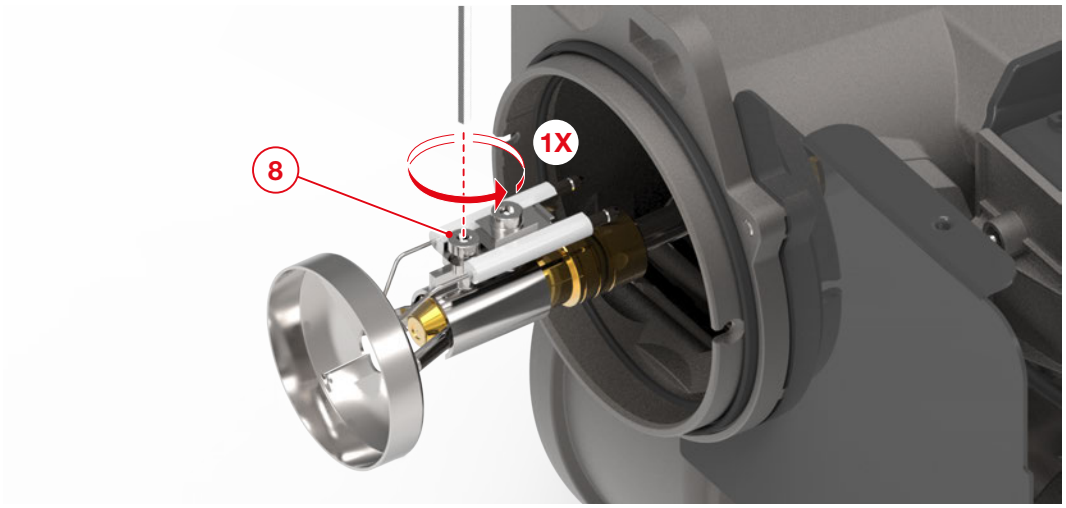


Fig. 40

- check the distance between the diffuser (1) and the nozzle (2) as shown in the figure.

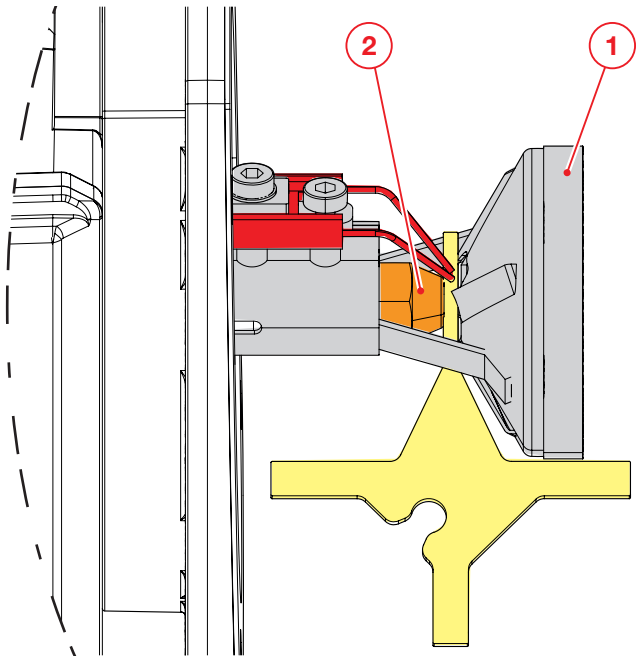


Fig. 41

- after having adjusted the position of the diffuser tighten the screw (8).
- refit the blast tube.

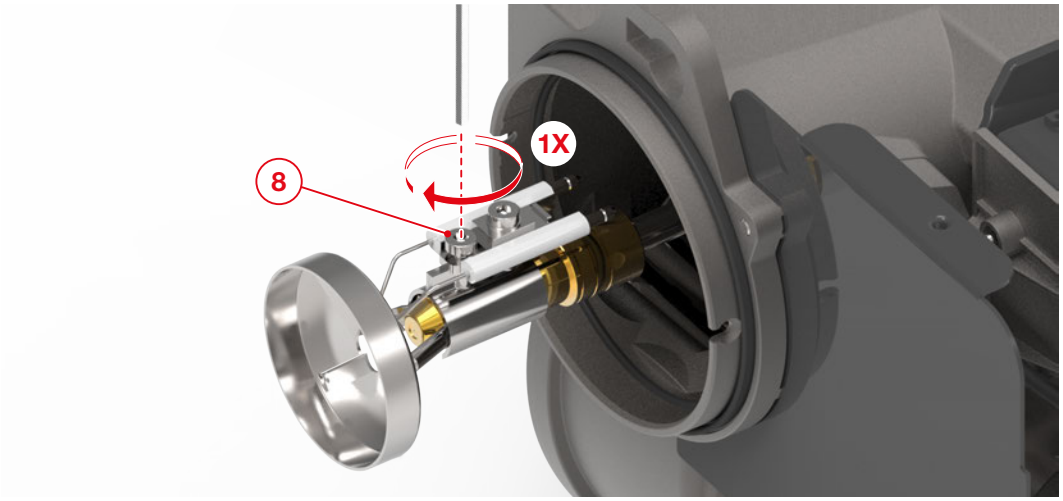


Fig. 42

6.3.3 Combustion head position check

To check the position of the combustion head:

- check the distance between the blast tube (1) and the nozzle (2) as shown in the figure.

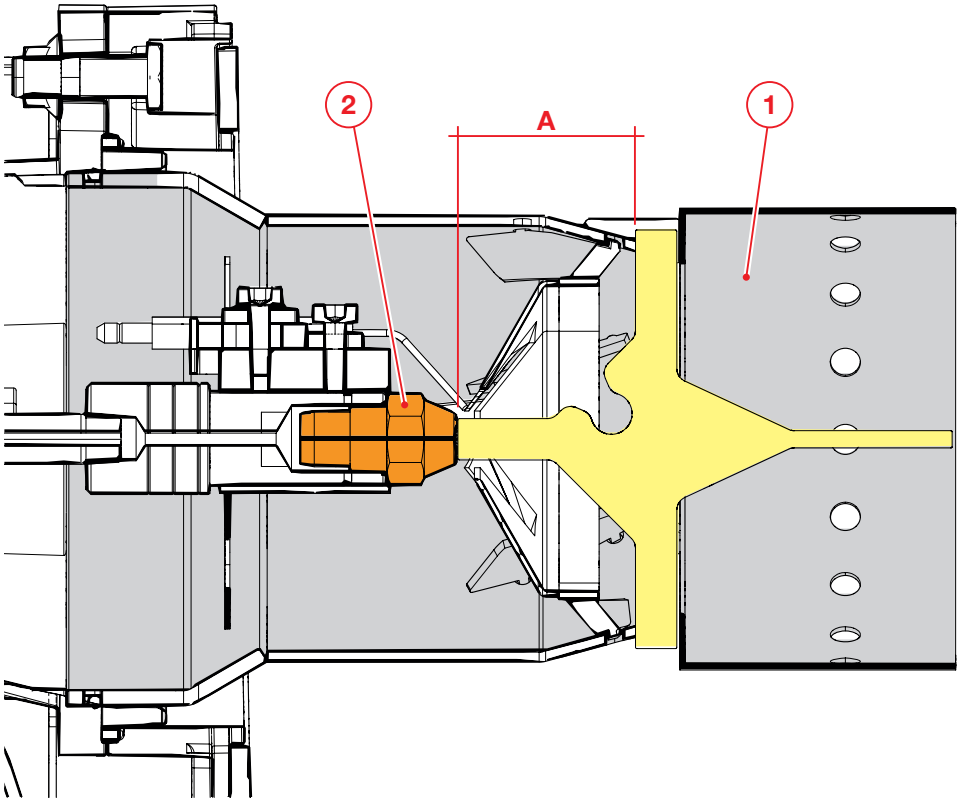


Fig. 43

6.3.4 Electrode position check

– Check the distance between tips of electrodes (2 mm)

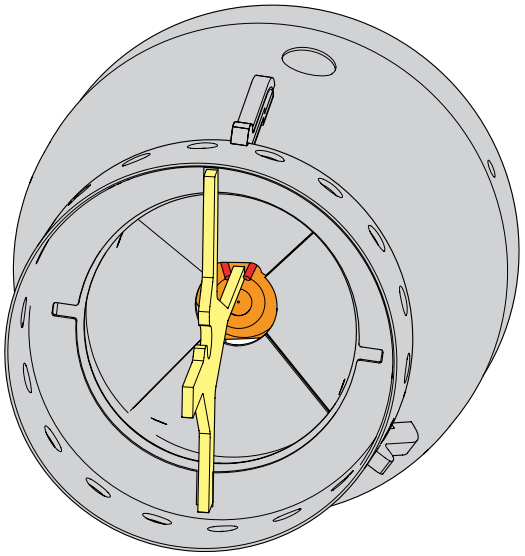


Fig. 44

– Check the position of the electrodes assuring that they are centered as shown in “Fig. 45”.

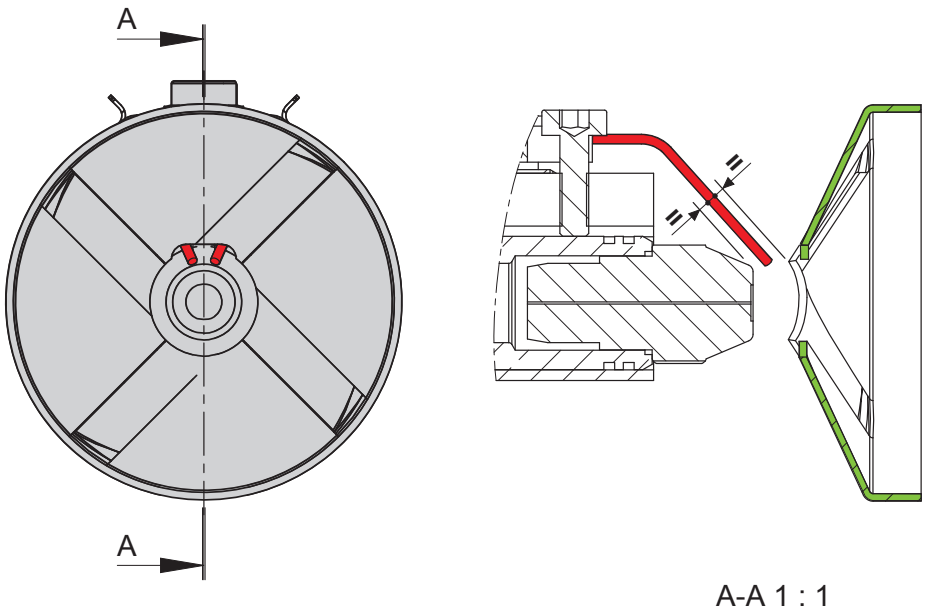


Fig. 45

6.3.5 Replacing the coil

The pump coil is designed and built to withstand temperatures of up to 85°C. In the event of malfunctions or faults, replace the coil using the following procedure:

- remove the connector (1)
- remove the nut (2) using the key supplied
- slide off the coil (3) and replace it

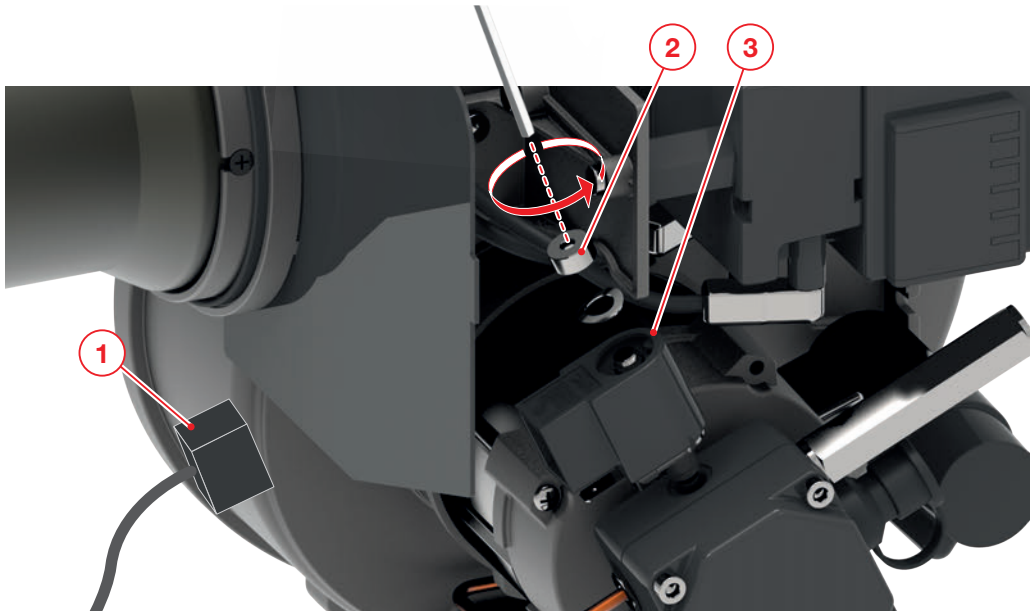


Fig. 46

- refit the components, reversing the procedure above.

6.3.6 Replacing the capacitor

Proceed as follows to replace the capacitor:

- remove protection cup (1) from the capacitor (2)
- detach the electrical connection from the capacitor
- remove the capacitor (2) and replace it

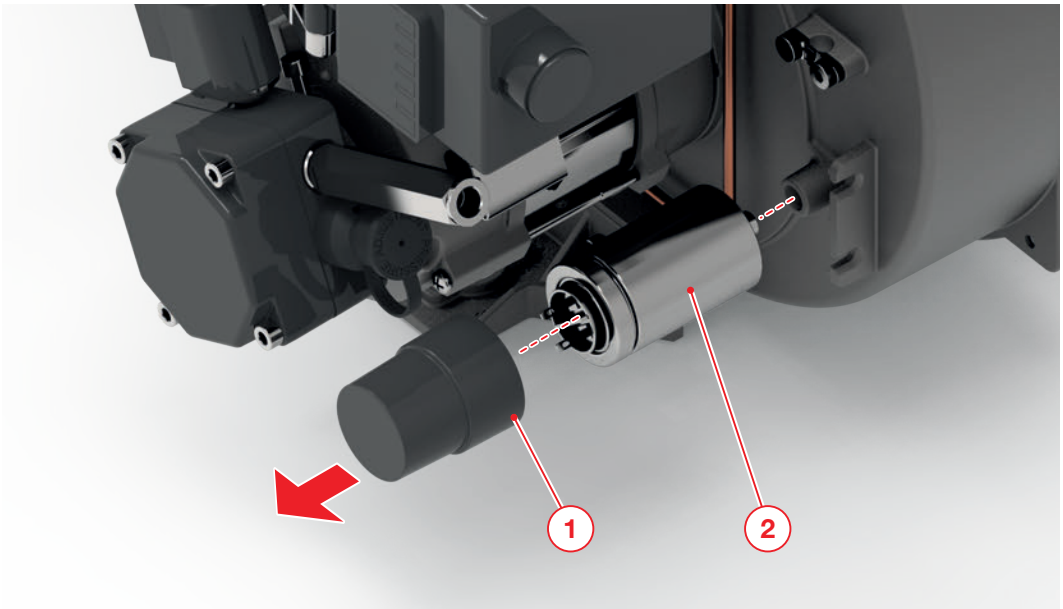


Fig. 47

- refit the components, reversing the procedure above.

6.3.7 Cleaning the internal rotor

Check there is no dust inside the fan wheel because this could reduce the combustion performances. Carry out maintenance operations, avoiding to damage the fan. Verify the correct position of fan wheel within the burner housing.

Follow the sequence
- loose the screws (1) and remove the air intake duct (2)
- clean the fan (3) and the inside of the air intake using a brush
- if necessary, disassembly and re-assembly the fan.

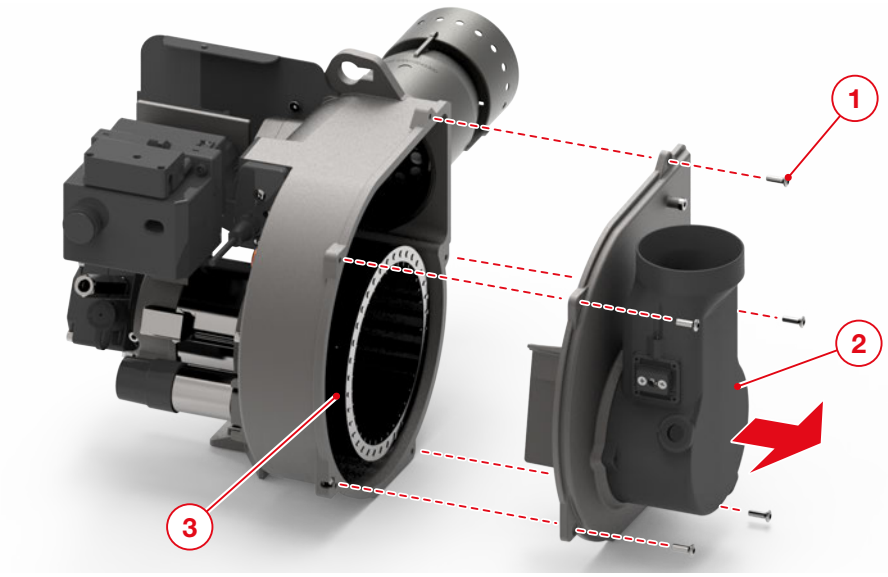
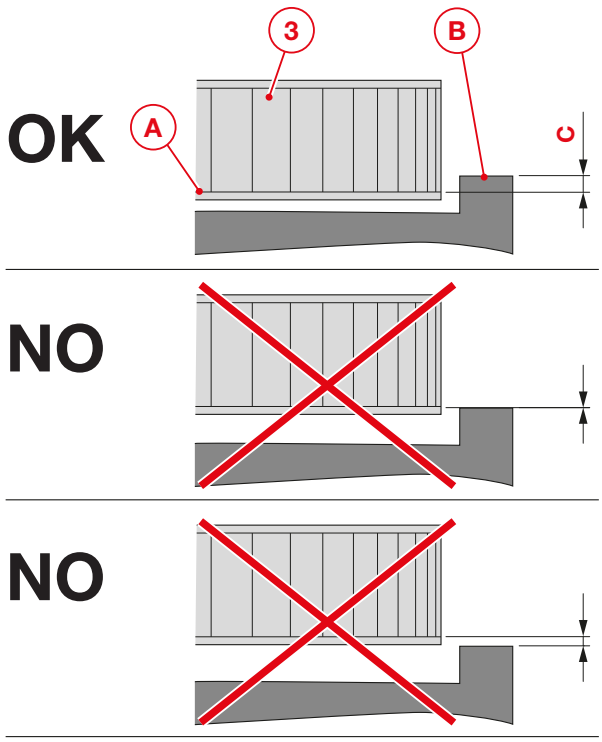


Fig. 48

Observe the positioning diagram below when replacing the motor and blower wheel (3). The inside flange (A) of the blower wheel must be fitted at a lower position (quote C) than the equipment plate (B),tighten the set screw on the blower wheel.



Burner	Position C
FB 3 K 73 LN	0,9 mm
FB 3 K 100 LN	0,9 mm

Fig. 49

6.3.8 Cleaning the pump filter

To be able to clean the filter (H), it is necessary to remove the pump cover.
Check the pump cover seal and replace the gasket if necessary.

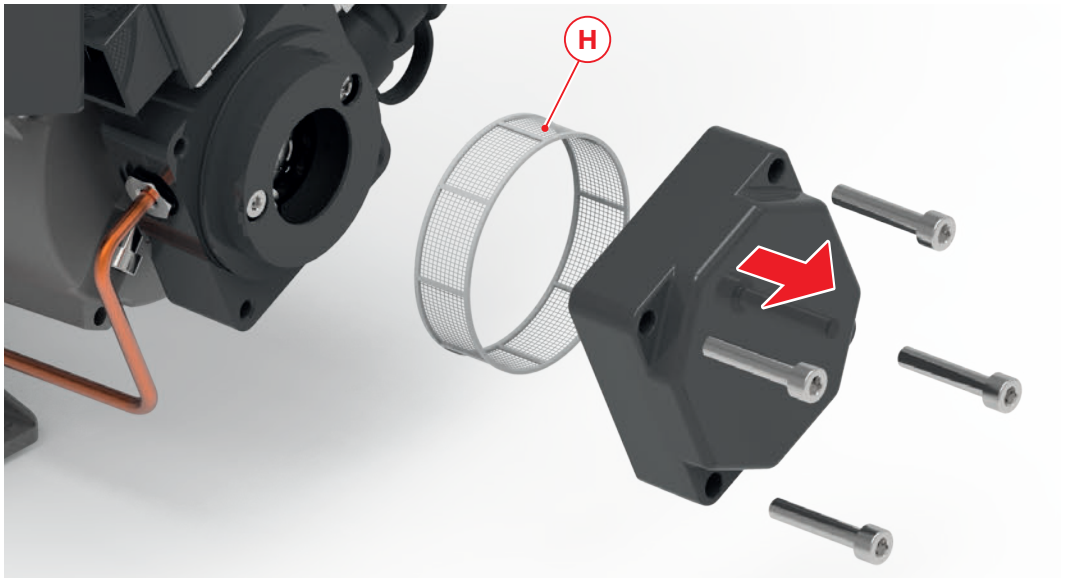


Fig. 50

6.3.9 Replacing oil pump

CAUTION

CAUTION
If the pump is blocked, proceed as follows.

- Disconnect the oil pipe from the pump
- remove the pump (1) from the motor loosening screws (3) using the key supplied (2)

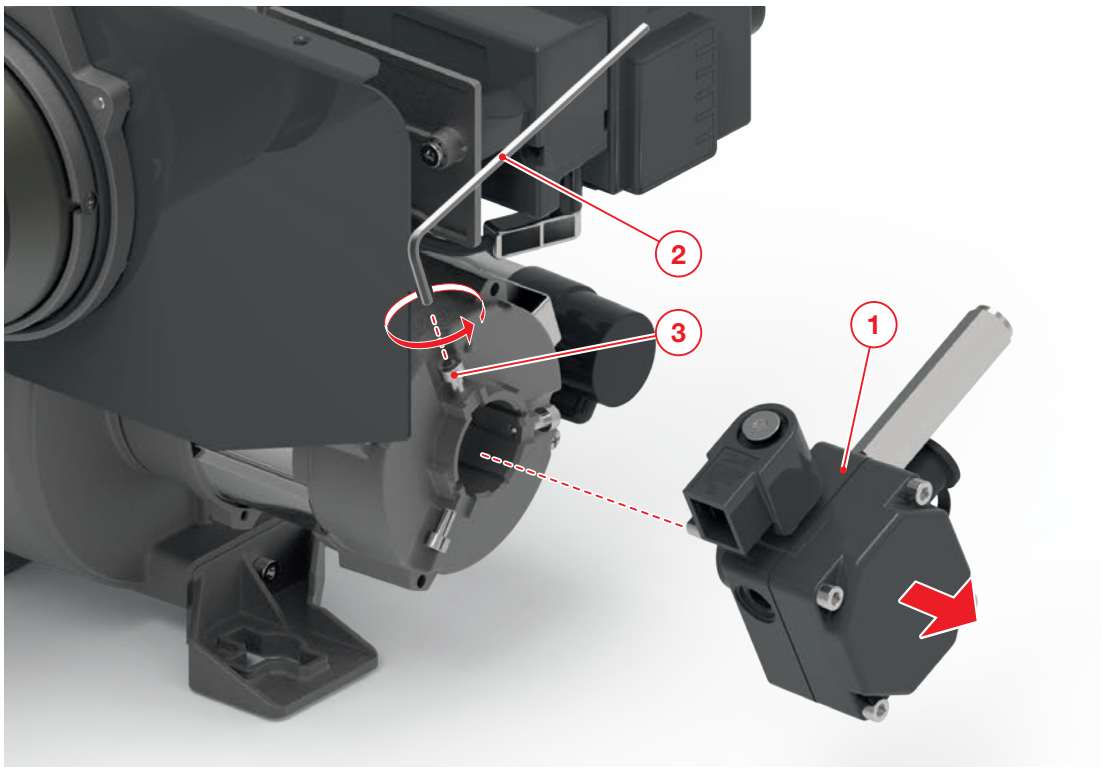


Fig. 51

- rotate manually the shaft (3-4 rotations both clockwise and anticlockwise)

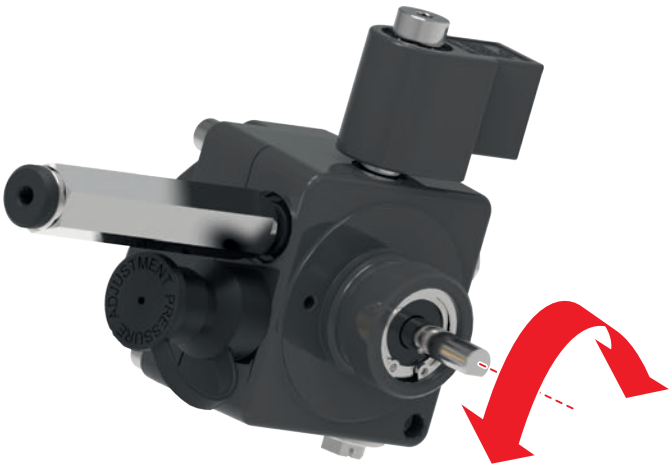


Fig. 52

- refit the pump to the motor
- reconnect the oil pipe to the pump. Check that there is no oil leakage on the pump side after this operation.

Replace the pump in the event it remains blocked or if there was any sticking during manual rotation.

6.3.10 Replacing control box

- Loosen screw (1) using the supplied key
- disconnect the 7 and 5 pin cable (2) from the control box (3)
- disconnect all cables used on the control box
- remove control box (3) pulling it outwards as shown by the arrows in the figure

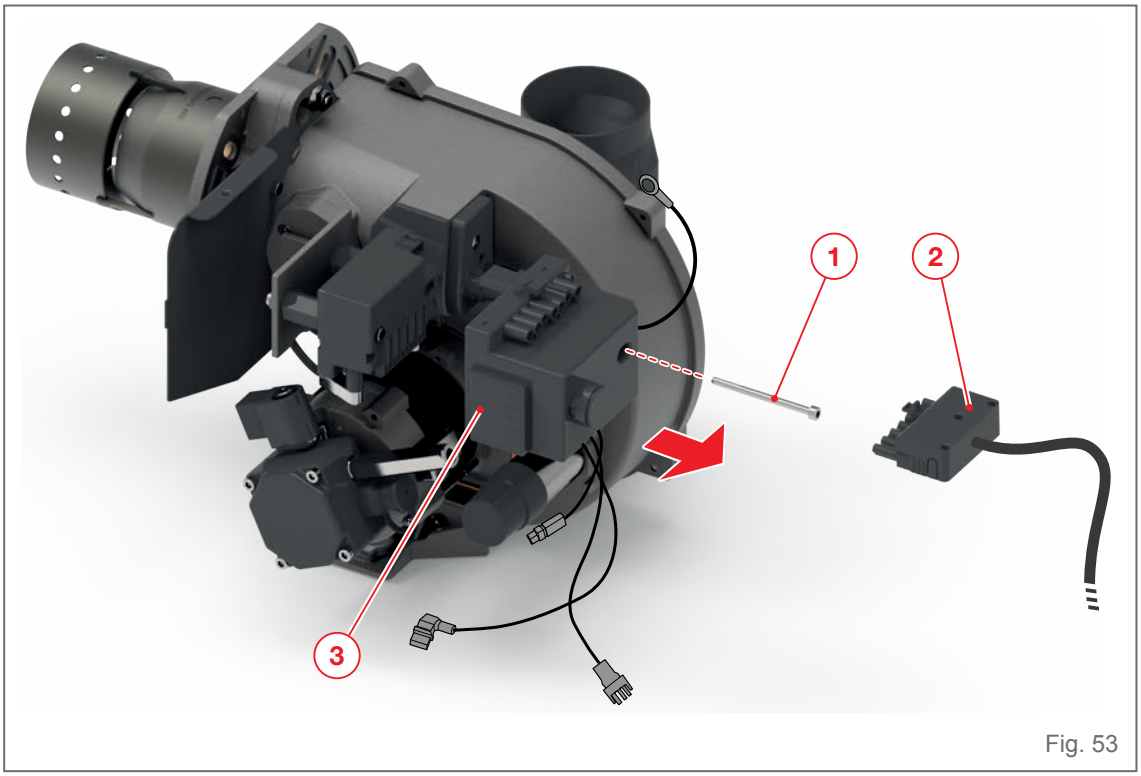


Fig. 53

- replace the control box
- reverse the procedure above in order to refit the components, and reconnect all the plugs. Tighten screw (1) with torque 2,3 Nm.

7 TROUBLESHOOTING

7.1 Combustion performances

After carrying out commissioning, cleaning or maintenance, combustion parameters must be verified.
Boiler has to maintain in operation at least 15 min. or reach a steady condition of operation, then check:

- pump pressure
- flue gas temperature
- CO2 (%)
- CO (ppm)
- NOx (ppm)
- Bacharach index.

7.2 Fault diagnosis and repair

In the event of a malfunction, first check that the prerequisites for correct operation are fulfilled:

- is the system connected to the power supply?
- is there oil in the tank?
- are all shut-off valves open?
- are all control and safety devices, such as the boiler thermostat, low pressure device (if fitted), limit switch, etc. adjusted correctly?

Warranty will be invalidated if genuine parts are not used on replacement. These components must be replaced by parts with the same order number.

WARNING
To reset the equipment control, press the release button.

WARNING
In case of burner lock out, to avoid damage to the installation, do not reset the burner more than twice in succession.

DANGER
If the burner goes into lock out for the third time, contact manufacturer's service organisation. In the case in which they occur further locks or malfunction burner, interventions must be carried out by qualified and authorized personnel, following the information in this manual and in accordance with the rules and legal regulations.

IMPORTANT INFORMATION
Only use original spare parts.

IMPORTANT INFORMATION
After each operation:

- Under normal operating conditions (doors closed, cover fitted, etc.), check combustion and check the individual lines for leaks.
- Record the results in the relevant documents.

7.3 Troubleshooting diagram

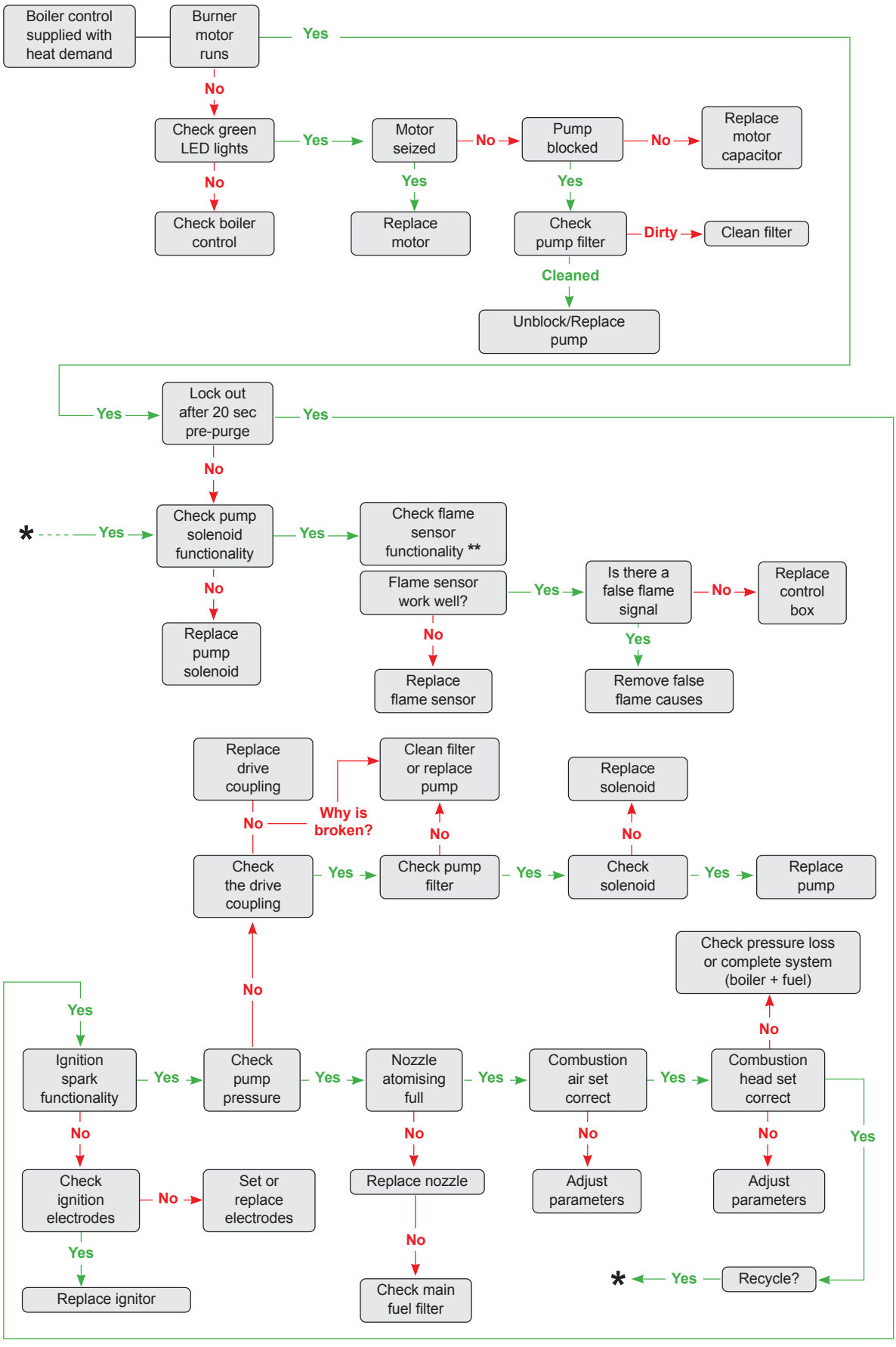


Fig. 54

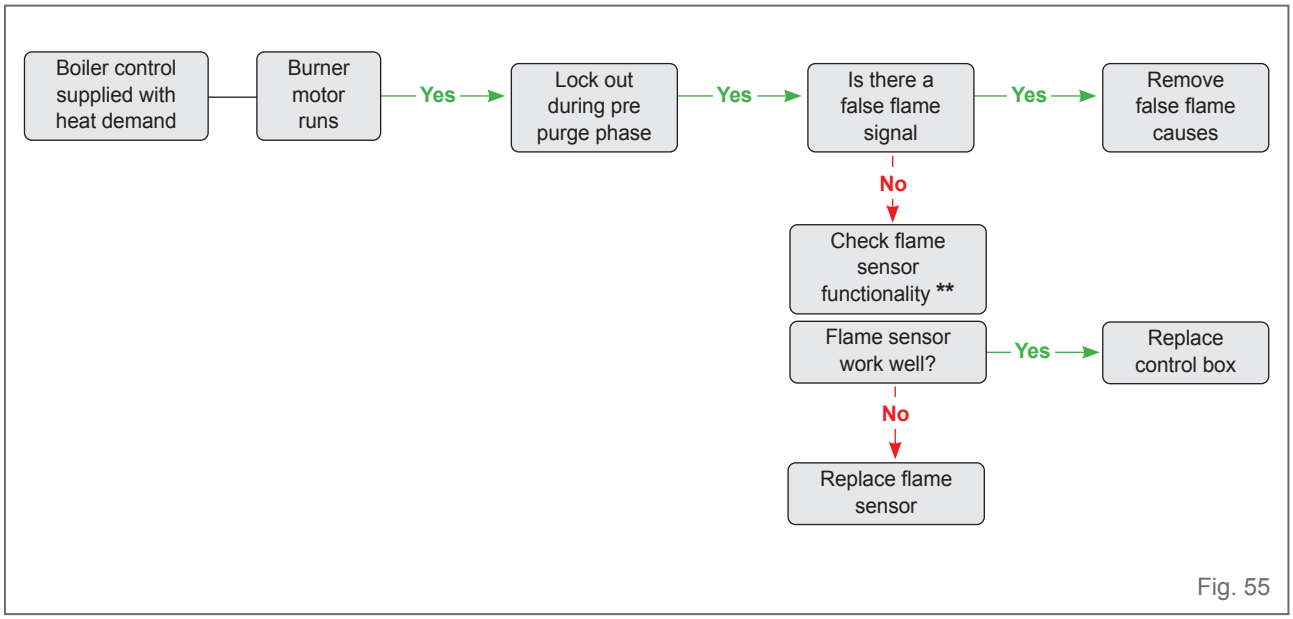


Fig. 55

(**) Check flame sensor functionality

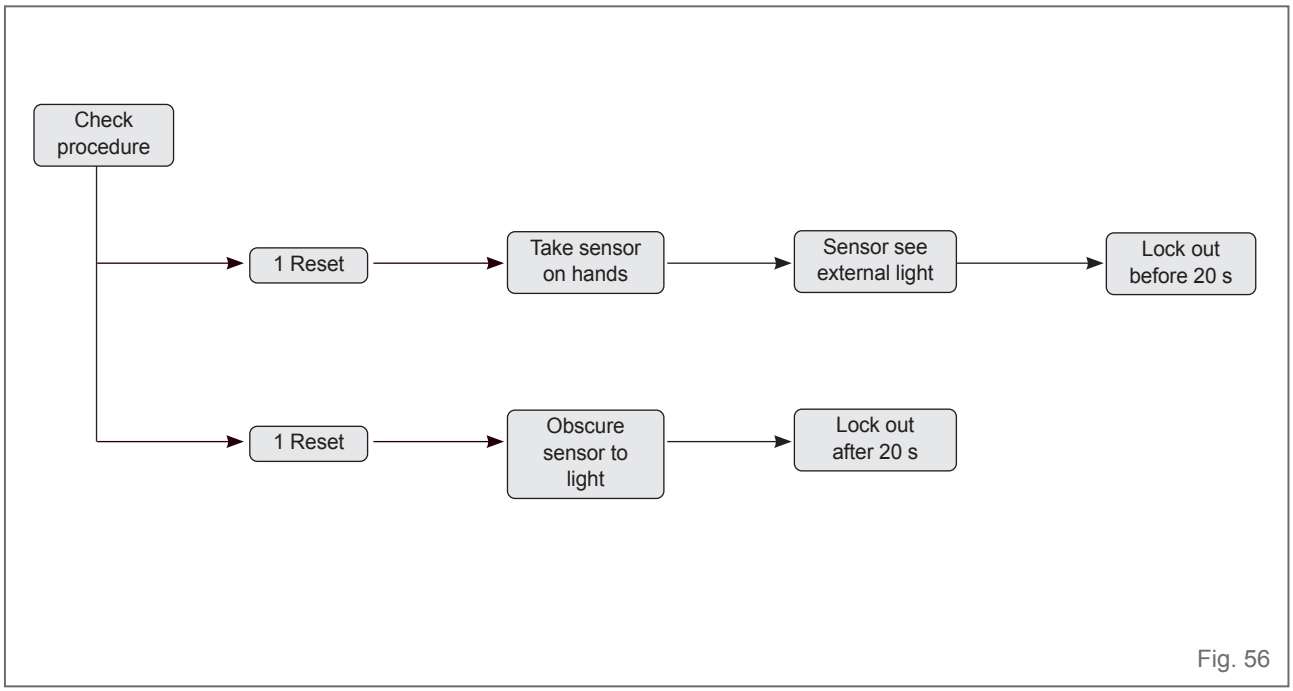


Fig. 56

8 SPARE PARTS LIST

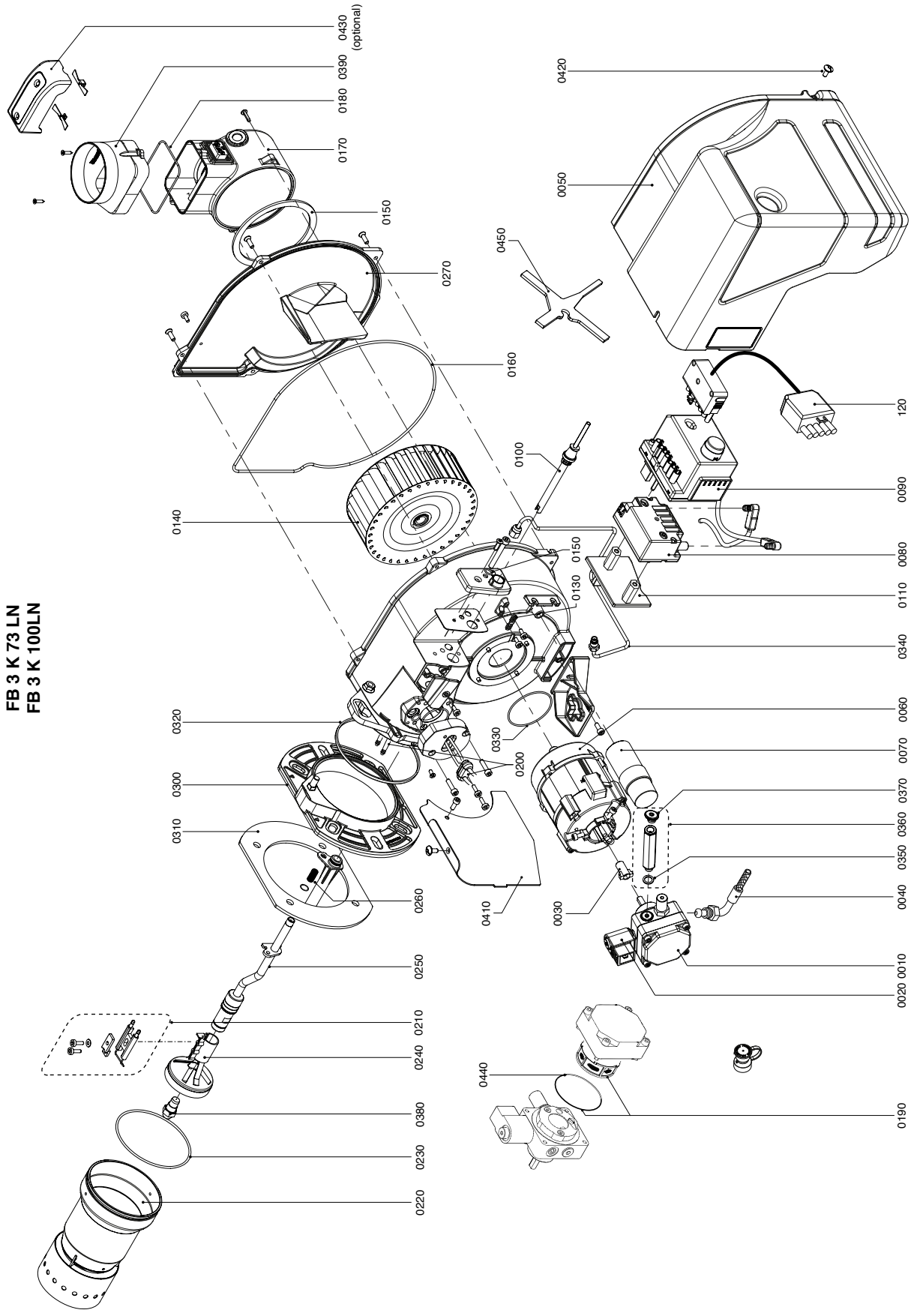


Fig. 57

No.	Description	FB 3 K 73 LN	FB 3 K 100 LN
		3146164	3146165
0010	OIL PUMP	65327227	65327227
0020	COIL	65327245	65327245
0030	COUPLING	65327229	65327229
0040	FLEXIBLE OIL HOSE	65328371	65328371
0050	BURNER COVER	65327543	65327543
0060	MOTOR + CAPACITOR	65327544	65327581
0070	CAPACITOR	65327545	65327582
0080	IGNITION TRANSFORMER	65327234	65327234
0090	CONTROL BOX WITH CABLES	6500773300	6500773300
0100	FLAME SENSOR E.B.R. FTEB (GREEN)	65327852	65327852
0100	FLAME SENSOR QRB1 (YELLOW)	65328148	65328148
0110	SUPPORT	65327240	65327240
0120	CABLE KIT WITH 7 AND 5-PIN CONNECTORS	65327237	65327237
0130	CLAMP	65327241	65327241
0140	FAN	65327546	65327546
0150	GASKET	65327508	65327508
0160	AIR INLET COVER GASKET	65327547	65327547
0170	AIR INLET ASSEMBLY	65327606	65327849
0180	ORING	65327549	65327549
0190	SET FILTER+SEAL	65327228	65327228
0200	IGNITION CABLES	65327284	65327284
0210	ELECTRODE GROUP	65327550	65327550
0220	BLAST TUBE	65328414	65328415
0230	BLAST TUBE ORING	65327552	65327552
0240	DIFFUSER	65327553	65327578
0250	NOZZLE HOLDER	65327554	65327633
0260	SPRING	65327206	65327206
0270	AIR INLET	65327548	65327548
0300	FLANGE	65327555	65327555
0310	GASKET	65327556	65327556
0320	ORING	65327557	65327557
0330	MOTOR GASKET	65327558	65327558
0340	PIPE	65327559	65327559
0350	GASKET	65327205	65327205
0360	EXTENDED PRESSURE PORT	65327242	65327242
0370	THREADED STOPPER	65327243	65327243
0380	NOZZLE	65327560	65327573
0390	SNORKEL	65327561	65327561
0410	FRONT PANEL	65327562	65327562
0420	COVER SCREW GROUP	65327563	65327563
0430	CONVENTIONAL FLUE CARTER	65328013	65328013
0440	ORING SET	65327846	65327846
0450	GAUGE	65329303	65329304

9 MANUFACTURER CERTIFICATE

9.1 Manufacturer Certificate / EU Design Conformity Declaration

We, **Firebird,** declare under our sole responsibility that the kerosene burners named **FB 3 K ... LN** is conform to the following standards:

- **EN 267**
- **EN 55014-1**
- **EN 60335-1**
- **EN 61000-6-2**
- **EN 50156-1**
- **EN 55014-2**
- **EN 60335-2-102**
- **EN 61000-6-3**

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

- **2014/35/UE Low Voltage Directive**
- **2014/30/UE EMC Directive**
- **2006/42/EC Machine Directive**
- **2011/65/EU RoHS2 Directive**

April 2018 / Mr. Alessandro Rubboli

R&D Director

9.2 UKCA Conformity Declaration

We, **Firebird,** declare under our sole responsibility that the kerosene burners named **FB 3 K ... LN** is conform to the following standards:

- **BS EN 267**
- **BS EN 55014-1**
- **BS EN 60335-1**
- **BS EN 61000-6-2**
- **BS EN 50156-1**
- **BS EN 55014-2**
- **BS EN 60335-2-102**
- **BS EN 61000-6-3**

These products bear the **UKCA** mark in accordance with the stipulations of the following directives:

- **Electrical Equipment (Safety) Regulations 2016**
- **Electromagnetic Compatibility Regulations 2016**
- **Supply of Machinery (Safety) Regulations 2008**
- **The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**

September 2022 / Mr. Alessandro Rubboli

R&D Director

10 APPENDIX

10.1 Use of bio fuel blends

The burner is suitable for kerosene with a biofuel content of up to 30%. It is a minimum requirement that the fuel blend (up to 30% Biofuel) is obtained with kerosene in accordance with the relevant standards, regional regulations and FAME in accordance with EN 14214.

IMPORTANT INFORMATION
In the event that the burner needs to be used with fuels containing biofuel percentages higher than 30%, contact the manufacturer.

10.2 Important advice for the use of bio fuel blends

10.2.1 Introduction

The growing attention focussed on renewable and sustainable energy sources would suggest an ever-increasing use of biofuels.

If you plan to make use of these fuels, you need to consider several technical aspects in order to reduce the potential for faults in the burner and heating system and the risk of fuel leaks.
The term 'liquid Biofuel' is a broad definition that includes oils made from numerous different raw materials, including recycled cooking oil. These types of oil must be considered and treated differently from common mineral and fossil fuels. This is because they are more acidic, hygroscopic and less stable.

Particular care should be taken in the storage of this fuel, in the supply pipe, in the ancillary equipment, in the filtration and in the choice of burner.

The classification of the biofuel is important for the smooth operation of the equipment.

IMPORTANT INFORMATION
The proprietor or the system manager is responsible for the detailed analysis of potential risks associated with the introduction of a mixture of biofuels and the suitability of the devices and installation.

10.2.2 General instructions and information

The supplier of the fuel must demonstrate compliance with an accredited quality management system for their storage, mixing and delivery processes.

During installation, make sure that all the materials and sealing devices used on the storage tank and oil delivery pipe to the burner are compatible with biofuels.

The tank must have a good quality biofuel-compatible oil filter and a **60 micron** secondary filter to protect the burner from contaminants.

Wherever an existing tank is to be used to store the oil, in addition to the above mentioned checks on the materials, it is essential that the tank is first inspected to verify its condition and check for the presence of water or other contaminants. If contaminants are found, a deep clean should be carried out. If this is not carried out the hygroscopic nature of the fuel could dissolve and detach complex components and cause faults in the equipment.

Based on the capacity of the storage tank and how the system is used, fuels can be stored inside it for a considerable amount of time. Consult your biofuel distributor for the use of biocidal products to prevent microbial growth inside the tanks and for instructions on fuel filtering.

During the commissioning of the burner, check that all combustion parameters are compliant with the recommendations in the technical manual for the appliance.
Check the filters on the burner oil pipe and oil pump, and if necessary replace them:
- at least every 4 months during burner use
- before starting the burner following a long period of disuse
- more often in the event of contamination.

CAUTION
Pay particular attention during the check and inspection to detecting fuel leaks from sealing devices, gaskets and hoses.

CAUTION
IF Bio fuel is used consult your Bio fuel distributor.

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