

Kerosene burners

One stage operation



CODE	MODEL
20105295	RDB2.2 BG1 BLU 16
20105294	RDB2.2 BG1 BLU 21
20105292	RDB2.2 BG1 BLU 26
20116137	RDB2.2 BG3 BLU 36



Original instructions

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1 Declaration

Declaration of conformity in accordance with ISO / IEC 17050-1

Manufacturer: RIELLO S.p.A.
 Address: Via Pilade Riello, 7
 37045 Legnago (VR)
 Product: Kerosene burners
 Model: RDB2.2 BG1 BLU 16
 RDB2.2 BG1 BLU 21
 RDB2.2 BG1 BLU 26
 RDB2.2 BG3 BLU 36

These products are in compliance with the following Technical Standard:

EN 12100

EN 267

and according to the European Directives:

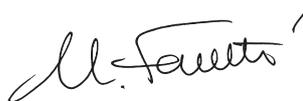
MD	2006/42/EC	Machine Directive
LVD	2014/35/UE	Low Voltage Directive
EMC	2014/30/UE	Electromagnetic Compatibility

The quality is guaranteed by a quality and management system certified in accordance with UNI EN ISO 9001.

Legnago, 01.12.2015

Executive General Manager
 RIELLO S.p.A. - Burner Department

Mr. U. Ferretti



Research & Development Director
 RIELLO S.p.A. - Burner Department

Mr. F. Comencini



2 Information and general warnings

2.1 Information about the instruction manual

2.1.1 Introduction

The instruction manual supplied with the burner:

- is an integral and essential part of the product and must not be separated from it; it must therefore be kept carefully for any necessary consultation and must accompany the burner even if it is transferred to another owner or user, or to another system. If the manual is lost or damaged, another copy must be requested from the Technical Assistance Service of the area;
- is designed for use by qualified personnel;
- offers important indications and instructions relating to the installation safety, start-up, use and maintenance of the burner.

Symbols used in the manual

In some parts of the manual you will see triangular DANGER signs. Pay great attention to these, as they indicate a situation of potential danger.

2.1.2 General dangers

The **dangers** can be of **3 levels**, as indicated below.



Maximum danger level!
This symbol indicates operations which, if not carried out correctly, cause serious injury, death or long-term health risks.



This symbol indicates operations which, if not carried out correctly, may cause serious injury, death or long-term health risks.



This symbol indicates operations which, if not carried out correctly, may cause damage to the machine and/or injury to people.

2.1.3 Other symbols



DANGER: LIVE COMPONENTS
This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences.



DANGER: FLAMMABLE MATERIAL
This symbol indicates the presence of flammable materials.



DANGER: BURNING
This symbol indicates the risks of burns due to high temperatures.



DANGER: CRUSHING OF LIMBS
This symbol indicates the presence of moving parts: danger of crushing of limbs.



WARNING: MOVING PARTS
This symbol indicates that you must keep limbs away from moving mechanical parts; danger of crushing.



DANGER: EXPLOSION
This symbol signals places where an explosive atmosphere may be present. An explosive atmosphere is defined as a mixture - under atmospheric conditions - of air and flammable substances in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.



PERSONAL PROTECTION EQUIPMENT
These symbols indicate the equipment that must be worn and kept by the operator for protection against threats against safety and/or health while at work.



OBLIGATION TO ASSEMBLE THE COVER AND ALL THE SAFETY AND PROTECTION DEVICES
This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



ENVIRONMENTAL PROTECTION
This symbol gives indications for the use of the machine with respect for the environment.



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

- This symbol indicates a list.

Abbreviations used

Ch.	Chapter
Fig.	Figure
Pag.	Page
Sec.	Section
Tab.	Table

Delivery of the system and the instruction manual

When the system is delivered, it is important that:

- the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
- The instruction manual shows:
 - the serial number of the burner;

.....

- the address and telephone number of the nearest Assistance Centre.

.....

- The system supplier must carefully inform the user about:
 - the use of the system;
 - any further tests that may be required before activating the system;
 - maintenance, and the need to have the system checked at least once a year by a representative of the manufacturer or another specialised technician.
 To ensure a periodic check, the manufacturer recommends the drawing up of a Maintenance Contract.

2.2 Guarantee and responsibility

The manufacturer guarantees its new products from the installation date, in accordance with the regulations in force and/or the sales contract. At the moment of the first start-up, check that the burner is integral and complete.



Failure to observe the information given in this manual, operating negligence, incorrect installation and carrying out of non authorised modifications will result in the annulment by the manufacturer of the guarantee that it supplies with the burner.

In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- incorrect installation, start-up, use and maintenance of the burner;
- improper, incorrect or unreasonable use of the burner;
- intervention of unqualified personnel;
- carrying out of unauthorised modifications on the equipment;
- use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- installation of untested supplementary components on the burner;
- powering of the burner with unsuitable fuels;
- faults in the fuel supply system;
- use of the burner even following an error and/or an irregularity;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- the use of non-original components, including spare parts, kits, accessories and optional;
- force majeure.

The manufacturer furthermore declines any and every responsibility for the failure to observe the contents of this manual.

3 Safety and prevention

3.1 Introduction

The burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations. It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:

- The burner must only be used as expressly described. Any other use should be considered improper and therefore dangerous.

In particular:

it can be applied to boilers operating with water, steam, diathermic oil, and to other uses expressly named by the manufacturer;

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- only those parts detailed as available as spare parts by the manufacturer can be replaced.

3.2 Safety warnings

The dimension of the boiler's combustion chamber must respond to specific values, in order to guarantee a combustion with the lowest polluting emissions rate.

The Technical Service Personnel will be glad to give you all the information for a correct matching of this burner to the boiler.

This burner must only be used for the application it was designed for. The manufacturer accepts no liability within or without the contract for any damage caused to people, animals and property due to installation, adjustment and maintenance errors or to improper use.

3.3 Basic safety rules

- Children or inexpert persons must not use the appliance.
- Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.
- Unauthorised persons must not attempt to repair the appliance.
- It is dangerous to pull or twist the electric leads.
- Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.

- Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not place anything on the burner.
- Do not block or reduce the size of the ventilation vents in the installation room.
- Do not leave containers and inflammable products or combustible materials in the installation room.

3.4 Personnel training

The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties.
- Personnel must observe all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel must inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications,

can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

In addition:



- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- the user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation;
- personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

4 Technical description of the burner

4.1 Technical data

TYPE	RDB2.2 BG1 BLU		RDB2.2 BG1 BLU		RDB2.2 BG1 BLU		RDB2.2 BG3 BLU		
		16		21		26		36	
Output Thermal power (with air at 20 °C)	kg/h	1.3		1.8		2.2		3.0	
	kW	16		21		26		36	
Fuel	Kerosene, viscosity 1.6 - 6 mm ² /s at 20 °C (Hi = 11.97 kWh/kg)								
Electrical supply	Single phase, ~ 50Hz 230V ± 30%								
Motor	Run current 0.85A - 2700 rpm - 283 rad/s								
Capacitor	4.5 mF								
Ignition transformer	Secondary 18 kV - 25 mA								
Pump	Kerosene, maximum pressure 11 bar (160psi)								
Absorbed electrical power	kW	0.15							

Tab. A

4.2 Burner description

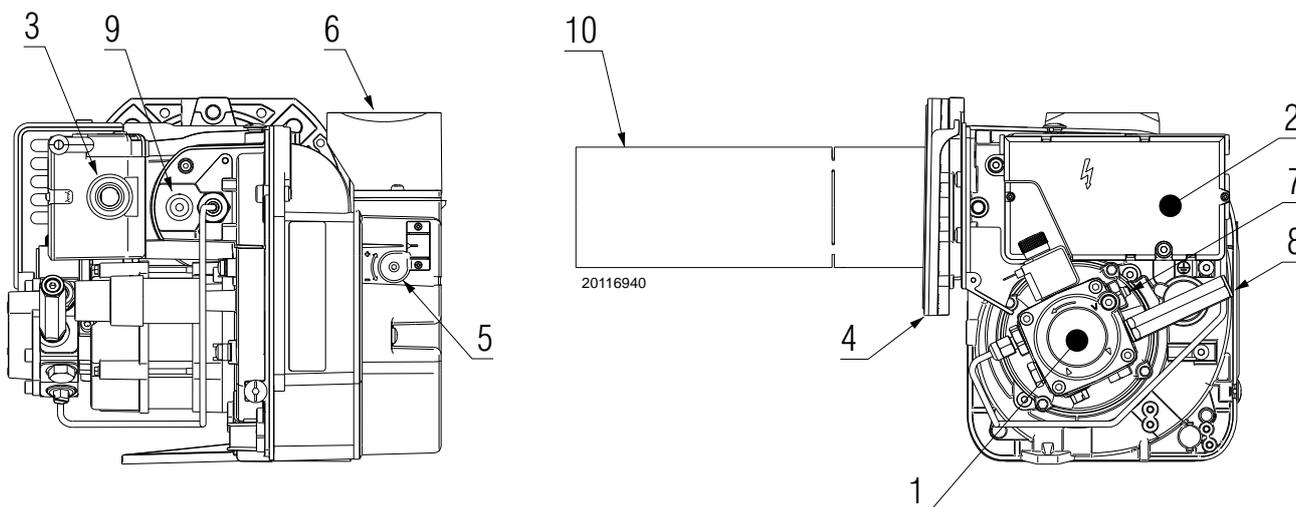


Fig. 1

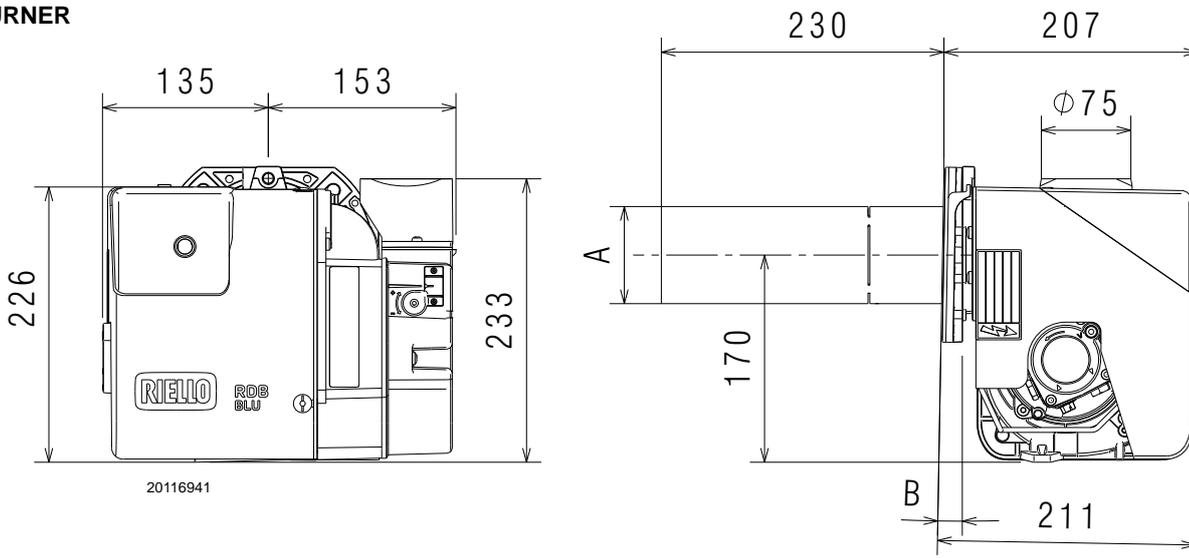
- 1 Pump
- 2 Control box
- 3 Reset push-button with lock-out lamp
- 4 Flange with insulating gasket
- 5 Air damper adjustment screw
- 6 Snorkel (BF)
- 7 Pump pressure adjustment screw
- 8 Pressure gauge port
- 9 UV sensor
- 10 Blast tube

4.3 Burner equipment

Hexagonal key	No. 1	Air intake	No. 1
Screw of by-pass pump.....	No. 1	Instruction manual.....	No. 1
Flexible oil pipe with nipple	No. 1	Spare part list	No. 1
Nut for burner to be fixed to flange.....	No. 1		

4.4 Burner dimensions

BURNER



FLANGE

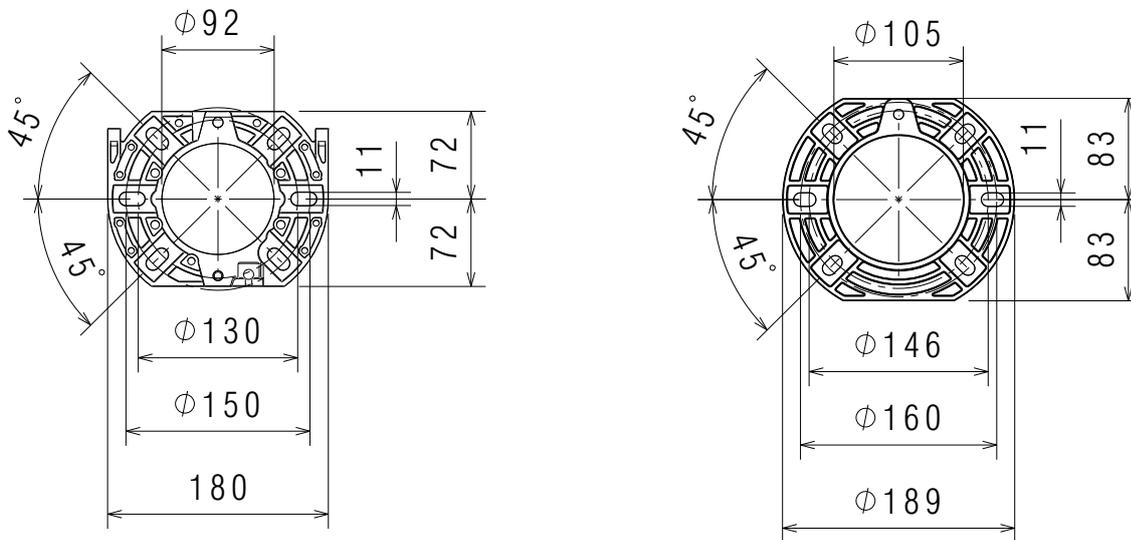


Fig. 2

	A (mm)	B (mm)
RDB2.2 BG1 BLU 16	80	1°
RDB2.2 BG1 BLU 21	80	1°
RDB2.2 BG1 BLU 26	80	1°
RDB2.2 BG3 BLU 36	89	0°

Tab. B

5 Installation

5.1 Notes on safety for the installation

After carefully cleaning all around the area where the burner will be installed, and arranging the correct lighting of the environment, proceed with the installation operations.



All the installation, maintenance and disassembly operations must be carried out with the electricity supply disconnected.



The installation of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



Combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

5.2 Handling

The burner packaging includes a wooden platform, it is therefore possible to move the burner (still packaged) with a transpallet truck or fork lift truck.



The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitability of the available means of handling. Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall). When handling, keep the load at not more than 20-25cm from the ground.



After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.



Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

5.3 Preliminary checks

Checking the consignment



After removing all the packaging, check the integrity of the contents. In the event of doubt, do not use the burner; contact the supplier.



The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

Checking the characteristics of the burner

Check the identification label of the burner, showing:

- the model **A**(Fig. 3) and type of burner **B**);
- the year of manufacture, in cryptographic form **C**);
- the serial number **D**);
- the electrical input power **E**);
- the types of fuel used and the relative supply pressures **F**);
- the data of the burner's minimum and maximum output possibilities **G**) (see Firing rate);
- the short circuit current **H**);
- the max input current **I**);
- the code of burners **L**);
- the electrical supply **M**);
- the weight of burner **N**).

R.B.L.	A		B		L
D	C	H	G		
M	E	I			
F	N				
RIELLO S.p.A. I-37045 Legnago (VR)			 		

20116944

Fig. 3



The output of the burner must be within the boiler's firing rate.



A burner label that has been tampered with, removed or is missing, along with anything else that prevents the definite identification of the burner makes any installation or maintenance work difficult.

5.4 Working position



The burner is designed to operate only in the positions 1, and 3 (Fig. 4). Installation 1 is preferable, as it is the only one that allows performing maintenance operations as described in this manual. Installations 2, 3 and 4 allow working operations but not maintenance with hooking to the boiler.



Any other position could compromise the correct operation of the appliance. Installation 5 is forbidden for safety reasons.

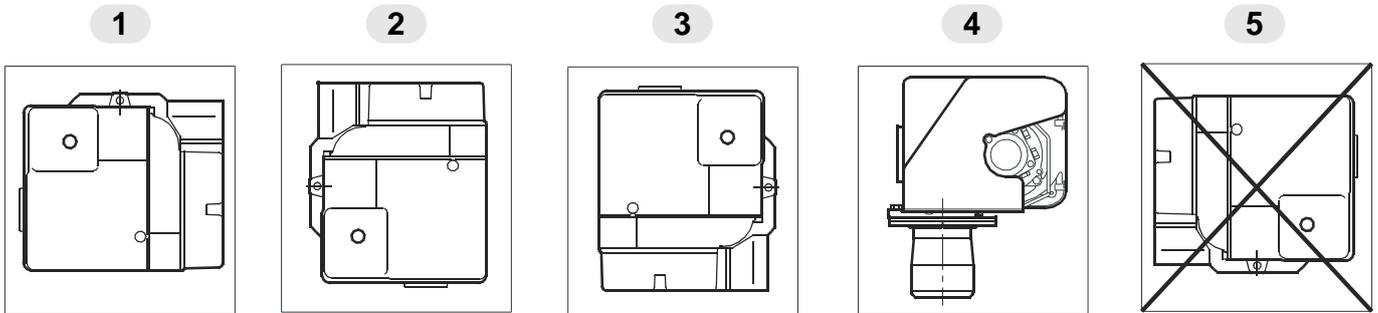
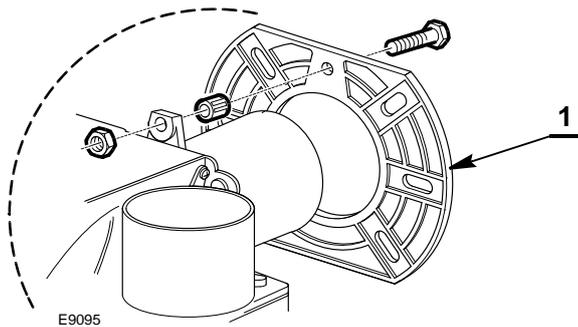


Fig. 4

5.5 Boiler fixing



- Put on the flange 1)(Fig. 5) the screw and two nuts.
- Fix the flange 1)(Fig. 6) to the boiler door 4) using screws 2) and (if necessary) the nuts 3) interposing the insulating gasket 5).



The seal between burner and boiler must be airtight.

Fig. 5

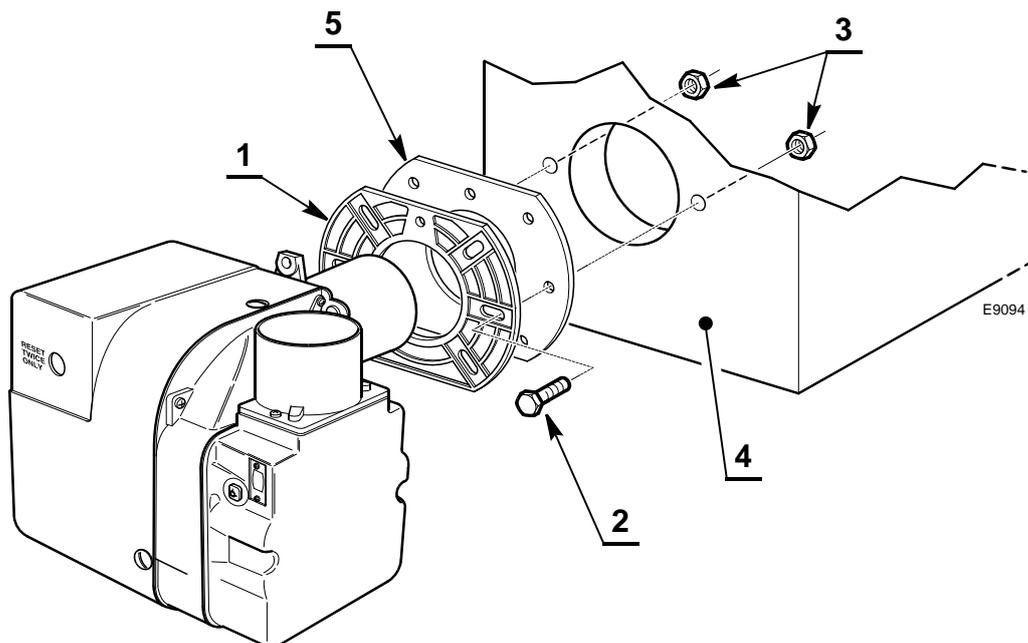


Fig. 6

5.6 Burner assembly

CF Application

In case of **CF** applications, the burner shall not operate without protection **(A)** of the suction inlet (Fig. 7).

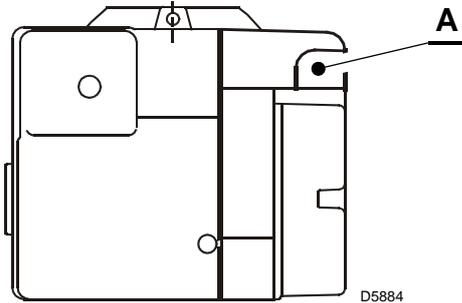


Fig. 7

BF Application



CAUTION

The temperature of the incoming air must not exceed 70 °C.



WARNING

For correct BF application, the burner must be installed on an appropriate BF boiler.

In case of **BF** applications an optional snorkel and gasket are available replacing **(A)** with **(B)** (Fig. 8)
This item can be supplied separately.

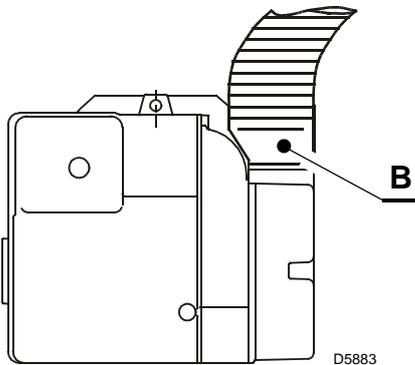


Fig. 8

The combustion air supply is through a flexible or rigid pipe connected to the air intake.

Consequently, you must comply with the following requirements and instructions:

- The combustion air intake tube must be:
 - fastened securely to the burner;
 - made of a suitable material, with temperature characteristics in the range - 30 °C to 80 °C;
 - in compliance with all requirements of applicable regulations in force in the country of destination.
- The intake-tube / burner system must not allow a loss of over 2 m³/h at 0.5 mbar:

for instance, the above requirements will be met if you use flues for pressure exhaust of flue gases (the condensation kind).

- Make sure the air intake tube's inlet is positioned so that it is not likely to be obstructed by foreign matter and, where necessary, use suitable screens.
- The inside diameter of the hose must be at least 80 mm.
- The intake tube can be up to 6 metres in length.



WARNING

Length is reduced if there are bends in the intake section.

For instance, using a tube with a smooth inside surface, you must allow for the following losses:

- for each 45° bend, tube length is reduced by 0.5 m;
- for each 90° bend, tube length is reduced by 0.8 m.

NOTE:

Burner installation must in any case comply with the flue systems included within the boiler approved configuration.



WARNING

- Under no circumstances should the air's entry in the hose intake area be obstructed.
- The hose must not be blocked in any way or feature a shutting device (valves, membranes etc.).

6 Hydraulic systems

6.1 Fuel supply

6.1.1 Pump

The pump is designed to allow working with one pipe.

In order to obtain two pipes working it is necessary to unscrew the return plug 2)(Fig. 9), screw the by-pass screw 3), supplied as burner equipment and then screw the return hose.



The suction plug 1) is made of plastic. Once removed, it must not be used again.

In single pipe installations, the plug in the return line 2) must be totally in steel.

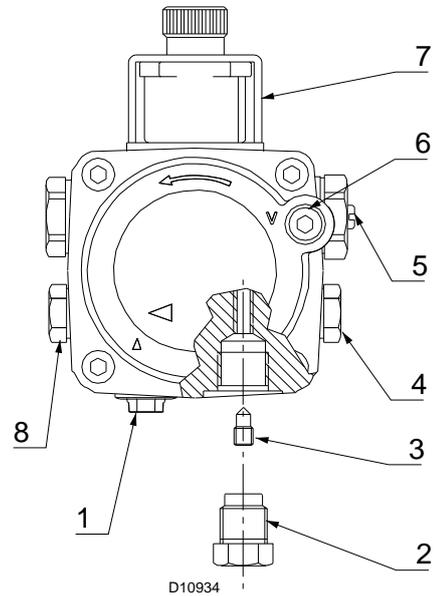


Fig. 9

Key (Fig. 9)

- | | | | |
|---|------------------|---|-------------------------------|
| 1 | Suction line | 5 | Pressure adjuster |
| 2 | Return line | 6 | Vacuum gauge connection |
| 3 | By-pass screw | 7 | Valve |
| 4 | Gauge connection | 8 | Auxiliary pressure test point |

6.2 One pipe system

Pressurised one pipe systems (Fig. 10) have a positive fuel pressure on intake to the burner.

Usually the tank is higher than the burner, or the fuel pumping systems are on the outside of the boiler.

Vacuum one pipe systems (Fig. 11) have a negative fuel pressure (depression) on intake to the burner.

Usually the tank is lower than the burner.



You are advised to use additional filters on the fuel supply line.

Riello recommends a good quality fuel filter at the tank (Fig. 10 - Fig. 11) and a secondary filter (60 μ for gas oil and 15 μ for kerosene) are used to protect the burner pump and nozzle from contamination.

6.2.1 Priming pump

On the system in Fig. 10 it is sufficient to loosen the plug of the vacuum gauge 6)(Fig. 9) and wait until the fuel flows out.

On the system in Fig. 11 start the burner and wait for the priming. Should lock-out occur prior to the arrival of the fuel, await at least 20 seconds before repeating the operation.



The installer must ensure that the supply pressure is not above 0.5 bar.

Above that level, the pump seal is subject to too much stress.

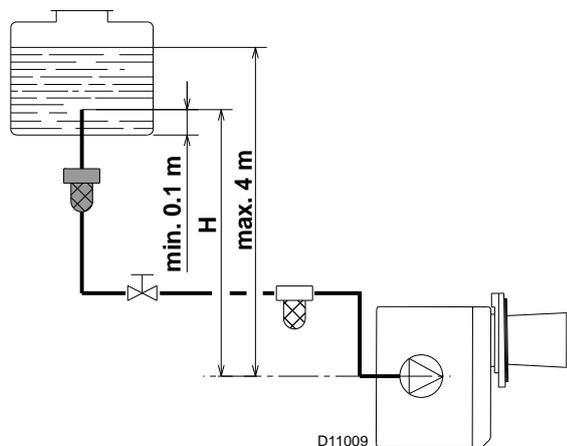


Fig. 10

H metres	L metres	
	I.D. (8 mm)	I.D. (10 mm)
0.5	10	20
1	20	40
1.5	40	80
2	60	100

Tab. C

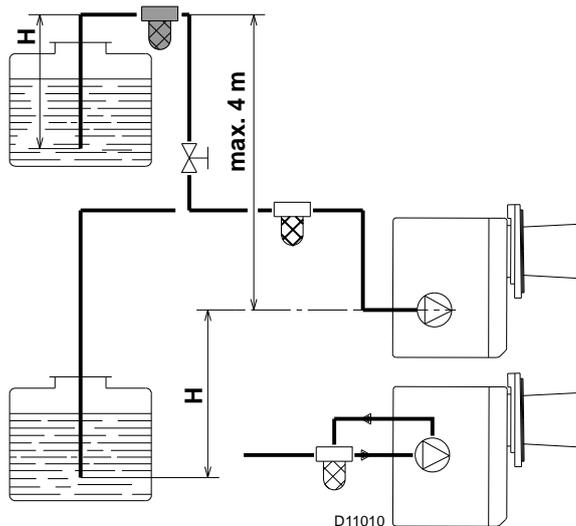


Fig. 11

H metres	L metres	
	I.D. (8 mm)	I.D. (10 mm)
0	35	100
0.5	30	100
1	25	100
1.5	20	90
2	15	70
3	8	30
3.5	6	20

Tab. D

- H difference of level
- L max. length of the suction line
- I.D. internal diameter of the oil pipes

NOTE:

The Tab. C and Tab. D show the maximum approximate lengths for the supply line, depending on the difference in level, length, and the diameter of the fuel conduit.

6.3 Two pipe system

Vacuum two pipe systems (**Fig. 12**) have a negative fuel pressure (depression) on intake to the burner. Usually the tank is lower than the burner.

The return line should terminate in the oil tank at the same level as the suction line; in this case a non-return valve is not required. Should however the return line arrives over the fuel level, the non-return valve is indispensable. This solution however is less safe than previous one, due to the possibility of leakage of the valve.



You are advised to use additional filters on the fuel supply line.

Riello recommends a good quality fuel filter at the tank (**Fig. 12**) and a secondary filter (60 μ for gas oil and 15 μ for kerosene) are used to protect the burner pump and nozzle from contamination.

6.3.1 Priming pump



Before starting the burner make sure that the return pipe-line is not clogged: any obstruction would cause the pump seals to break.

On the system in **Fig. 12** start the burner and wait for the priming. Should lock-out occur prior to the arrival of the fuel, await at least 20 seconds before repeating the operation.



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

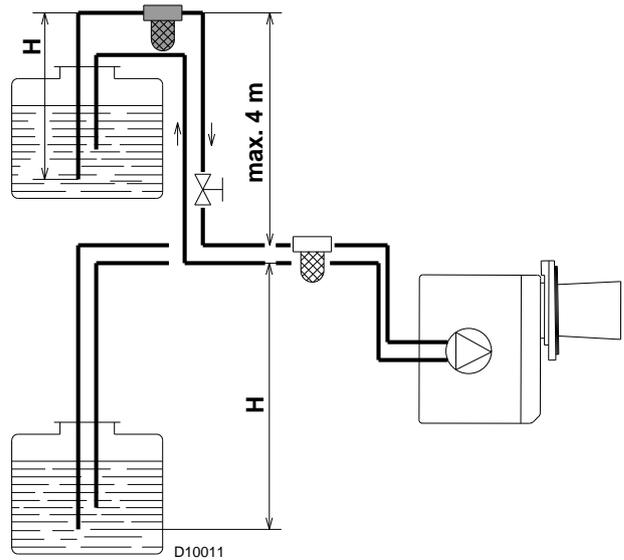


Fig. 12

H metres	L metres	
	I.D. (8 mm)	I.D. (10 mm)
0	35	100
0.5	30	100
1	25	100
1.5	20	90
2	15	70
3	8	30
3.5	6	20

Tab. E

- H** difference of level
- L** max. length of the suction line
- I.D.** internal diameter of the oil pipes

NOTE:

The Tab. E shows the maximum approximate lengths for the supply line, depending on the difference in level, length, and the diameter of the fuel conduit.

7 Start-up, calibration and operation of the burner

7.1 Notes on safety for the first start-up



The first start-up of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



Check the correct working of the adjustment, command and safety devices.

7.2 Combustion adjustment

In conformity with Efficiency Directive 92/42/EEC, the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and CO₂ concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.



The combustion air is sucked from outside, therefore, there can be sensitive temperature variations that can influence the percentage value of the CO₂. It is advisable to adjust the CO₂ according to the diagram.

For example: with an external air temperature of 10°C, adjust the CO₂ to 12.5% (± 0.2%).

To suit the required appliance output, choose the proper nozzle and adjust the pump pressure and the air damper opening in accordance with the following data.

The values refer to 11.6% of CO₂ at sea level, and with the light oil and ambient temperature at 10°C.

The values in Tab. F are obtained on a boiler (according to EN267). They refer to 12.5 % CO₂, at sea level and with an ambient and light oil temperature of 20 °C.

BURNER Code	Nozzle			Pump pressure bar	Burner output kg/h ± 4%	Burner output kW	Damper adjustment Set-point
	GHP	Angle	Type				
RDB2.2 BG1 BLU 16	0.40	80°	Danfoss ES	11	1.3	16	1.1-B
RDB2.2 BG1 BLU 21	0.60	80°	Danfoss ES	9	1.8	21	3
RDB2.2 BG1 BLU 26	0.65	80°	Danfoss ES	9.5	2.2	26	1.9
RDB2.2 BG3 BLU 36	0.85	80°	Danfoss ES	11	3.0	36	3.25

Tab. F

7.3 Recommended nozzles

The burner complies with the emission requirements of the EN 267 standard.

In order to guarantee that emissions do not vary, recommended and/or alternative nozzles specified by manufacturer in the Instruction and warning booklet should be used.



It is advisable to replace nozzles every year during regular maintenance operations.



The use of nozzles other than those specified by manufacturer and inadequate regular maintenance may result into emission limits non-conforming to the values set forth by the regulations in force, and in extremely serious cases, into potential hazards to people and objects.

The manufacturing company shall not be liable for any such damage arising from non-observance of the requirements contained in this manual.

To set the delivery range within which the nozzle must work, nozzle return line fuel pressure must be adjusted.

7.4 Pump pressure

The pump is calibrated in the factory as shown in Tab. F.

7.5 Air damper adjustment

The air damper is adjusted in the factory.

This adjustment is purely indicative. However, each installation has its own operating conditions: nozzle flow rate, positive or negative pressure in the combustion chamber, air excess requirement, etc. All these conditions can require different adjustments of the air damper.



Only for code 20105295

The adjustment of the air is carried out using two independent dampers (Fig. 13).

7.5.1 Main air damper

The main air damper A)(Fig. 13) can be regulated in position B) for the burner code 20105295.

To adjust the positions of the air damper, proceed as follows:

- remove the secondary damper B) by loosening the screw 1);
- loosen the screw 2) and turn the main damper A) to the required position;
- tighten the screw 2) and re-install the secondary damper B).

7.5.2 Two-stage air damper

The purpose of the damper B)(Fig. 14) is to optimise the air intake.

Optimisation is possible by using the screw 3)(Fig. 14).

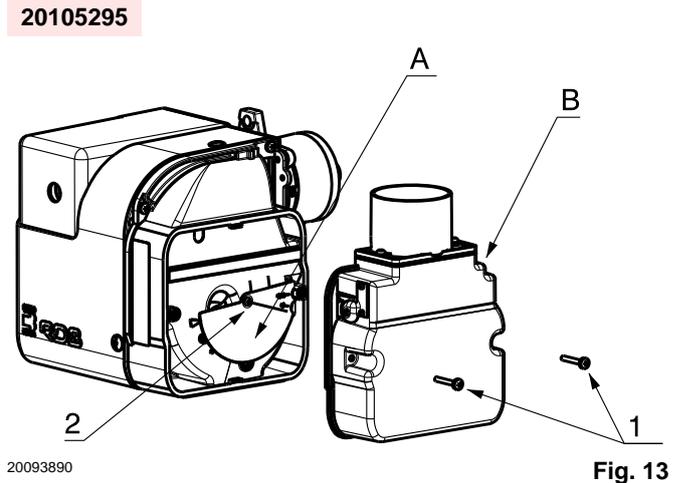


Fig. 13

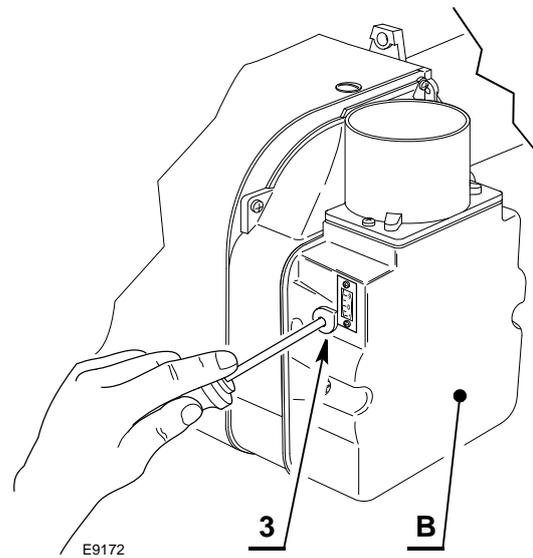


Fig. 14

7.6 Electrodes setting



These dimensions Fig. 15 must be respected.

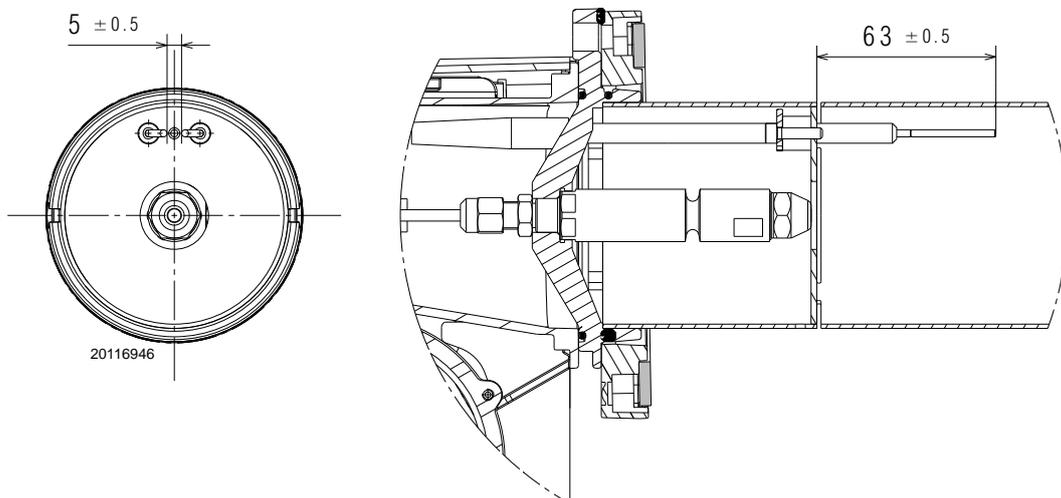


Fig. 15

7.7 Electrical system

Notes on safety for the electrical wiring



- The electrical wiring must be carried out with the electrical supply disconnected.
- The electrical wiring must be carried out in conformity with the regulations in force in the countries of destination, and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Do not invert the neutral with the phase in the electrical supply line.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burners have been calibrated for intermittent operation. This means that they must stop once every twenty four hours to permit the control box to check its efficiency at start up. Normally the boiler's thermostat/pressure switch ensures the stopping of the burner.
If this is not the case, a timer should be fitted in series to L-N to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel.
- The electrical system must be suitable for the maximum power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - provide for an omnipolar switch, as required by current safety regulations.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



Disconnect the electrical supply from the burner by means of the main system switch.



Turn off the fuel interception tap.
Avoid condensate, ice and water leaks from forming.

7.7.1 Control box



All installation, maintenance and dismantling operations should be carried out with the power switched off.



The replacement of the electric control box must be carried out by qualified personnel, as indicated in this manual and in accordance with standards and regulations in force.

To remove the control box from the burner, proceed as follows:

- unscrew the screw 1)(Fig. 16) and open the protection 2).
- Disconnect all the components.
- Remove the coil 3) from the oil pump.
- Unscrew the two screws 4) and remove the control box.
- Refit the control box following the procedure in the reverse order to the one described above.

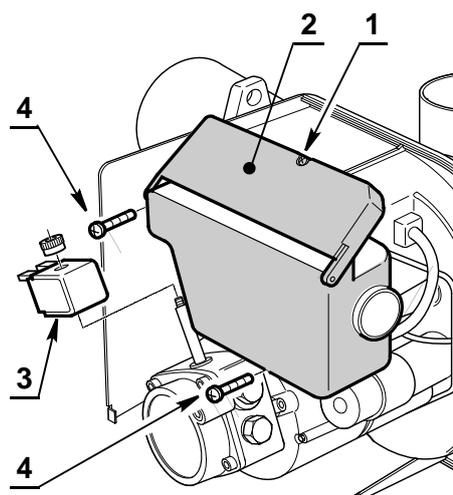
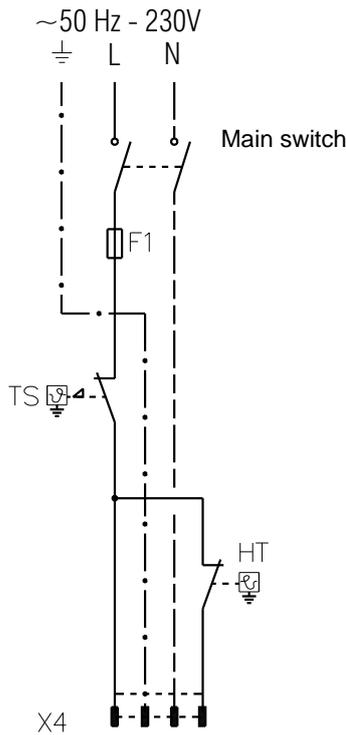


Fig. 16

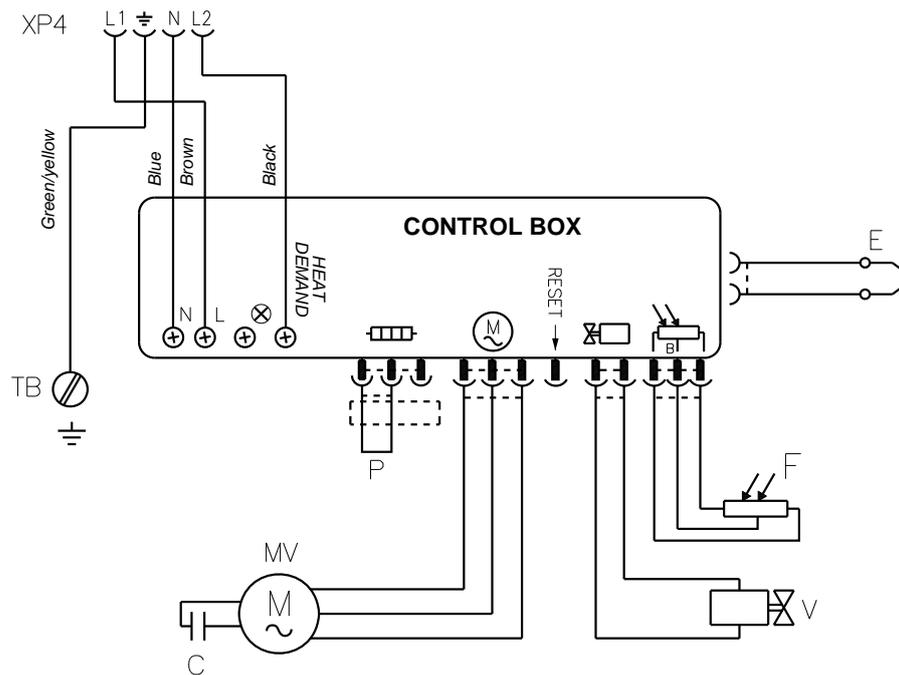
7.8 Electrical diagram

TO BE DONE BY THE INSTALLER



- Key (Fig. 17)**
C: Capacitor
E: Electrodes
F: UV detector
F1: T4A Fuse
HT: Heat request thermostat
MV: Fan motor
TB: Burner-earth
TS: Safety thermostat
V: Oil valve
X4: 4-pin plug
XP4: 4-pin socket

CARRIED OUT IN THE FACTORY



20117170

Fig. 17



WARNING

- Do not invert the neutral with the phase in the electrical supply line.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The section of the conductors must be at least 1 mm². (Unless requested otherwise by local standards and legislation).



WARNING

Test the burner by checking the shut-down of the burner by opening the thermostats and the lockout by darkening the UV detector.



CAUTION

If the cover is still on, remove it and proceed with the electric wiring following the wiring diagrams. Use flexible cables in compliance with EN 60 335-1 standards.

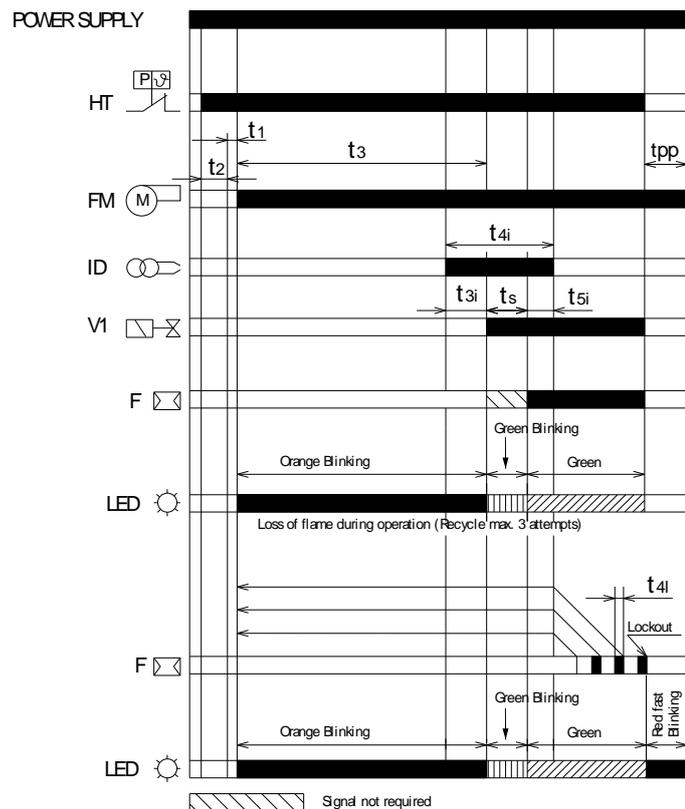


WARNING

This control box has a post-purging function. Do not replace it with other versions!

7.9 Operating programme

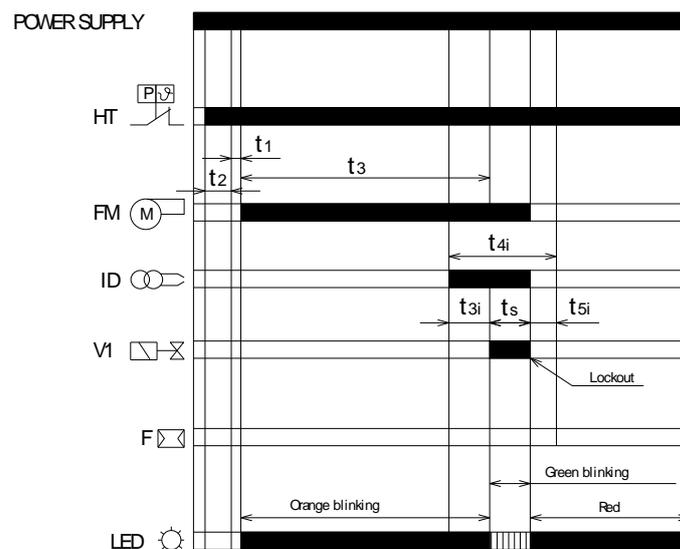
Normal operation



D11212

Fig. 18

Lockout due to ignition failure



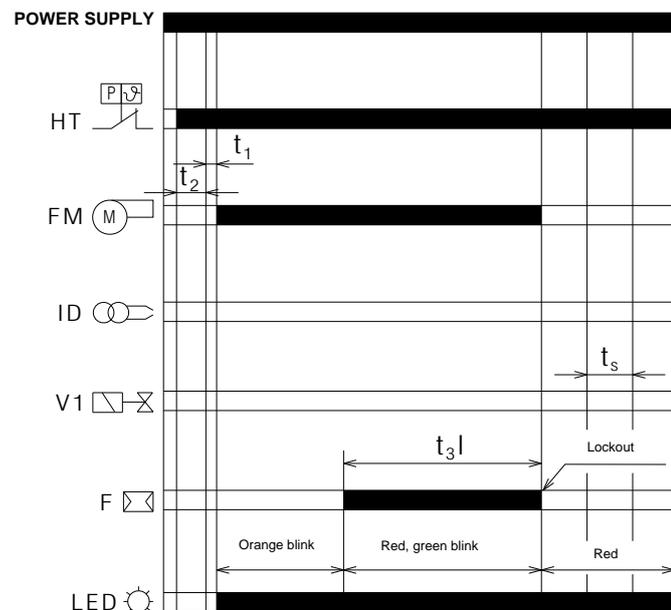
D11210

Fig. 20

Key (Fig. 18 - Fig. 19 - Fig. 20)

- F Flame detector
- HT Heat request thermostat
- ID Ignition device
- FM Fan motor
- V1 Oil valve
- LED Reset push-button LED colour
- t1 Standby time
- t2 Time for checking initialisation
- t3 Pre-purging time
- t3i Pre-ignition time
- t3l Checks for extraneous light during pre-purging
- t4i Total ignition time
- t4l Reaction time to achieve safety shut-down due to flame failure
- t5i Post-ignition time
- tpp Post-purging time
- ts Safety time

Lockout due to extraneous light during pre-purging



20086216

Fig. 19

7.10 Table of times

Symbol	Description	Value (sec.)
t0	Standby: the burner is waiting for a heat request	-
t1	Standby time for an input signal: reaction time, control box remains in waiting status for t1	≤ 1
t2	Initialisation standby time: check time following the main power start-up	3.5
t2l	Checks extraneous light during t2: waiting mode for t2l, then lockout: the motor does not start	25
t3	Pre-purge time: the fan motor is working	15
t3l	Checks extraneous light during pre-purging: control box goes into lockout at the end of t3l	25
t3i	Spark pre-ignition time	2
ts	Safety time	5
t4i	Total spark ignition time	10
t4l	Reaction time to achieve safety shut-down due to flame failure	≤ 1
t5i	Spark post-ignition time	3
-	Minimum time to reset the control box using push-button reset	0.4
tr	Re-cycles: Max. no. 3 repetitions of complete start-up sequence if there is a flame failure during operation; the final action at the last attempt following flame failure is a lock-out	3 re-cycles
tpp	Post-purge time: additional purge time at the end of a heat request. Can be interrupted by a new heat request	60

7.10.1 Operations status indication

Status	Push-button colour	Seconds	Colour code Led	
OFF	OFF	-	-	
Pre-purge	ORANGE blinking	0.5	0.5	● ○ ● ○ ● ○ ● ○ ● ○
Safety time	GREEN blinking	0.5	0.5	■ □ ■ □ ■ □ ■ □ ■ □
Normal operating position	GREEN*	-	-	Steady ON

7.10.2 Fault diagnostics - lockouts

Fault description	Reset push-button colour	Seconds	Colour code Led	
Extraneous light (false flame signal)	GREEN, RED blinking alternately	0.5	0.5	■ ▲ ■ ▲ ■ ▲ ■ ▲ ■ ▲
Frequency supply error	ORANGE	-	-	Steady ON
Voltage monitor error	ORANGE, GREEN fast blinking alternately	0.2	0.2	● ■ ● ■ ● ■ ● ■ ● ■
Reset push-button anomaly	GREEN, RED fast blinking alternately	0.2	0.2	■ ▲ ■ ▲ ■ ▲ ■ ▲ ■ ▲
Lockout for no flame after Ts	RED	-	-	Steady ON
Lockout for false flame signal	RED blinking	0.5	0.5	▲ △ ▲ △ ▲ △ ▲ △ ▲ △
Lockout for maximum number of recycles	RED fast blinking	0.2	0.2	▲ △ ▲ △ ▲ △ ▲ △ ▲ △
Lockout for fan motor error	RED, ORANGE blinking inverted	2.5	0.5	▲ ● ▲ ● ▲ ● ▲ ● ▲ ●
Lockout due to malfunction in the internal control circuit that drives the oil valve	RED, GREEN blinking inverted	2.5	0.5	▲ ■ ▲ ■ ▲ ■ ▲ ■ ▲ ■
Lockout for eeprom error	ORANGE, GREEN blinking alternately	0.5	0.5	● ■ ● ■ ● ■ ● ■ ● ■

Key

ON	OFF	Colour code
▲	△	RED
●	○	ORANGE
■	□	GREEN

7.10.3 Shut-down test

If, during operations, the reset push-button is pressed for longer than 5 seconds and less than 10 seconds, (so as not to go to the next menu See "Programming menu" on page 23.) the burner switches off, the oil valve closes, the flame is extinguished and the starting sequence restarts.

If the switch off test is enabled, the number of repetitions of the start up sequence (see section 7.10.5) and the number of possible resets (see section 7.10.10), are reset.

7.10.4 Intermittent operation

After 24 hours of continuous operation, the control box starts the automatic switch-off sequence, followed by a restart, in order to check for a possible fault with the flame detector.

It is possible to set this automatic switch off to 1 hour, (see the section 7.12).

7.10.5 Recycle and limit of repetitions

The control box allows a recycle, i.e. complete repetition of the start-up sequence, making up to 3 attempts, in the event the flame failure during operation.

If the flame failure 4 times during operations, this will cause a burner lockout. If there is a new demand for heat during the recycle, the 3 attempts are reset when the limit thermostat (TL) switches.

NOTE:

After 510 seconds of continuous operation, a new attempt of possibility is added.

By disconnecting the power supply, when a new heat request occurs (power supply is applied to the burner) all possible attempts at re-ignition are reset (maximum 3).

7.10.6 Presence of an extraneous light or parasite flame

The presence of the parasite flame or the extraneous light can be detected in the stand-by condition when the burner is stopped and waiting for a heat request. If the presence of a flame or extraneous light is detected in the "t2" state, the motor does not start until the flame signal has disappeared or until lockout has been reached.

If when the fan motor starts, during the pre-purging, an extraneous light or parasite flame is detected the burner remains in purging until it disappears or the lockout condition is reached 25 seconds.

If the parasite flame or the extraneous light are detected during the pre-purging, the pre-purging time of 15 seconds is reset and the time for checking for the presence of a parasite flame or extraneous light begins (the motor continues to purge).

The function is cumulative and can be carried out a maximum of 2 times. If at the 24th second the parasite flame or the extraneous light disappears, the pre-purging time starts and if the parasite flame or the extraneous light reappear the pre-purging time is reset and the countdown of 25 seconds for checking for the presence of the parasite flame or the extraneous light restarts.

The third time that the parasite flame or the extraneous light appears the burner goes into lockout.

If during the recycling due to flame disappearance when operating and the consequent repetition of the start-up sequence the presence of a parasitic flame or extraneous light is detected, the control countdown of 25 seconds starts (for the presence of the parasitic flame or extraneous light).

The fault is indicated by means of the blinking LED (see section 7.10.2).

7.10.7 Pre and post spark ignition

In the pre-spark ignition time the ignition device starts 2 seconds before the oil valve opens.

In the post-spark ignition time, the ignition device stops 3 seconds after safety time.

The spark ignition is present during all safety time.

NOTE:

In case of continuous recycling or heat requests close to one another, the maximum permissible number of cycle repetitions of the ignition transformer is one attempt every minute.

7.10.8 Reset protection

The burner can be released by pressing, for at least 0.4 seconds, the reset push-button integrated in the control box and the unlocking occurs only when the push-button is released.

NOTE:

The burner can be reset only 5 times consecutively, then power supply has to be disconnected for a new 5 reset possibilities.

The burner can only be reset if power supply is applied to the control box.

7.10.9 Reset push-button anomaly

if the reset push-button breaks or is kept pressed for more than 60 seconds, the fault is indicated by the blinking of the led (see section 7.10.2) as long as the fault is present.

This fault is merely a visualisation.

- If the fault is detected during pre-purging or safety time, the burner does not stop (the start-up sequence will continue).
- If the fault is detected during operation, the burner does stops and stays stopped with the fault signal active.
- If the fault is detected during a lockout, the fault is not signalled and the burner cannot be reset.

When the fault disappears, the LED stops flashing.

7.10.10 Frequency main supply anomaly

The control-box automatically detects the value of the frequency of the main supply in the range of 50 - 60 Hz, in both cases working times are verified. The fault is indicated by way of the blinking LED (see section 7.10.2).

- If the anomaly is detected before heat demand the burner does not start.
- If the fault is detected during the pre-purging, the burner remains in purge condition and the fault is appropriately signalled.
- The fault is not detected during normal running, the burner remains in this state.

When the fault disappears, the burner restarts.

7.10.11 Internal voltage anomaly

The control-box automatically detects if the internal voltage works correctly. The fault is indicated by way of the blinking LED (see section 7.10.2).

- If the anomaly is detected during the initialisation check time, the burner does not start.
- If the anomaly is detected after a lockout the burner does not start.
- If the anomaly is detected after a shut-down test, the burner does not start.
- The fault is not detected during normal running, the burner remains in this state.

When the fault disappears, the burner restarts.

7.10.12 Checking the fan motor

The control box automatically detects the presence of the fan motor and, in the event of a fault, it performs a lockout. The lockout is indicated by the flashing led (see section 7.10.2).

7.10.13 Checking the electronic circuit controlling the oil valve

The control box detects the presence of a fault inside the electronic circuit controlling the oil valve, the fault is indicated by the flashing led ("see section 7.10.2"):

- if the anomaly is detected during the initialisation, the burner goes into lockout.
- if the anomaly is detected during the pre-purging, the burner goes into lockout.
- During a recycling, if the fault is detected, the burner does not start and goes into lockout.
- If the anomaly is detected during running position the burner remains in operation.

The fault is not detected if the burner is in lockout.

7.10.14 EEPROM check

The control-box automatically detects if EEPROM memory of micro-controller has failed and will perform a lockout. The lockout is indicated by flashing led (see section 7.10.2).

7.11 Post-purge

Post-purging is a function that allows you to maintain the air purging even after the burner is switched off in the absence of the heat request for a pre-set time.

The burner switches off the flame when the heat request thermostat opens, cutting off the fuel supply to the valves.

The post-purge function is not performed:

- after a lockout
- if the heat request is interrupted during pre-purging.

Post-purging occurs:

- if the heat request is interrupted during the safety time;
- if the heat request is interrupted during normal operation.

NOTE:

If during post-purging there is an extraneous light or a parasite flame the burner goes into lockout after 25 seconds.

If during post-ventilation there is a new heat request, the post-purging time is halted, the fan motor stops and a new burner operating cycle starts.

7.12 Programming menu

GENERAL

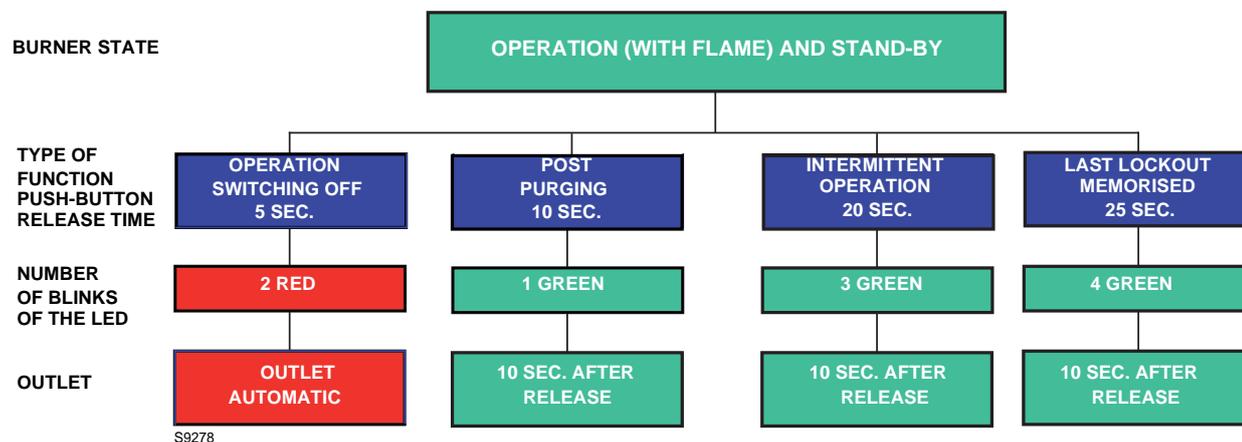
The programming menu can be accessed via the integrated reset push-button, during OPERATION and in STAND-BY.

If in page menu the reset push-button is not pressed within 10 seconds the page will be automatically be exited and there will be a green led flashing for the time set.

If the number of presses on the reset push-button exceeds the maximum allowable, the value that stays in memory will be the maximum one.

If the reset push-button is pressed for more than 60 seconds, a push-button error will be displayed and the control-box will re-start.

BLOCK DIAGRAM FOR ENTERING THE MENU



S9278

Fig. 21

Function	Push-button release time	No. of blinks of the led per menu page	No. of pressings of the reset push-button	No. of blinks of the Led (green)	Quitting the menu
Shut-down test	5s ≤ t < 10s	2 blinks RED	/ none	/ none	Automatic, at the end of the blinking
Post-purging	10s ≤ t < 15s	1 blink GREEN	1 = 10 sec. 2 = 20 sec. 3 = 30 sec. 4 = 60 sec. (default) 5 = 120 sec. 6 = 0 sec. (deactivated)	1 blink 2 blinks 3 blinks 4 blinks 5 blinks 6 blinks	10 sec. after the release of the push-button
Intermittent operation	20s ≤ t < 25s	3 blinks GREEN	1 = 0 disabled 2 = 1 hour 3 = 24 hours (default)	1 blink 2 blinks 3 blinks	10 sec. after the release of the push-button
Last lockout memorised	25s ≤ t < 30s	4 blinks GREEN	/ none	Displaying the type of lockout according to the table section 7.10.2	10 sec. after the release of the push-button

Tab. G

7.12.1 Shut-down test

Sequence for shut-down test programming

- Programming allowed in OPERATING mode and in STAND-BY.
- Press push-button for 5 sec. $\leq t < 10$ sec.
- RED led flashing 2 times (0.2s. ON; 0.2s. OFF).
- Release the push-button.
- The burner will initialise a shut-down followed by a restart

After shut-down, the burner restarts automatically and the no. of attempts of recycle are restored.

At the exit of shut-down test page menu there are no flashing led.

7.12.2 Post-purge

The post-purging time can be set for a maximum of **120 seconds**, proceeding as follows:

Sequence for post-purge programming

- Programming allowed in OPERATING mode and in STAND-BY.
- Press push-button for 10 sec. $\leq t < 15$ sec.
- GREEN led flashing 1 time
- Release the push-button
- GREEN led OFF
- Press the push-button from 1 - 5 times (*)
- GREEN led ON and OFF every time press and release
- After 10 sec. GREEN led flashing for the programmed times (0.5s. ON; 0.5s. OFF)

Sequence for disable post-purging

- Reset allowed in OPERATING mode and in STAND-BY.
- Press push-button for 10 sec. $\leq t < 15$ sec.
- GREEN led flashing 1 time
- Release the push-button
- GREEN led OFF
- Press the push-button 6 times (*)
- GREEN led ON and OFF every time press and release
- After 10 sec. GREEN led flashing for 6 times previously programmed (0.5s ON; 0.5s OFF)

**If heat demand stops during programming of post-purge function, occur exit menu without save the setting value.
If heat demand stops during the led flashing occur exit menu, but the setting value is stored.**

7.12.3 Intermittent operation

Sequence for enable/disable

- Programming allowed in OPERATING mode and in STAND-BY.
- Press push-button for 20 sec. $\leq t < 25$ sec.
- GREEN led flashing 3 times
- Release the push-button
- GREEN led OFF
- Press the push-button once to disable the function (*)
- Press the push-button 2 times to enable a shut-down every hour (*)
- Press the push-button 3 times to enable a shut-down every hour 24 hours (*)
- GREEN led ON and OFF every time press and release
- After 10 sec. GREEN led flashing for the programmed times (0.5s. ON; 0.5s. OFF).

The modification of the parameter setting for Intermittent operation takes effect:

- after the next heat request by the thermostat (HT)
- after the activation of a switch-off test
- after flame disappearance during operation
- after disconnecting and reconnecting the electrical supply

7.12.4 Displaying the last lockout that occurred

The control box allows the last lockout that happened and is memorised to be displayed, by accessing See "Programming menu" on page 23..

Access to this page is possible both in STAND-BY, as well as in the OPERATING status.

Display sequence of the last lockout that occurred

- Keep the push-button pressed for 25 sec. $= t < 30$ sec.
- The GREEN led flashes 4 times.
- Release the push-button.
- Displaying the type of lockout memorised for 10 sec.

The time displaying the type of lockout can be extended by repressing the reset push-button during the display of the lockout (the lockout display continues for another 10s).

NOTE:

(*) Always wait 1 sec. with each pressing and release of the push-button to ensure the command is logged correctly.

7.13 Lockout types

Whenever a lockout occurs, the control box shows the reasons for the fault (and the reasons can be identified by the reset push-button colour). The sequence of pulses issued by the control box of the LED in the reset push-button identifies the possible types of fault, which are listed in the table below

Lock-out description	Lock-out time	Led colour	Probable cause
Presence of extraneous light during standby	After 25 seconds	▲ ▲ ▲ ▲	– presence of a false flame signal before the heat request
Pre-heating not terminated	After 600 seconds	▲ ▲ ▲ ▲ 0.5 sec. ON 2.5 sec. OFF	– the short-circuit socket is not connected
Presence of extraneous light detected during pre-purging	After 25 seconds	▲ ▲ ▲ ▲	– presence of false flame signal during pre-purging
Extraneous light detected during post-purging	After 25 seconds	▲ ▲ ▲ ▲	– presence of false flame signal during post-purging (or pre-heating if the short-circuit socket is not connected)
The flame is not detected after the safety time	After 5 seconds from oil-valve starts	RED Steady ON	– flame detector defective or dirty – oil valve defective or dirty – faulty ignition transformer – badly regulated burner – oil fuel not present
Flame failure during operation	After 3 recycles	▲ ▲ ▲ ▲	– badly adjusted burner – oil valve defective or dirty – flame detector defective or dirty
Fan motor error	Immediate	▲ ● ▲ ●	– faulty fan motor – fan motor not connected
Malfunction in the internal control circuit that drives the oil valve	Immediate	▲ ■ ▲ ■	– faulty oil valve – internal control circuit that drives the oil valve faulty
Eeprom error	Immediate	● ■ ● ■	– faulty internal memory

Tab. H

The frequency of the flash of reset push-button for the status indication, See “Fault diagnostics - lockouts” on page 20.



WARNING

To reset the control box, press the reset push-button.



WARNING

In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row. If the burner locks out for a third time, contact the customer service.



DANGER

In the event there are further lockouts or faults with the burner, the maintenance interventions must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

8 Faults / Solutions

Here below you can find some causes and the possible solutions for some problems that could cause a failure to start or incorrect operation of the burner.

A fault usually makes the lockout led signal which is situated inside the reset push-button of the control box.

When lockout lamp comes on the burner will attempt to light only after pushing the reset push-button. After this if the burner functions correctly, the lockout can be attributed to a temporary fault that is not dangerous.

Otherwise, if the lockout persists the cause of the fault should be sought and the solutions shown in Tab. I put into effect.

Faults	Possible cause	Fault diagnostics	Solutions
The burner does not start when there is heat demand.	Lack of electrical supply.	OFF	Check presence of voltage in the L - N the pin plug. Check the conditions of the fuses. Check that safety thermostat is not in lockout.
	The flame detector sees an extraneous light.	■▲■▲	Eliminate the extraneous light.
	The connections in the control box are wrongly inserted.	OFF	Check and connect all the plugs and sockets properly.
	The short circuit socket is not connected.	■□■□■ 0.5 sec. ON 2.5 sec. OFF	Replace them.
The burner goes into lockout mode before or during the pre-purging.	The flame detector sees extraneous light.	▲△▲△	Eliminate the extraneous light.
Burner runs normally in the pre-purge and ignition cycle and locks out after about 5 seconds.	The flame detector is dirty.	RED Steady ON	Clear it.
	The flame detector is faulty.		Replace it.
	Flame moves away or fails.		Check pressure and output of the fuel. Check air output. Change nozzle. Check the coil of solenoid valve.
Burner starts with an ignition delay.	The ignition electrodes are wrongly positioned.	OFF	Adjust them according to the instructions of this manual.
	Air output is too high.		Set the air output according to the instructions of this manual.
	Nozzle dirty or worn.		Replace it.

Tab. I



WARNING

The manufacturer cannot accept responsibility for any damage to persons, animals or property due to error in installation or in the burner adjustment, or due to improper or unreasonable use or non observance of the technical instruction enclosed with the burner, or due to the intervention of un-qualified personnel.

9 Maintenance

9.1 Notes on safety for the maintenance

The periodic maintenance is essential for the good operation, safety, yield and duration of the burner.

It allows you to reduce consumption and polluting emissions and to keep the product in a reliable state over time.



DANGER

The maintenance interventions and the calibration of the burner must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

Before carrying out any maintenance, cleaning or checking operations:



DANGER

Disconnect the electrical supply from the burner by means of the main system switch.



DANGER

Turn off the fuel interception tap.



Wait for the components in contact with heat sources to cool down completely.

9.2 Maintenance programme

9.2.1 Maintenance frequency



The combustion system should be checked at least once a year by a representative of the manufacturer or another specialised technician.

9.2.2 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

The optimum calibration of the burner requires an analysis of the flue gases.

Significant differences with respect to the previous measurements indicate the points where most care should be exercised during maintenance.

Combustion head

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned.

Fan

Check to make sure that no dust has accumulated inside the fan or on its blades, as this condition will cause a reduction in the air flow rate and provoke polluting combustion.

Boiler

Clean the boiler as indicated in its accompanying instructions in order to maintain all the original combustion characteristics intact, especially the flue gas temperature and combustion chamber pressure.

Pump

If the pressure is unstable, or the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner. This measure permits the cause of the anomaly to be traced to either the suction line or the pump.

If the problem lies in the suction line, check the filter is clean and that air is not entering the piping.

Filters

Check the filtering baskets on line and at nozzle present in the system.

Clean or replace if necessary.

If rust or other impurities are observed inside the pump, use a separate pump to lift any water and other impurities that may have deposited on the bottom of the tank.

Nozzles

It is advisable to replace nozzles every year during regular maintenance operations.

Do not clean the nozzle openings.

Hoses

Check that these are in good conditions.

Fuel tank

Approximately every 5 years, suck any water on the bottom of the tank using a separate pump.

Combustion

In case the combustion values found at the beginning of the intervention do not respect the standards in force or, in any case, do not correspond to a proper combustion, contact the Technical Assistant in order to carry out the necessary adjustments.

Leave the burner working without interruptions for 10 min. and set rightly all the components stated in this manual.

Then carry out a combustion check verifying:

- Smoke temperature at the flue;
- Percentage of CO₂;
- CO content (ppm);
- Smoke value according to opacity smokes index according to Bacharach scale.

RIELLO

RIELLO S.p.A.
I-37045 Legnago (VR)
Tel.: +39.0442.630111
[http:// www.riello.it](http://www.riello.it)
[http:// www.riello.com](http://www.riello.com)