

GB **Kerosene burners**

One stage operation



MODEL	CODE
RDB2.2 BX E15/21	20147321
RDB2.2 BX E21/26	20147346
RDB2.2 BX V15/26	20094977
RDB2.2 BX VC26	20147322
RDB2.2 BX V26/36	20109931
RDB2.2 BX V36/46	20110334
RDB2.2 BX VC36	20147350



Original instructions

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1 Declarations

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 BX E15/21
 RDB2.2 BX E21/26
 RDB2.2 BX V15/26
 RDB2.2 BX VC26
 RDB2.2 BX V26/36
 RDB2.2 BX V36/46
 RDB2.2 BX VC36

These products are in compliance with the following Technical Standards:

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 ISO 9001:2015.

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
Page	Page
Sec.	Section
Tab.	Table

2.1.4 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 date of installation, 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.



WARNING

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;
- continuation of use of the burner when a fault has occurred;
- 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;
- 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.

The manufacturer's warranty is subject to correct burner, appliance and application matching, and set up in line with Manufacturer's instructions and guidelines. All components within the hydraulic circuit suitable for biofuel use and supplied by the manufacturer will be identified as bio-compatible. No warranty is given in relation to the use of components which are not so identified with biofuel blends. If in any doubt please contact the manufacturer for further advice.

If any burners are used with fuel with a bio content >30% then the components within the hydraulic circuit may be affected and are not covered under warranty. The hydraulic circuit consists of:

- pump
 - hydraulic ram (where applicable)
 - valve block
 - flexible oil lines (considered as a consumable component)
- 1 Irrespective of any warranty given by the manufacturer in relation to normal use and manufacturing defects, when fuels not meeting the relevant standards are used, or where fuel storage issues have not been addressed correctly, or the equipment used is not compatible, if failures occur which are directly or indirectly attributed to such issues and/or to the non-observance of this guidance, then no warranty or liability is implied or accepted by the manufacturer.
 - 2 The manufacturer has carefully chosen the specification of the bio-compatible components including the flexible oil lines to protect the pump, safety valve and nozzle. The manufacturer warranty is dependent upon the use of genuine components including the oil lines, being used.
 - 3 The manufacturer warranty does not cover defects arising from incorrect commissioning or servicing by non manufacturer employed service engineers, and any issues impacting the burner arising from external site related issues.

2.3 Guidance for the use of biofuel blends up to 30%

Introduction

With increasing focus on renewable and sustainable energy requirements, biofuel usage is set to increase. The manufacturer is committed to promoting energy conservation and the use of renewable energy from sustainable resources including liquid biofuels, however there are some technical aspects that must be considered at the planning stage of using such fuels to reduce the potential for equipment failure or the risks of fuel leakage.

Liquid biofuel is a generic description used for oil that can come from numerous feed stocks including recycled cooking oils. These types of oils have to be considered and treated differently from standard mineral or fossil fuels, as they are generally more acidic, hygroscopic and less stable.

Due to this, a holistic approach is needed for the specification of the liquid biofuel, the storage of the fuel, its oil supply line and ancillary equipment, and very importantly the oil filtration and the burner itself. The specification for FAME (Fatty Acids Methyl Ester) liquid biofuel is critical to reliable equipment operation.

It is a minimum requirement that the fuel blend (up to 30% bio) is obtained with light oil in accordance with the relevant EN standards, regional regulations and FAME in accordance with EN 14214. It is also important that the fuel blends meet the environmental operating condition requisites of the relative EN standards.

When choosing your oil products where you know biofuels will be in use, please make sure that a bio-compatible burner and/or components have been supplied. If an existing burner is to be used with a liquid biofuel then a kit may be required to make it compatible and the guidance notes enclosed concerning oil storage and filtration must be adhered to. The end user is responsible for the thorough verification of the potential risks associated with the introduction of a biofuel blend and the suitability of the appliances and installation applicable.

Irrespective of any warranty given by the manufacturer in relation to normal use and manufacturing defects, when fuels not meeting the relevant standards are used, or where fuel storage issues have not been addressed correctly, or the equipment used is not compatible, if failures occur which are directly or indirectly attributed to such issues and/or to the non-observance of this guidance, then no warranty or liability is implied or accepted by the manufacturer.

2.3.1 Information and general instructions

To ensure consistency, the supplier of the fuel must be able to demonstrate compliance with a recognised Quality Control and management system to ensure high standards are maintained within the storage, blending and delivery processes.

The installation oil storage tank and its ancillaries must also be prepared BEFORE liquid biofuel is introduced.

Checks and preparation should include:

- For new installations, make sure that all materials and seals in the oil storage and supply line to the burner are compatible with biofuels. For all installations, there must be a good quality bio-compatible oil filter at the tank and then a secondary filter of 60 Microns protecting the burner from contamination.
- If an existing oil storage tank is to be used then in addition to the materials checks as detailed above, it will be essential that the tank is first inspected for condition and checked for water or other contamination. The manufacturer strongly recommends that the tank is cleaned and oil filters replaced prior to biofuel delivery. If this is not completed then due to

the hygroscopic nature of biofuel, it will effectively clean the tank, absorb water present which in turn will result in equipment failure that is not covered by the manufacturer's warranty.

- Depending on the capacity of the oil storage tank and oil usage, fuels may remain static within the tank for some considerable time and so the manufacturer recommends that the oil distributor is consulted regarding the use of additional biocides within the fuel to prevent microbial growth from occurring within the tank. The manufacturer suggests that fuel suppliers and or service companies be contacted for guidance on fuel filtration. Special attention should be applied to dual fuel applications where oil may be stored for long periods of time.
- The burner must be set according to the appliance application and commissioned checking that all combustion parameters are as recommended in the appliance technical manual.
- The manufacturer recommends that the in line and burner oil pump filters are inspected and if required replaced at least every 4 months during burner use, before the burner start-up following a long period of discontinuous operation and even more frequently where contamination has occurred. Particular attention is needed when inspecting and checking for fuel leakages from seals, gaskets and hoses.

2.3.2 Product Disclaimer Statement

CAREFULLY READ THE FOLLOWING DISCLAIMER. YOU ACCEPT AND AGREE TO BE BOUND BY THIS DISCLAIMER BY PURCHASING BIO-COMPATIBLE BURNERS AND/OR COMPONENTS.

Although the information and recommendations (hereinafter "Information") in this guidance is presented in good faith, believed to be correct and has been carefully checked, the manufacturer (and its subsidiaries) makes no representations or warranties as to the completeness or accuracy of the Information. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will the manufacturer (and its subsidiaries) be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. Other than set forth herein, the manufacturer (and its subsidiaries) makes no additional warranties with respect to the bio-compatible burner, either express or implied, including that of marketability or fitness for a particular purpose or use.

In no event shall the manufacturer (and its subsidiaries) be liable for any indirect, incidental, special or consequential damages including, without limitation, loss of profits, damages for loss of business profits, business interruption, loss of business information, loss of equipment, or other pecuniary loss or compensation for services whether or not it is advised of the possibility of such damages.

With the exception of injuries to persons, the manufacturer's liability is limited to the customer's right to return defective/non-conforming products as provided by the relevant product warranty.

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 foreseen 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 envisaged by the manufacturer can be replaced.



The manufacturer guarantees safety and proper functioning only if all burner components are intact and positioned correctly.

3.2 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 Models available

Designation	Voltage	Code
RDB2.2 BX E15/21	1/230V/50Hz	20147321
RDB2.2 BX E21/26	1/230V/50Hz	20147346
RDB2.2 BX V15/26	1/230V/50Hz	20094977
RDB2.2 BX VC26	1/230V/50Hz	20147322
RDB2.2 BX V26/36	1/230V/50Hz	20109931
RDB2.2 BX V36/46	1/230V/50Hz	20110334
RDB2.2 BX VC36	1/230V/50Hz	20147350

Tab. A
4.2 Technical data

Model	RDB2.2 BX E15/21	RDB2.2 BX E15/26	RDB2.2 BX V15/26	RDB2.2 BX VC26
Delivery ⁽¹⁾	1.25 – 1.75 kg/h	1.75 – 2.17 kg/h	1.25 – 2.17 kg/h	2.17 kg/h
Heat output range ⁽¹⁾	15 - 21 kW	21 - 26 kW	15 - 26 kW	26 kW
Thermal power ⁽¹⁾	18 kW	23.5 kW	21 kW	26 kW
Fuel	Kerosene, viscosity 1.6 – 6mm ² /s at 20°C			
Electrical supply	Single-phase, ~ 50Hz 230V ± 10%			
Motor	Intensity 0.6 A – Output 90W - Speed 2800 tr/min. - 294 rad/s			
Capacitor	4,5 µF			
Ignition transformer	Secondary 8 kV – 16 mA			
Pump (kerosene)	Max. pressure; 10 bar 10 (145 PSI)			
Electric power consumption ⁽²⁾	0,16 kW			
Protection level	IP 20			
Net weight	8.2 kg			

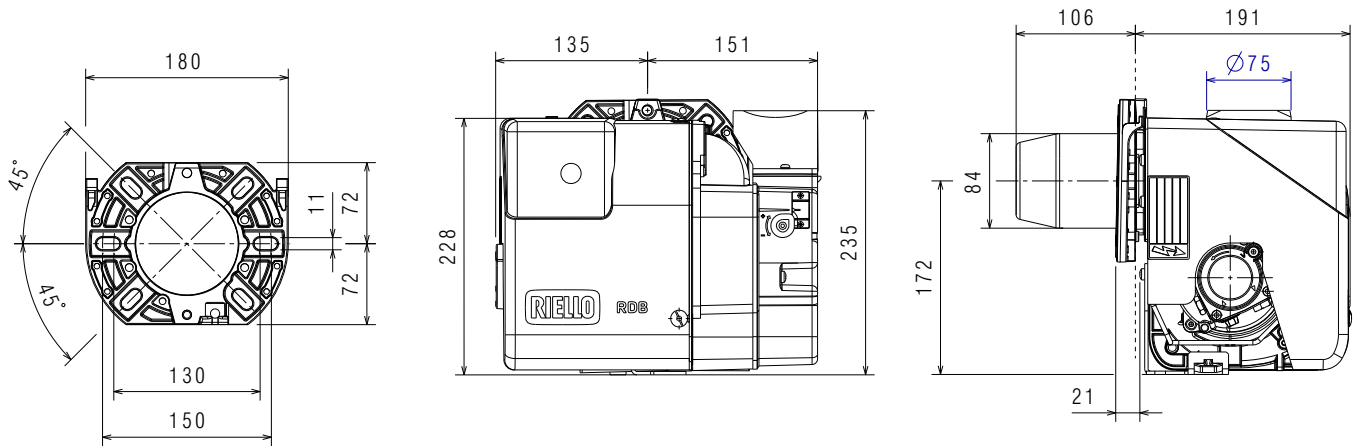
Model	RDB2.2 BX V26/36	RDB2.2 BX V36/46	RDB2.2 BX VC36
Delivery ⁽¹⁾	2.17 – 3 kg/h	3 – 3.83 kg/h	3.83 kg/h
Heat output range ⁽¹⁾	31 kW	41 kW	36 kW
Thermal power ⁽¹⁾	31 kW	41 kW	36 kW
Fuel	Kerosene, viscosity 1.6 – 6mm ² /s at 20°C		
Electrical supply	Single-phase, ~ 50Hz 230V ± 10%		
Motor	Intensity 0.6 A – Output 90W - Speed 2800 tr/min. - 294 rad/s		
Capacitor	4,5 µF		
Ignition transformer	Secondary 8 kV – 16 mA		
Pump (kerosene)	Max. pressure; 10 bar 10 (145 PSI)		
Electric power consumption ⁽²⁾	0,16 kW		
Protection level	IP 20		
Net weight	8.2 kg		

Tab. B

⁽¹⁾ Reference conditions: Ambient temperature 20°C - Barometric pressure 1013 mbar - Altitude 0m a.s.l. (H_i = 11.86 kWh/kg)

⁽²⁾ Values detected during operation.

4.3 Overall dimensions



20110517

Fig. 1

4.4 Burner description

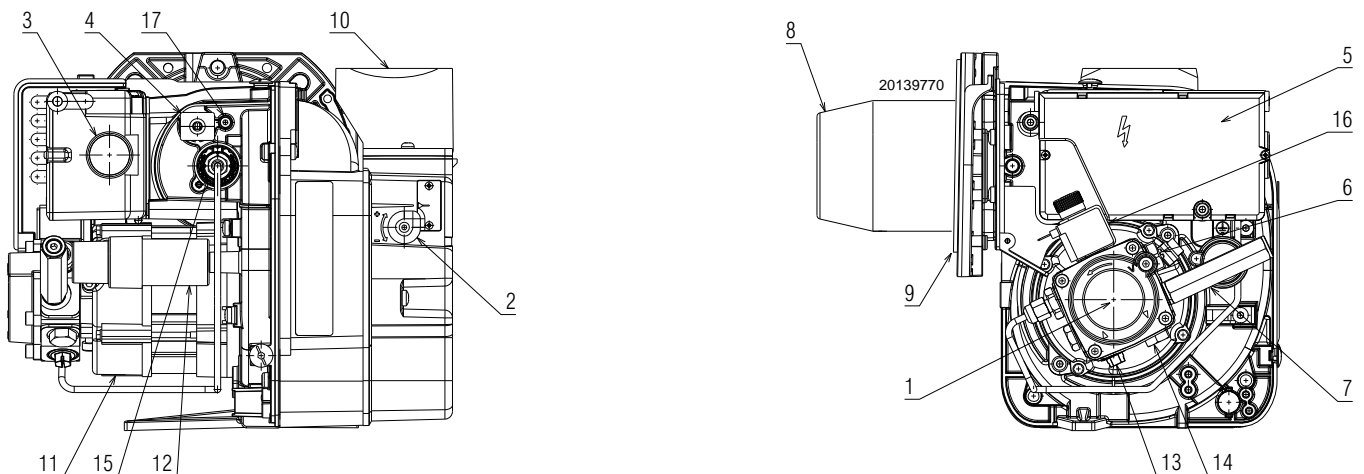


Fig. 2

- | | |
|----------------------------------|---|
| 1 Oil pump | 14 Return line |
| 2 Air damper adjustment screw | 15 Combustion head adjustment handle knob |
| 3 Reset button with lockout lamp | 16 Coil |
| 4 Flame sensor | 17 Air pressure test point |
| 5 Control box | |
| 6 Pump pressure adjustment screw | |
| 7 Extension for gauge connection | |
| 8 Combustion head | |
| 9 Flange with insulating gasket | |
| 10 Air inlet | |
| 11 Motor | |
| 12 Motor ignition capacitor | |
| 13 Fuel suction line | |



The hoses supplied with this burner are not suitable for use with light oil containing a bio blend.

In case of use with light oil containing up to 30% bio blend, it will be essential to use flexible oil lines suitable for biofuel use.

Please contact the manufacturer for further information.

4.5 Material supplied separately

Fitting G 3/8 (for flexible hoses)	No. 1	Screw of by-pass pump	No. 1
Screws and nuts for flange to be fixed to boiler	No. 4	Flexible oil pipe	No. 1
Screw and nut for securing the burner to the flange.	No. 1	Instruction	No. 1
Hexagonal wrench	No. 1	Spare parts list	No. 1
Template control.	No. 1		

5 Installation

5.1 Notes on safety for the installation

After carefully cleaning all around the area where the burner is to be installed, and arranging for the environment to be illuminated correctly, 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 20-25 cm 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 (Fig. 9) of the burner, showing:

- A the burner model
- B the burner type
- C the burner code
- D the serial number of the burner
- E the year of manufacture in cryptographic type
- F the burner output data (see Firing rate)
- G the electrical supply and absorption data
- H the types of light oil used
- I the burner setting

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

20138461

Fig. 3



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 Installer/Service notes for the use of light oil with bio blends up to 30%

- When installing the burner, make sure the fuel to be used is light oil. In the case of light oil with a bio blend up to 30%, the latter must comply with the manufacturer specifications (refer to "Technical data" and "Instructions for using biofuel blends up to 30%").
- If a bio blend is in use the installer must seek information from the end user that their fuel supplier can evidence that the blends of fuel conform to the relevant standards.
- Check that the materials used in the construction of the oil tank and ancillary equipment are suitable for biofuels, If not these must be upgraded or replaced with bio-compatible parts.
- Particular attention should be given to the oil storage tank and supply to the burner. The manufacturer recommends that existing oil storage tanks are cleaned, inspected and any traces of water are removed BEFORE biofuel is introduced (contact the tank manufacturer or oil supplier for further advice). If these recommendations are not respected this will increase the risk of contamination and possible equipment failure.
- In line oil filters should be replaced making sure that they are bio-compatible. The manufacturer recommends a good quality bio-compatible oil filter at the tank and a secondary 60 micron filter be used to protect the burner pump and nozzle from contamination.
- The burner hydraulic components and flexible oil lines must be suitable for biofuel use (check with the manufacturer if in doubt).
- The burner must be commissioned and combustion parameters set to appliance manufacturer's recommendations.
- Regularly check visually for any signs of oil leakage from seals, gaskets and hoses.
- It is strongly recommended that with biofuel use, oil filters are inspected and replaced every 4 months. More regularly where contamination is experienced.

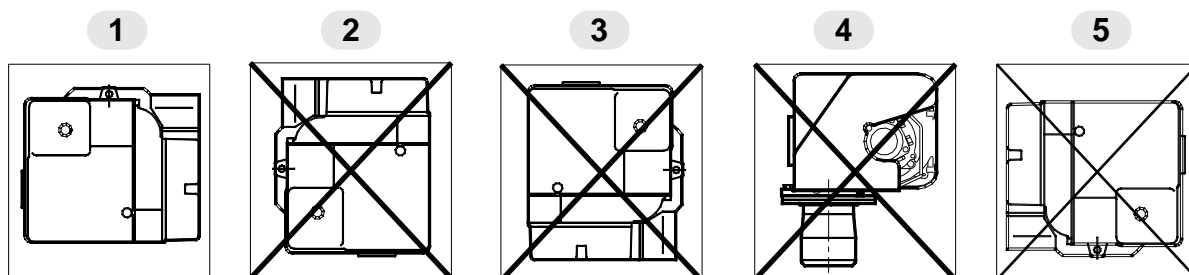
5.5 Operating position



The burner is designed to work only in position 1. Installation 1 is preferable, as it is the only one that allows the maintenance operations as described in this manual.



Any other positioning could compromise the correct operation of the appliance. Installations 2, 3, 4 and 5 are forbidden for safety reasons.



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Fig. 4

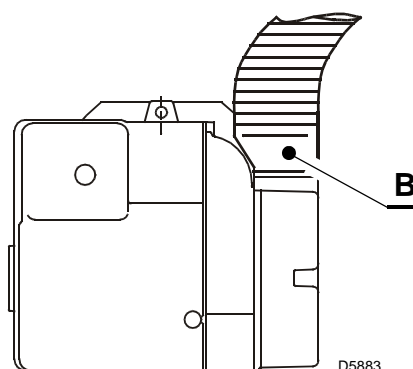
5.6 Burner assembly



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



The burner must be installed on an appropriate BF boiler.



D5883

Fig. 5

5.7 Securing the burner to the boiler



Prepare a suitable lifting system.

In order to fix the burner to the boiler, proceed as follows:

- Insert the screw 2) in the flange 1), and tighten the nut 3)(Fig. 6);
- Fix the flange 5) to the boiler door 4) using the screws 6) placing in between the insulating gasket 7)(Fig. 7);
- Insert the burner, and fix it in place with the nut 8)(Fig. 8).

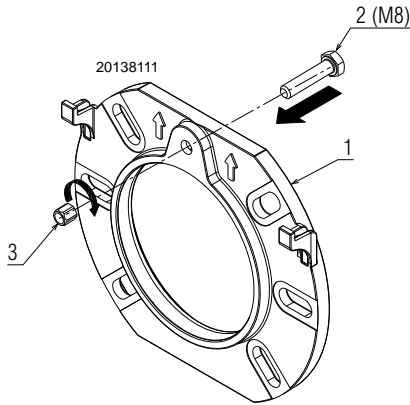


Fig. 6

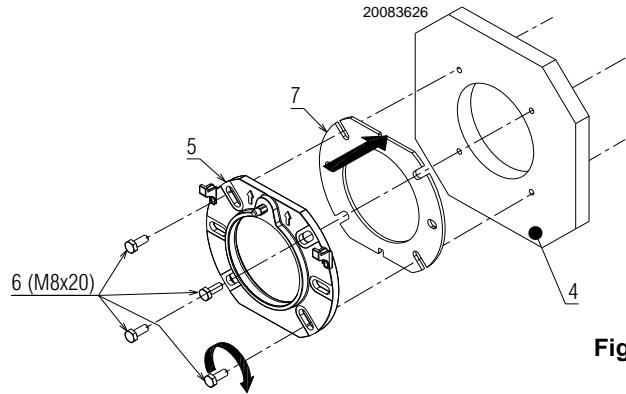


Fig. 7

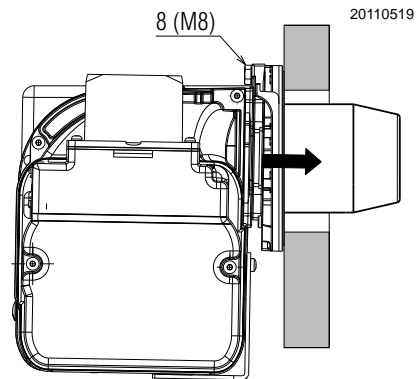


Fig. 8

5.8 Fuel supply

5.8.1 Pump



WARNING

Before starting the burner, make sure that the tank return line is not clogged.

Obstructions in the line could cause the sealing organ located on the pump shaft to break.

The pump is designed to allow working with one pipe.

For two pipe operation it is necessary to unscrew the return plug 2) (Fig. 9), screw the by-pass screw 3) and then screw back on the plug 2).



WARNING

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.

Where light oil containing bio diesel is in use, it is recommended to avoid over oxygenation of the blended fuels.



WARNING

Where at all possible avoid the use of two-pipe systems where the circulated fuel is returned to the tank.

If this cannot be avoided make sure that the return pipe is normally below the surface of the fuel level within the storage tank.



WARNING

In case of use with light oil containing up to 30% bio blend, it will be essential to use flexible oil lines suitable for biofuel use.

Please contact the manufacturer for further information.

Pump pressure

The pump is factory set to the values shown in Tab. F on page 15.

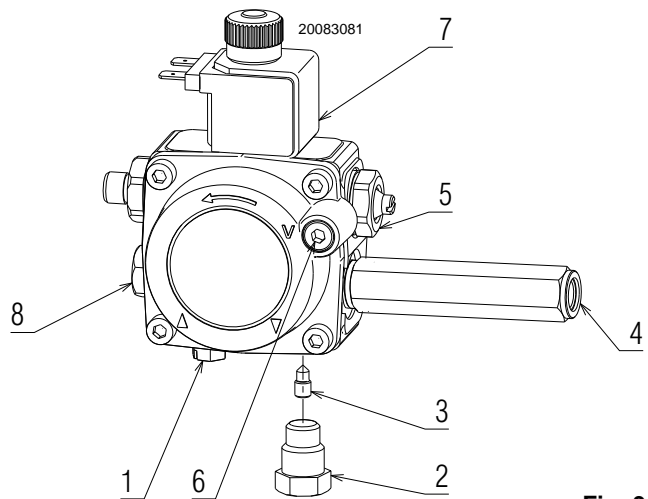


Fig. 9

Key (Fig. 9)

- 1 Gas oil suction line
- 2 Return line
- 3 By-pass screws
- 4 Manometer connection
- 5 Pressure adjuster
- 6 Vacuumeter connection
- 7 Gas oil solenoid
- 8 Auxiliary pressure test points

5.9 Two-pipe system

The two-pipe vacuum systems (Fig. 10) have a negative fuel pressure (depression) at the burner input. 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.

The Manufacturer recommends the use of a good quality fuel filter on the tank (Fig. 6), and a secondary filter (60µ for light oil and 15µ for kerosene) to protect the burner pump and nozzle from contamination.

In case of biodiesel use, make sure to install bio-fuel compatible filters.



For the 19 kW model it is necessary to put a 40 µ.filter instead of 60 µ.filter on the fuel supply line.

5.9.1 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. 6 switch on the burner and wait for the priming. Should lockout 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 (30cm Hg). Beyond this limit gas is released from the oil.

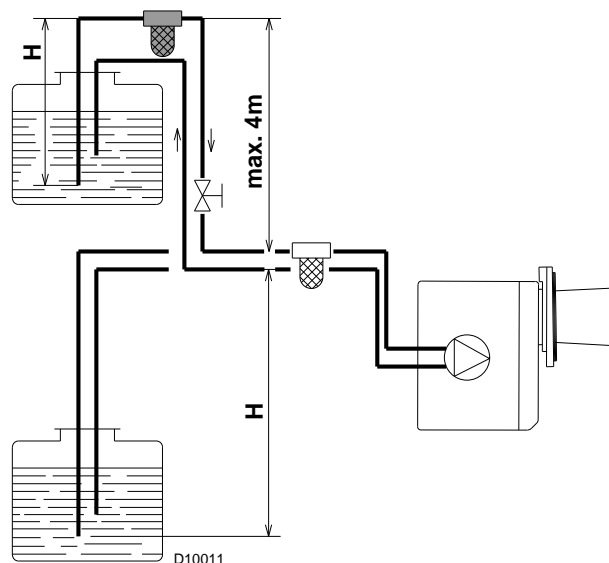


Fig. 10

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. C

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

NOTE:

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

5.10 One-pipe system

Pressurised one-pipe systems (Fig. 11) have a positive fuel pressure at the burner inlet.

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

The one pipe vacuum systems (Fig. 12) have a negative pressure (depression) at the burner inlet.

Usually the tank is lower than the burner.



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

The Manufacturer recommends the use of a good quality fuel filter on the tank (Fig. 12), and a secondary filter (60µ for light oil and 15µ for kerosene), to protect the burner pump and nozzle from contamination.

In case of biodiesel use, pay attention to install bio-compatible filters.

5.10.1 Priming pump

On the system in Fig. 7 just loosen the plug of the vacuumeter 6)(Fig. 12) and wait until the fuel comes out.

On the system in Fig. 12 switch on the burner and wait for the priming. Should lockout 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.

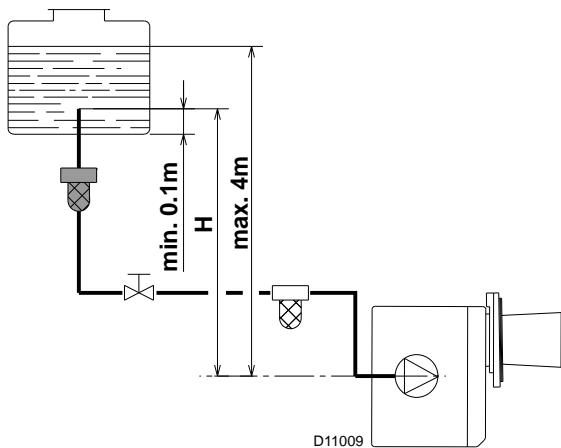


Fig. 11

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. D

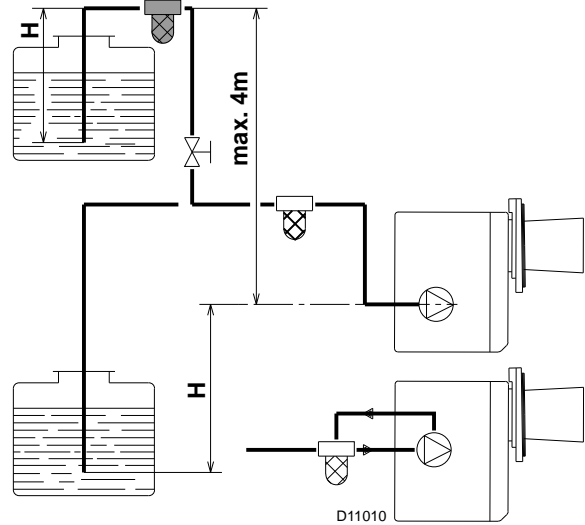


Fig. 12

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:

Tab. D, and Tab. E the approximate maximum lengths for the supply pipes, according to the difference of level, length and diameter of the fuel line.

6 Start-up, calibration and operation of the burner

6.1 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.

6.2 Combustion adjustment

In conformity with EN 267, 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 indicated diagram.

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

Settings carried out in factory

The values in Tab. F refer to 12.50 of CO₂, at sea level and with a temperature of the surroundings and the light oil of 20 °C.

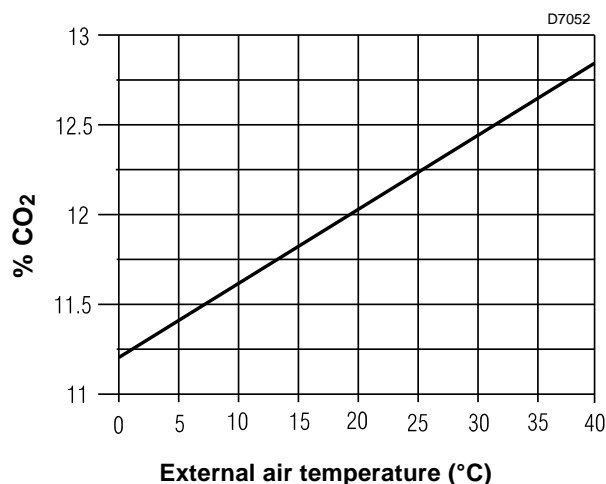


Fig. 13

Model	Nozzle			Pump pressure (+/-0.5)	Burner output	Combustion head adjustment (*) (+/-0.5)	Air damper adjustment (+/-0.25)
	Model	GPH	Angle	bar	kg/h ± 4%	mm (Fig. 16)	Set-point (Fig. 17)
RDB2.2 BX E15/21	Danfoss	0.55	60° EH	7.0	1.5	11.5	C/3
RDB2.2 BX E21/26	Danfoss	0.65	60° EH	10.0	2.0	13	C/4
RDB2.2 BX V15/26	Danfoss	0.60	60° ES	8.0	1.75	13	C/4.25
RDB2.2 BX VC26	Danfoss	0.75	60° ES	8.5	2.17	15	4
RDB2.2 BX V26/36	Danfoss	0.85	60° ES	9.0	2.6	16.5	5.25
RDB2.2 BX V36/46	Danfoss	1.10	60° ES	10.0	3.5	17.5	4.5
RDB2.2 BX VC36	Danfoss	1.0	60° ES	9.0	3.0	17.5	6.5

Tab. F

(*) Type-approval adjustment

6.2.1 Replacing the nozzle



Turn off the burner's power supply using the main system switch.

To replace the nozzle, proceed as follows:

- loosen the nut 1) and take the burner out of the boiler.
- Loosen the 3 screws 1)(Fig. 15) from the collar and remove the blast tube 2);
- loosen the screw 3) and disconnect the high voltage cables 4);
- remove the electrode-stabiliser unit 5);
- fix the nozzle-holder 6) with the aid of the wrench, then replace the nozzle 8);
- loosen the nozzle with the aid of a size 16 wrench, and replace it;
- screw in the nozzle again, then reassemble the electrode/stabiliser unit, respecting the position of the electrodes.(See Fig. 22 on page 22).



Make sure the screw 3)(Fig. 17) is positioned in its seat 7).

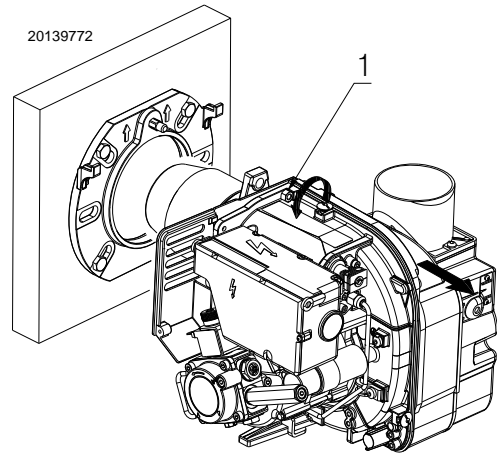


Fig. 14

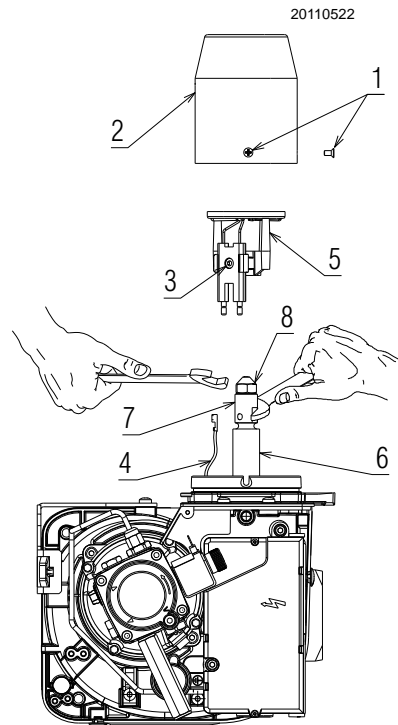


Fig. 15

6.3 Positioning the electrodes



The measurements shown in Fig. 16 must be respected.

Model	A	B	C
RDB2.2 BX E15/21	7	2.5	2.5 - 3
RDB2.2 BX E21/26			
RDB2.2 BX V15/26			
RDB2.2 BX VC26	4.5	3	2 - 2.5
RDB2.2 BX V26/36			
RDB2.2 BX V36/46			
RDB2.2 BX VC36			

Tab. G

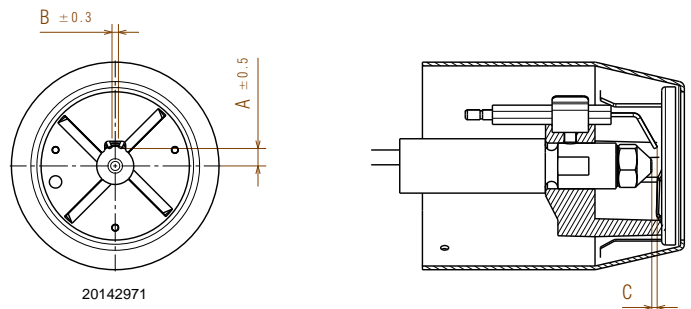


Fig. 16

6.4 Combustion head adjustment

The combustion head is adjusted in the factory.

Make sure these adjustments comply with the values indicated in Tab. F on page 15.

Using the supplied gauge 1)(Fig. 17)(P/N 20147306) check the dimension "D".

Adjustments can be made by rotating the adjustment knob A)(Fig. 17).

Where the recommended head setting is for example 11.5 mm using the universal gauge set the combustion head to 11 mm and then open the head setting by a further half rotation of the head adjuster seen in Fig. 17.

One complete rotation of the head adjuster knob = 1mm adjustment of the head.

Model	TURNS	D
FULLY CLOSED	-	-
RDB2.2 BX E15/21	~ 3 cw	11.5
RDB2.2 BX E21/26	~ 4.5 cw	13
RDB2.2 BX V15/26	~ 4.5 cw	13
RDB2.2 BX VC26	~ 7 cw	15
RDB2.2 BX V26/36	~ 8.5 cw	16.5
RDB2.2 BX V36/46	~ 9.5 cw	17.5
RDB2.2 BX VC36	~ 9.5 cw	17.5

Tab. H

A)(Fig. 17):

- An adjustment for the head setting is included to allow a similar pressure drop across the burner head at all outputs.
- Closing the head (reducing the gap) can decrease the NOx value but closing it too far may affect the ignition quality.
- Opening up the head (increasing the gap) will only be necessary if the installation has a flue system with a very high resistance and the ignition quality needs to be improved.

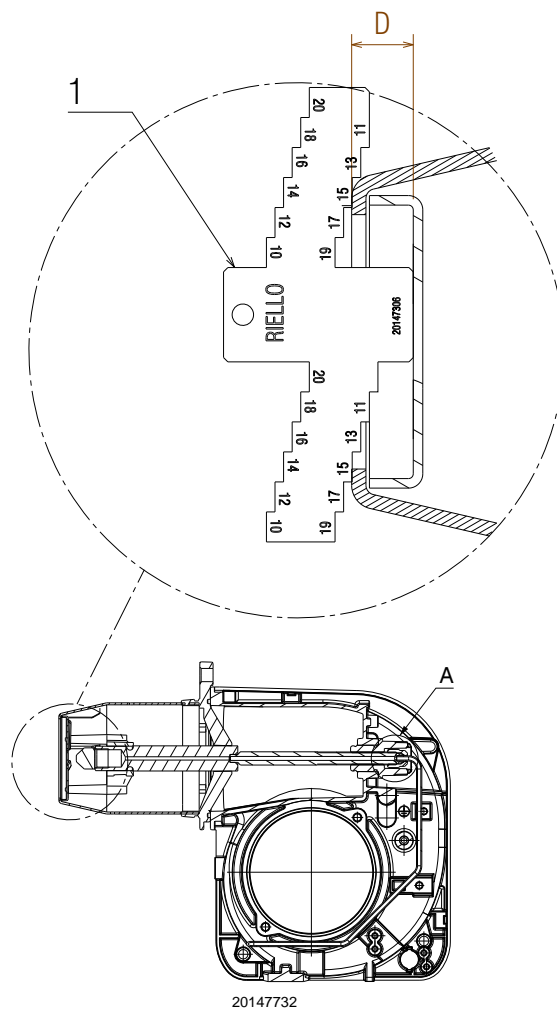


Fig. 17

6.5 Air damper adjustment

The air damper is factory set to the values indicated in Tab. F on page 15.

These adjustments are indicative. Each installation however, has its own unpredictable working conditions: actual nozzle output; positive or negative pressure in the combustion-chamber, the need of excess air, etc.

All these conditions may require a different air-damper setting.

The damper 1)(Fig. 18) is used to precisely adjust the input air flow rate.

To modify the setting use the screw 2) as shown in Fig. 18.

In the 15 - 21 kW and 15 - 26 kW models there is another air damper calibrated in the factory to notch C (Fig. 18).

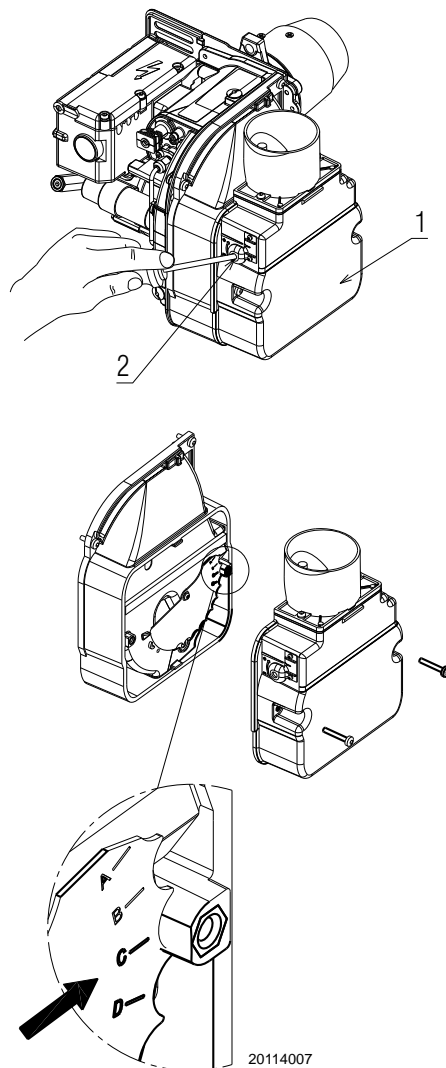


Fig. 18

7 Electrical wiring

7.1 Notes on safety for the electrical wiring



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring 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.
- 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 set for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch.
- 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 input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use an omnipolar switch, as indicated by the current safety standards.
- 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:



Turn off the burner's power supply using the main system switch.



Turn off the fuel interception tap.



Avoid condensate, ice and water leaks from forming.



After carrying out maintenance, cleaning or checking operations, reassemble the cover and all the safety and protection devices of the burner.

7.2 Control box



All the installation, maintenance and dismantling operations should be performed voltage free.

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

To remove the control box (Fig. 19) from the burner follow of the instruction:

- loosen the screw 1), open the protection 2) and remove all components.
- Remove the coil 3).
- Loosen the two screws 4).
- Move a little the control box and remove the high voltage leads.

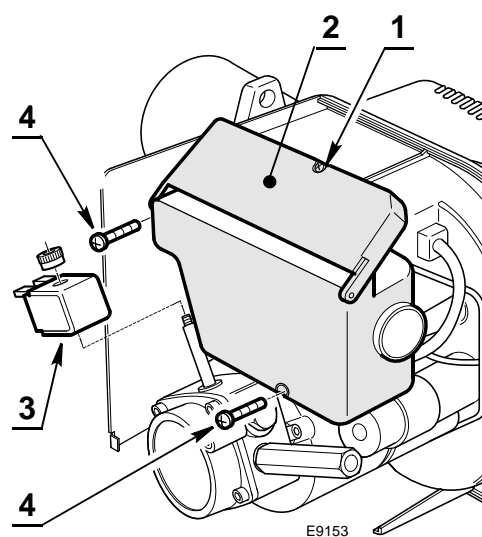


Fig. 19

7.3 Electrical wiring diagram

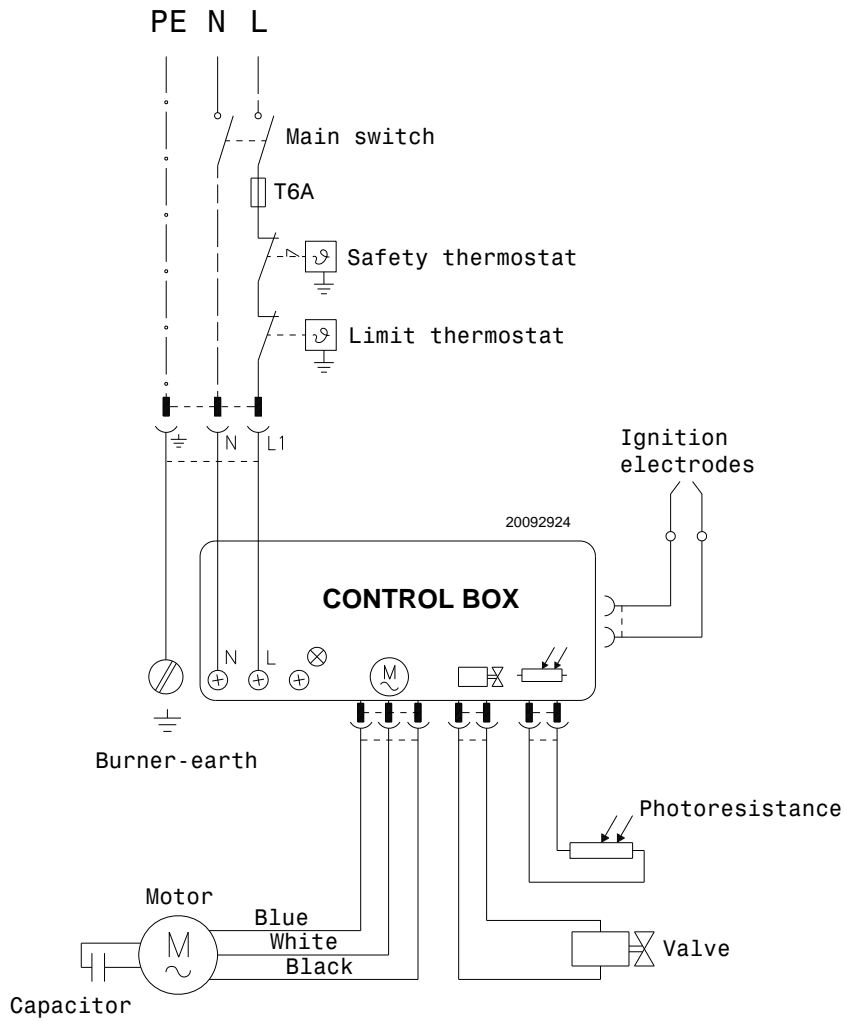


Fig. 20



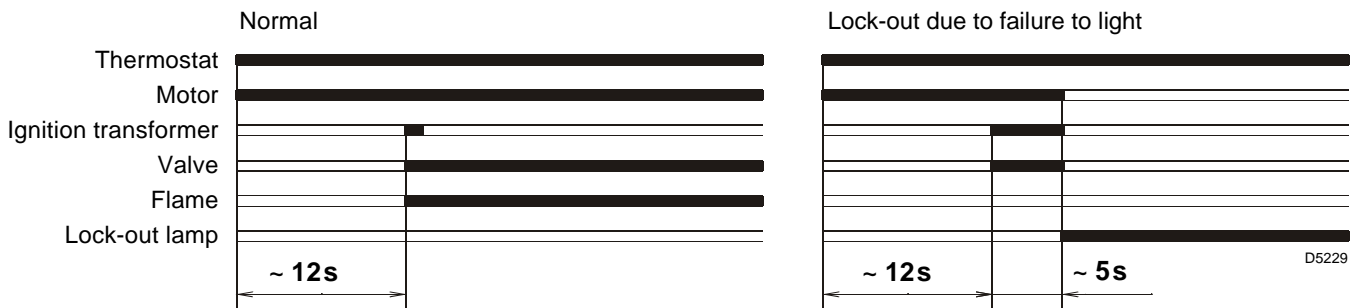
WARNING

- Do not swap neutral and phase over, follow the diagram shown carefully and carry out a good earth connection.
- The electrical wiring carried out by the installer must be in compliance with the rules in force in the country.
- The section of the conductors must be at least 1mm². (Unless requested otherwise by local standards and legislation).

TESTING:

Check the shut-down of the burner by opening the thermostats and the lock-out by darkening the flame sensor.

7.4 Burner start-up cycle



D5229

Fig. 21

Lock out is indicated by a lamp on the control box 3)(Fig. 1 on page 9).

8 Maintenance

8.1 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.



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:



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



Close the fuel interception tap.



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

8.2 Maintenance programme

8.2.1 Maintenance frequency



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

8.2.2 Checking and cleaning



The operator must use the required equipment 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.

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 piping or the pump.

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

Nozzles

It is advisable to replace nozzles once a year during periodical maintenance.

Do not clean the nozzle openings.

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.

Hoses

- Check periodically the flexible pipes conditions. They have to be replaced at least every 2 years.
- In case of use of gas oil and biofuel blends, it is strongly recommended to inspect even more frequently the hoses and replace them where contamination has occurred.
- Check to make sure that the hoses are still in good condition.



The hoses supplied with this burner are not suitable for use with light oil containing a bio blend.

In case of use with light oil containing up to 30% bio blend, it will be essential to use flexible oil lines suitable for biofuel use.

Please contact the manufacturer for further information.

Fuel tank

If water or contamination is present within the fuel tank, it is essential that this is removed before the equipment is to be used. This is extremely important when light oil containing biofuel is in use. If in doubt about how to achieve this then please contact the fuel or oil tank supplier.

Cleaning the fan



WARNING

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.

When performing these operations, take care not to damage the fan.

Proceed as follows:

- unscrew the screws 1)(Fig. 22) and take out the air damper 2);
- loosen the screws 3) and take out the suction inlet 4);
- clean the fan and the inside of the suction inlet, using a suitable brush and compressed air.
- If necessary, carefully disassemble the fan (Fig. 23).



WARNING

It is essential to respect position B)(Fig. 23), indicated in the table.

When reinstalling, follow the above indications in reverse order; put all the burner components back in their original positions.

Air damper

Inside the suction casing 2)(Fig. 22) there is a damper that opens due to the effect of the depression generated when operating. The device interrupts the natural flow of air from the burner to the boiler and vice-versa during stop phases.

It is important to periodically check the device and clean if there are accumulations of dust that can obstruct the regular opening and closing of the damper.

Combustion

Carry out an analysis of the combustion flue gases.

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

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.

Let the burner run at full capacity for about ten minutes, setting all the elements correctly as explained in this manual.

Then carry out the analysis of the combustion by checking:

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

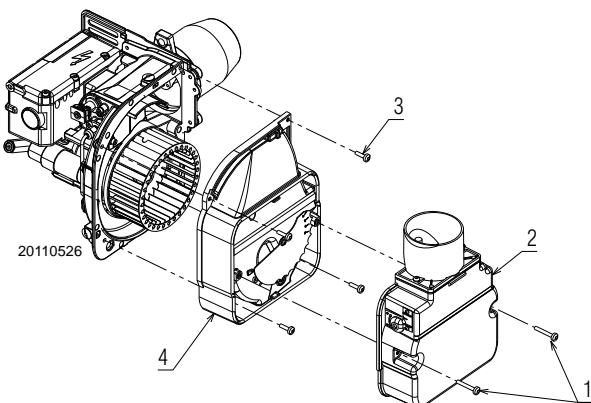


Fig. 22

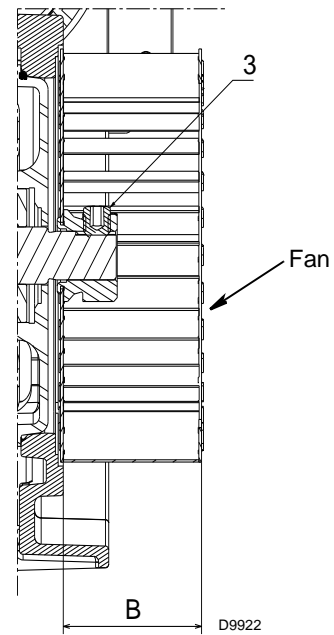


Fig. 23

Model	B
All models	51 ± 0.2mm

Tab. I

8.2.3 Safety components

The safety components must be replaced at the end of their life cycle indicated in Tab. J. The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid) (if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

Tab. J

9 **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 lock-out lamp light which is situated inside the reset button of the control box 3)(Fig. 2 on page 9).

When lock out lamp lights the burner will attempt to light only after pushing the reset button. After this if the burner functions correctly, the lock-out can be attributed to a temporary fault.

If however the lock out continues the cause must be determined and the solution found.



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.



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.



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.

Faults	Possible causes	Solution
The burner will not start when the limit thermostat closes.	Lack of electrical supply.	Check presence of voltage in the L - N clamps of the control box. Check the conditions of the fuses. Check that safety thermostat limit is not lock out.
	The flame sensor detects false light.	Eliminate the light.
	The connections in the control box are wrongly inserted.	Check and connect completely all the plugs.
Burner runs normally in the pre-purge and ignition cycle and locks out after about 5 seconds.	The flame sensor is dirty.	Clean it.
	The flame sensor is defective.	Change 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.	Adjust them according to the instructions of this manual.
	Air output is too high.	Set the air output.
	Nozzle dirty or worn.	Replace it.

Tab. K

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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)