GB

Gas oil/ Kerosene burners

Two stage operation

BIO

CODE	MODEL
3471712	RL 70
3471713	RL 70
3471812	RL 100
3471813	RL 100
3471912	RL 130
3471913	RL 130

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1 Information and general warnings ... 3
1.1 Information about the instruction manual ... 3
1.1.1 Introduction ... 3
1.1.2 General dangers ... 3
1.1.3 Other symbols ... 3
1.1.4 Delivery of the system and the instruction manual ... 4
1.2 Guarantee and responsibility ... 4
1.3 Guidance for the use of bio fuel blends up to 10% ... 5
1.3.1 Information and general instructions ... 5
1.3.2 Product Disclaimer Statement ... 6

2 Safety and prevention ... 7
2.1 Introduction ... 7
2.2 Safety warnings ... 7
2.3 Basic safety rules ... 7
2.4 Personnel training ... 7

3 Technical description of the burner ... 8
3.1 Burner designation ... 8
3.2 Models available ... 8
3.3 Technical data ... 9
3.4 Electrical data ... 9
3.5 Overall dimensions ... 10
3.6 Firing rates ... 11
3.7 Test boiler ... 11
3.8 Burner description ... 12
3.9 Standard equipment ... 12

4 Installation ... 13
4.1 Notes on safety for the installation ... 13
4.2 Handling ... 13
4.3 Preliminary checks ... 13
4.4 Installer/Servicer notes for the use of Gas oil with Bio blends up to 10% ... 14
4.5 Operating position ... 14
4.6 Boiler plate ... 14
4.7 Blast tube length ... 15
4.8 Securing the burner to the boiler ... 15
4.9 Combustion head setting ... 15
4.9.1 Combustion head calibration ... 16
4.10 Nozzle installation ... 16
4.10.1 Choice of nozzles for 1st and 2nd stage ... 16
4.10.2 Nozzle assembly ... 17
4.11 Gas oil supply ... 19
4.11.1 Double-pipe circuit ... 19
4.11.2 The loop circuit ... 19
4.11.3 Single-pipe circuit ... 20
4.12 Hydraulic connections ... 20
4.13 Pump ... 21
4.13.1 Technical data ... 21
4.13.2 Pump priming ... 21

5 Electrical system ... 22
5.1 Notes on safety for the electrical wiring ... 22
5.1.1 Electrical connections ... 22
5.1.2 Electrical wiring factory-set ... 23
5.1.3 Electrical wiring to be completed by the installer ... 24
5.2 Calibration of thermal relay ... 24

6 Start-up, calibration and operation of the burner 25
6.1 Notes on safety for the first start-up 25
6.2 Burner calibration 25
6.2.1 Firing 25
6.2.2 Operation 25
6.3 Burner operation 27
6.3.1 Burner starting 27
6.3.2 Steady state operation 28
6.3.3 Firing failure 28
6.3.4 Undesired shutdown during operation 28
6.3.5 Final checks 28
6.4 Burner start-up cycle diagnostics 28
6.5 Resetting the flame control and using diagnostics 28
6.5.1 Resetting the flame control 29
6.5.2 Visual diagnostics 29
6.5.3 Software diagnostics 29

7 Maintenance 30
7.1 Notes on safety for the maintenance 30
7.2 Maintenance programme 30
7.2.1 Maintenance frequency 30
7.2.2 Checking and cleaning 30
7.3 Opening the burner 32
7.4 Closing the burner 32

8 Faults - Possible causes - Solutions 33

A Appendix - Accessories 35

1 Information and general warnings

1.1 Information about the instruction manual

1.1.1 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.

1.1.2 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.

1.1.3 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 HOOD AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the hood 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

1.1.4 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.

1.2 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.



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 occured
➤ 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.

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

If any Riello burners are used with fuel with a bio content >10% then the components within the hydraulic circuit maybe 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 Riello 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 Riello.
2. Riello have carefully chosen the specification of the bio compatible components including the flexible oil lines to protect the pump, safety value and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used.
3. Riello warranty does not cover defects arising from incorrect commissioning or servicing by non Riello employed service engineers, and any issues impacting the burner arising from external site related issues.

1.3 Guidance for the use of bio fuel blends up to 10%

Background

With increasing focus on renewable and sustainable energy requirements, Bio fuel usage is set to increase. Riello is committed to promoting energy conservation and the use of renewable energy from sustainable resources including liquid bio fuels, 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 Bio fuel 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, hydroscopic and less stable.

Due to this, a holistic approach is needed from the specification of the liquid Bio fuel, 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 Bio fuel is critical to reliable equipment operation.

It is a minimum requirement that the fuel blend (up to 10% Bio) is obtained with gasoil 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 requirements related to operational environment conditions within the relevant EN standards.

When choosing your Riello oil products where you know Bio fuels 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 Bio fuel 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 bio fuel blend and the suitability of the appliances and installation applicable.

Irrespective of any warranty given by Riello 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 Riello.

1.3.1 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 Bio fuel 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 Bio fuels. For all installations, there must be a good quality bio compatible oil filter at the tank and then a secondary filter of 100 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. Riello strongly recommends that the tank is cleaned and oil filters replaced prior to Bio fuel delivery. If this is not completed then due to the hydroscopic nature of Bio fuel, 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 Riello 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. Riello suggests that fuel suppliers and or service companies are contacted for guidance on fuel filtration. Special attention should be applied to duel 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.
- Riello 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 discontinue 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.

1.3.2 Product Disclaimer Statement

CAREFULLY READ THE FOLLOWING DISCLAIMER. YOU ACCEPT AND AGREE TO BE BOUND BY THIS DISCLAIMER BY PURCHASING RIELLO 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, Riello (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 Riello (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, Riello (and its subsidiaries) makes no additional warranties with respect to the bio compatible burner, either express or implied, including that of merchantability or fitness for a particular purpose or use.

In no event shall Riello (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, Riello's liability is limited to the customer's right to return defective/non-conforming products as provided by the relevant product warranty.

2 Safety and prevention

2.1 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.

2.2 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.

2.3 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.

2.4 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;

➤ must take all the measures necessary to prevent unauthorised people gaining access to the machine;

➤ 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;

➤ 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.

➤ Personnel must observe all the danger and caution indications shown on the machine.

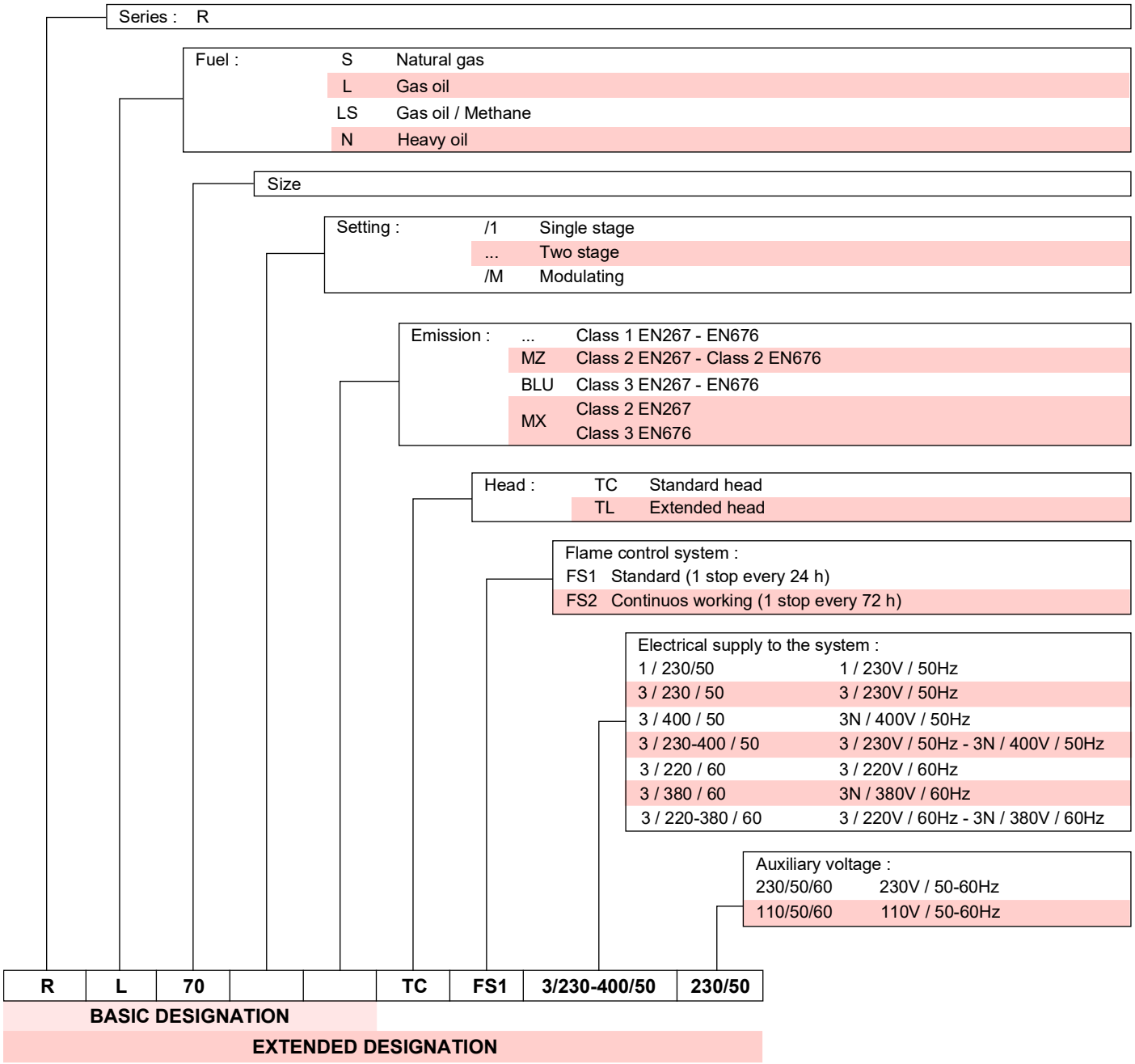
➤ Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.

➤ 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.

3 Technical description of the burner

3.1 Burner designation



3.2 Models available

Model	Code	Electrical supply	Blast tube lenght mm
RL 70	3471712	Three-phase	250
	3471713	Three-phase	385
RL 100	3471812	Three-phase	250
	3471813	Three-phase	385
RL 130	3471912	Three-phase	250
	3471913	Three-phase	385

3.3 Technical data

MODEL				RL 70	RL 100	RL 130
Power (1) Output (1)		2nd stage	kW Mcal/h kg/h	474 - 830 408 - 714 40 - 70	711 - 1186 612 - 1020 60 - 100	948 - 1540 816 - 1325 80 - 130
		1st stage	kW Mcal/h kg/h	255 - 474 219 - 408 21.5 - 40	356 - 711 306 - 612 30 - 60	486 - 948 418 - 816 41 - 80
Fuel				Kerosene, Gas oil and Blends of gas oil and bio fuel (FAME in accordance with EN 14214) up to 10%		
Gas oil	net calorific value density viscosity at 20 °C		kWh/kg Mcal/kg kg/dm³ mm²/s max	11.86 10.2 (10.200 kcal/kg) 0.82 - 0.85 6 (1.5 °E - 6 cSt)		
Kerosene	net calorific value density viscosity (2)		kWh/kg Mcal/kg kg/dm³ mm²/s	11.97 10.3 (10.300 kcal/kg) 0.77 - 0.83 1,5 - 2,0 cSt		
Operation				• Intermittent (min. 1 stop in 24 hours). • Two-stage (high and low flame) and single-stage (all - nothing).		
Pump	Range (at 12 bar) pressure range fuel temperature		kg/h bar °C max	205 (light oil) 140 (kerosene) 5.5 - 21 60	205 (light oil) 140 (kerosene) 5.5- 21 60	260 (light oil) 150 (kerosene) 10 - 21 60
Nozzles			number	2		
Standard applications				Boilers: water, steam, diathermic oil		
Ambient temperature			°C	0 - 40		
Combustion air temperature			°C max	60		
Noise level (3)	Sound pressure Sound power		dB(A)	75 86	77 88	78.5 89.5
Weight			kg	63	65	70

Tab. A

(1) Reference conditions: ambient temperature 20°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.
(2) Kerosene viscosity measured at pump intake
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the “Free Field” method, as per EN 15036, and according to an “Accuracy: Category 3” measuring accuracy, as set out in EN ISO 3746.

3.4 Electrical data

Model		RL 70	RL 100	RL 130
Electrical supply	V Hz	230 - 400 with neutral ~ +/-10% 50 - three-phase		
Electrical power consumption	W max	1400	1800	2600
Protection level		IP44		

Tab. B

3.5 Overall dimensions

Approximate measurements.

The maximum dimensions of the burner are given in Fig. 1.

Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part withdrawn on the slide bars.

The maximum dimension of the burner when open is give by measurement I.

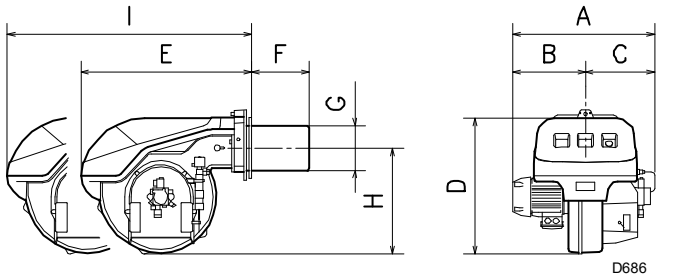


Fig. 1

mm	A	B	C	D	E	F (1)	G	H	I (1)
RL 70	611	296	315	555	680	250 - 385	179	430	951 - 1086
RL 100	627	312	315	555	680	250 - 385	179	430	951 - 1086
RL 130	644	338	306	555	680	250 - 385	189	430	951 - 1086

Tab. C

(1) Blast tube: short-long

3.6 Firing rates

The RL 70 - 100 - 130 Model burners can work in two ways: one-stage and two-stage.

1st stage DELIVERY must be selected within area A of the adjacent diagrams.

2nd stage DELIVERY must be selected within area B (and C for model RL 130). This area provides the maximum delivery of the burner in relation to the pressure in the combustion chamber.

The work point may be found by plotting a vertical line from the desired delivery and a horizontal line from the pressure in the combustion chamber. The intersection of these two lines is the work point which must lie within area B.

In order to utilize also area C (RL 130) it is necessary to perform the calibration of the combustion head as explained on pag. 16.

WARNING

The firing rate value (Fig. 2) has been obtained considering an ambient temperature of 20 °C, an atmospheric pressure of 1013 mbar (approx. 0 m above sea level), and with the combustion head adjusted as shown on pag. 15.

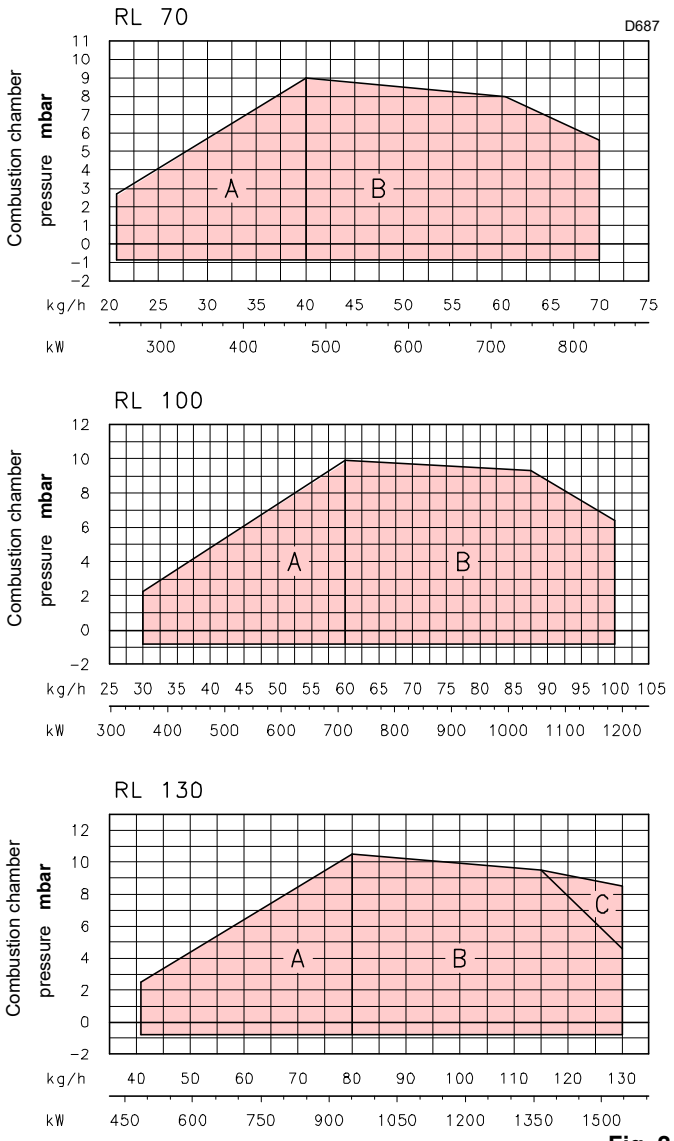


Fig. 2

3.7 Test boiler

The firing rates were set in relation to special test boilers in accordance with the methods defined in EN 267 standards.

Fig. 3 indicates the diameter and length of the test combustion chamber.

Example:

delivery 65 kg/hour:

diameter = 60 cm; length = 2 m.

Whenever the burner is operated in a much smaller commercially-available combustion chamber, a preliminary test should be performed.

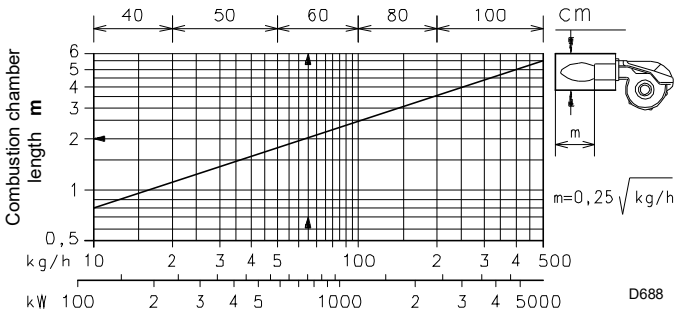


Fig. 3

3.8 Burner description

1 Ignition electrodes
2 Combustion head
3 Screw for combustion head adjustment
4 Screw for fixing fan to flange
5 Slide bars for opening the burner and inspecting the combustion head
6 Safety solenoid valve
7 Pump
8 Air inlet to fan
9 Air gate valve
10 Hydraulic cylinder for regulation of the air gate valve in 1st and 2nd stage positions. When the burner is not operating the air gate valve is fully closed in order to reduce heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.
11 Fan pressure test point
12 Boiler mounting flange
13 Flame stability disk
14 Electrical motor
15 Extensions for slide bars 5)
16 Ignition transformer
17 Motor contactor and thermal cut-out with reset button
18 1st and 2nd stage valve assembly
19 Terminal strip
20 Two switches:
- one "burner off - on"
- one for "1st - 2nd stage operation"
21 Fairleads for wiring carried out by the installer
22 flame control with lock-out pilot light and lock-out reset button
23 Flame inspection window
24 Pump pressure adjustment
25 Flame sensor for flame presence control
26 Sockets for electrical connections

Two types of burner failure may occur:
flame control lock-out: if the flame control 22)(Fig. 4) pushbutton (red led) lights up, it indicates that the burner is in lock-out.
To reset, hold the pushbutton down for between 1 and 3 seconds.
Motor trip: release by pressing the pushbutton on thermal cutout 17)(Fig. 4).

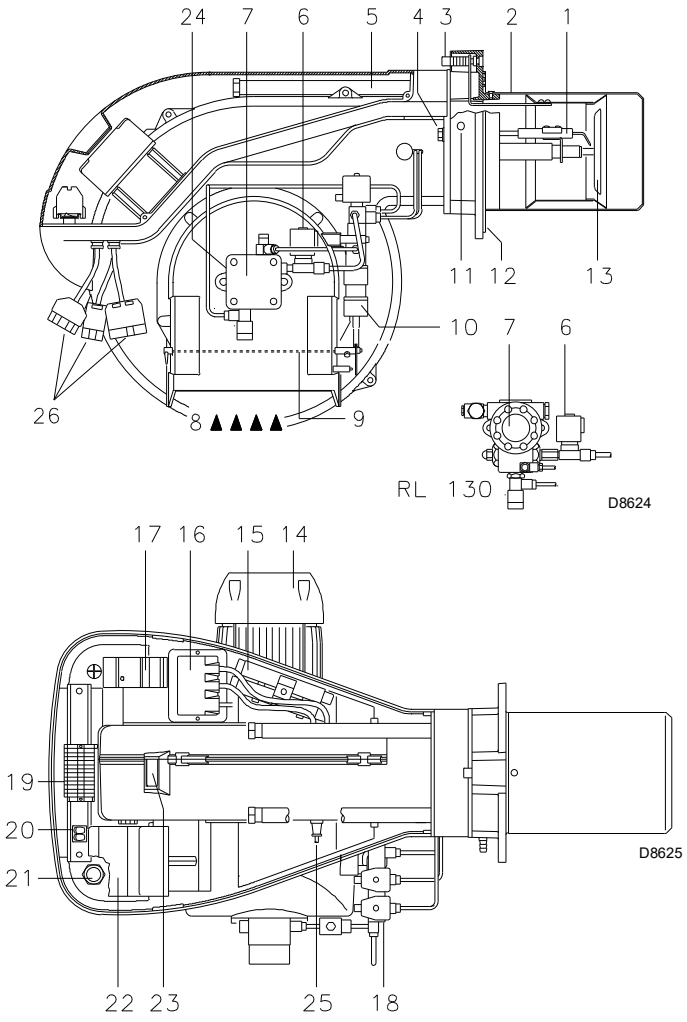


Fig. 4

3.9 Standard equipment

2 - Flexible hoses
2 - Gaskets for flexible hoses
2 - Nipples for flexible hoses
1 - Thermal insulation screen
2 - Extensions 15)(Fig. 4) for slide bars 5)(Fig. 4)
(for models with 385 mm blast tube)
4 - Screws to secure the burner flange to the boiler: M 12 x 35
2 - Plugs for electrical connections
1 - Instruction booklet
1 - Spare parts list

WARNING

In case of use with gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use.

Please contact Riello for further information.

4 Installation

4.1 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.

DANGER

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

WARNING

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.

4.2 Handling

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

WARNING

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 suitableness 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.

CAUTION

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.

4.3 Preliminary checks

Checking the consignment

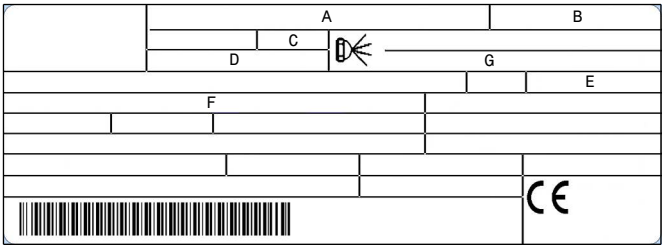
CAUTION

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. 5) and type of burner (**B**);
- ➤ the year of manufacture, in cryptographic form (**C**);
- ➤ the serial number (**D**);
- ➤ the data for electrical supply and the protection level (**E**);
- ➤ the absorbed electrical power (**F**);
- ➤ the types of gas used and the relative supply pressures (**G**);
- ➤ the data of the burner's minimum and maximum output possibilities (**H**) (see Firing rate).
  Warning. The burner output must be within the boiler's firing rate;
- ➤ the category of the appliance/countries of destination (**I**);
- ➤ light oil maximum viscosity (**L**).



20188727

Fig. 5

WARNING

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.

4.4 Installer/Servicer notes for the use of Gas oil with Bio blends up to 10%

- During the burner installation, check that the gasoil and bio fuel blends are in accordance with Riello specifications (please refer to the chapters "Technical Data" and "Guidance for the use of bio fuel blends up to 10%" within the burner technical manual).
- 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 bio fuels, 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. Riello recommends that existing oil storage tanks are cleaned, inspected and any traces of water are removed BEFORE bio fuel 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. Riello recommends a good quality bio compatible oil filter at the tank and a secondary 100 micron filter are used to protect the burner pump and nozzle from contamination.
- The burner hydraulic components and flexible oil lines must be suitable for bio fuel use (check with Riello if in doubt). Riello have carefully chosen the specification of the bio compatible components including the flexible oil lines to protect the pump, safety value and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used. 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 Bio fuel use, oil filters are inspected and replaced every 4 months. More regularly where contamination is experienced.
- During extended periods of non operation and/or where burners are using oil as a standby fuel, it is strongly recommended that the burner is put into operation for shorts periods at least every three months.

4.5 Operating position

The burner is designed to work only in the positions **1, 2, 3** and **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** permit operation but make maintenance and inspection of the combustion head difficult, pag. 30.

WARNING

Any other position could compromise the correct working of the appliance.

Installation **5** is prohibited for safety reasons.

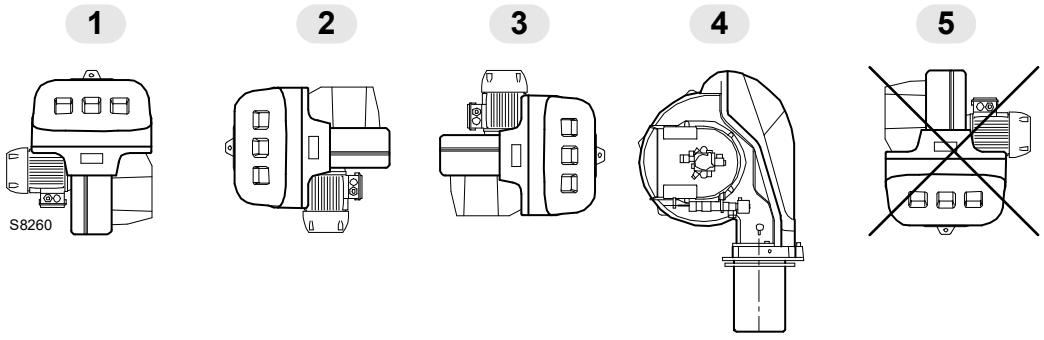


Fig. 6

4.6 Boiler plate

Drill the combustion chamber locking plate as shown in Fig. 7. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

mm	A	B	C
RL 70	185	275 - 325	M 12
RL 100	185	275 - 325	M 12
RL 130	195	275 - 325	M 12

Tab. D

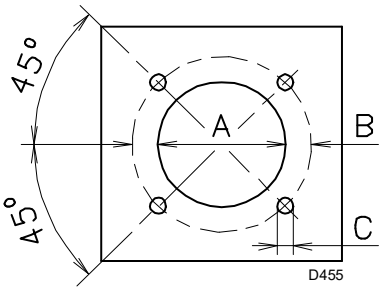


Fig. 7

4.7 Blast tube length

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling.

The range of lengths available, L (mm), is as follows:

Blast tube 10)(Fig. 8)	Short	Long
RL 70	250	385
RL 100	250	385
RL 130	250	385

For boilers with front flue passes 13)(Fig. 8) or flame inversion chambers, protective fettling in refractory material 11) must be inserted between the boiler fettling 12) and the blast tube 10).

This protective fettling must not compromise the extraction of the blast tube.

4.8 Securing the burner to the boiler

Disassemble the blast tube 9) from the burner 6) by proceeding as follows:

– Loosen the four screws 3) and remove the cover 1).
– Remove the screws 2) from the two slide bars 5).
– Remove the two screws 4) fixing the burner 6) to the flange 5).
– Withdraw the blast tube 9) complete with flange 7) and slide bars 5).

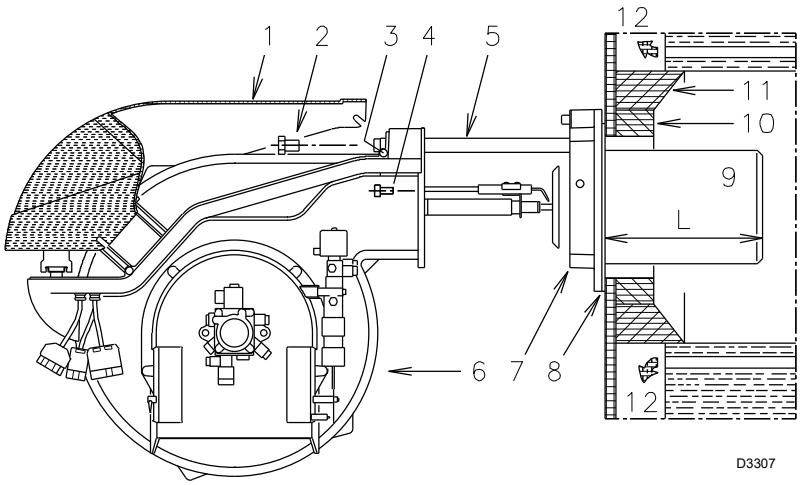


Fig. 8

4.9 Combustion head setting

The setting of the combustion head depends exclusively on the delivery of the burner in the 2nd stage - in other words, the combined delivery of the two nozzles selected on pag. 16.

Turn screw 4)(Fig. 9) until the notch shown in diagram (Fig. 10) is level with the front surface of flange 5)(Fig. 9).

Example:

The RL 70 Model with two 6.0 GPH nozzles and 12 bar pump pressure.

Find the delivery in Tab. E on page 16:

25.5 + 25.5 = 51 kg/h.

Diagram (Fig. 10) indicates that for a delivery of 51 kg/h the RL 70 Model requires the combustion head to be set to approx. three notches, as shown in (Fig. 9).

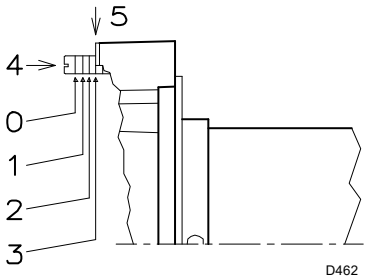


Fig. 9

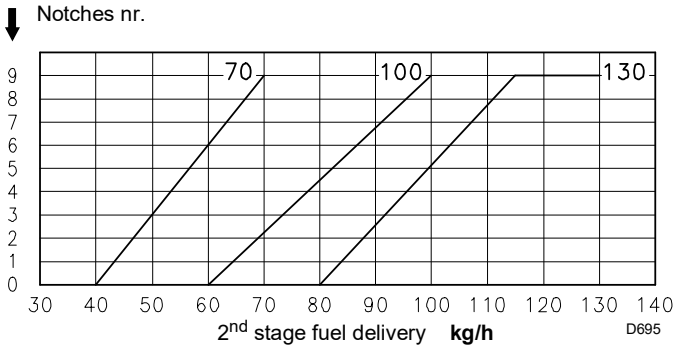


Fig. 10

4.9.1 Combustion head calibration

At this point check, for model RL 130, whether the maximum delivery of the burner in 2nd stage operation is contained in area B or in area C of the firing rate. See pag. 11.

If it is in area B then no operation is required.

If, on the other hand, it is in area C:
– Unscrew the screws 1)(Fig. 11) and disassemble the blast tube 5).
– Unscrew the screws 3) and remove the shutter 4).
– Tighten the screws 3) on the rod 2).
– Now refit the blast tube 5) and the screws 1).

Once this operation has been carried out (if it was required), secure flange 7)(Fig. 8) to the boiler plate interposing the supplied gasket 8).

Use the 4 screws provided after having protected the thread with antiscruffing products (high-temperature grease, compounds, graphite).

WARNING

The seal between burner and boiler must be airtight.

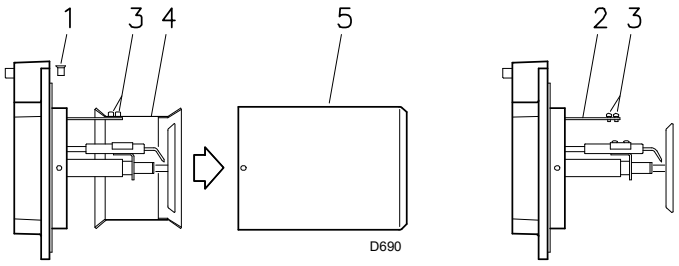


Fig. 11

4.10 Nozzle installation

4.10.1 Choice of nozzles for 1st and 2nd stage

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 Riello in the Instruction and warning booklet should be used.

WARNING

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

CAUTION

The use of nozzles other than those specified by Riello S.p.A. 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 nonobservance of the requirements contained in this manual.

Both nozzles must be chosen from among those listed in Tab. E.

The first nozzle determines the delivery of the burner in the 1st stage.

The second nozzle works together with the 1st nozzle to determine the delivery of the burner in the 2nd stage.

The deliveries of the 1st and 2nd stages must be contained within the value range indicated on pag. 9.

Use nozzles with a 60° spray angle at the recommended pressure.

The two nozzles usually have equal deliveries, but the 1st stage nozzle may have the following specifications if required:
- a delivery less than 50% of the total delivery whenever the back-pressure peak must be reduced at the moment of firing: the burner allows good combustion values also with a ratio 40 - 100 % between the 1st and 2nd stage;
- a delivery higher than 50% of the total delivery whenever the combustion during the 1st stage must be improved.

GAS OIL

GPH	kg/h (1)			kW
	10 bar	12 bar	14 bar	12 bar
5.00	19.2	21.2	23.1	251.4
5.50	21.1	23.3	25.4	276.3
6.00	23.1	25.5	27.7	302.4
6.50	25.0	27.6	30.0	327.3
7.00	26.9	29.7	32.3	352.3
7.50	28.8	31.8	34.6	377.2
8.00	30.8	33.9	36.9	402.1
8.30	31.9	35.2	38.3	417.5
8.50	32.7	36.1	39.2	428.2
9.00	34.6	38.2	41.5	453.1
9.50	36.5	40.3	43.8	478.0
10.0	38.4	42.4	46.1	502.9
10.5	40.4	44.6	48.4	529.0
11.0	42.3	46.7	50.7	553.9
12.0	46.1	50.9	55.3	603.7
12.3	47.3	52.2	56.7	619.1
13.0	50.0	55.1	59.9	653.5
13.8	53.1	58.5	63.3	693.8
14.0	53.8	59.4	64.5	704.5
15.0	57.7	63.6	69.2	754.3
15.3	58.8	64.9	70.5	769.7
16.0	61.5	67.9	73.8	805.3
17.0	65.4	72.1	78.4	855.1
17.5	67.3	74.2	80.7	880.0
18.0	69.2	76.4	83.0	906.1
19.0	73.0	80.6	87.6	956.0
19.5	75.0	82.7	89.9	980.9
20.0	76.9	84.8	92.2	1005.8
21.5	82.7	91.2	99.1	1081.7
22.0	84.6	93.3	101.4	1106.6

Tab. E

(1) We get the indicated delivery when both nozzles are working and gas oil has the following characteristics: density 0.84 kg/dm3 - viscosity 4.2 cSt/20 °C - temperature 10 °C

Example with the RL 70 Model (gas oil)

Boiler output = 635 kW - efficiency 90 %

Output required by the burner =

635 : 0,9 = 705 kW;

705 : 2 = 352 kW per nozzle;

therefore, two equal, 60°, 12 bar nozzles are required:

1st = 7.0 GPH - 2° = 7.0 GPH,

or the following two different nozzles:

1st = 6.0 GPH - 2° = 8.0 GPH,

or:

1st = 8.0 GPH - 2° = 6.0 GPH.

KEROSENE

GPH	kg/h (1)				kW
	8 bar	9 bar	10 bar	12 bar	10 bar
6.5	19.01	20.26	21.44	23.66	256.8
7.0	20.47	21.82	23.09	25.48	276.5
7.5	21.94	23.38	24.74	27.30	296.3
8.0	23.40	24.93	26.39	29.12	316.0
8.5	24.86	26.49	28.04	30.94	335.8
9.0	26.32	28.05	29.69	32.77	355.6
9.5	27.78	29.61	31.34	34.59	375.3
10.0	29.25	31.17	32.99	36.41	395.1
10.5	30.71	32.73	34.64	38.23	414.9
11.0	32.17	34.28	36.29	40.05	434.6
11.5	33.63	35.84	37.94	41.87	454.4
12.0	35.10	37.40	39.59	43.69	474.2
13.0	38.02	40.52	42.89	47.33	513.7
13.5	39.48	42.08	44.54	49.15	533.4
14.0	40.95	43.63	46.19	50.97	533.2
15.0	43.87	46.75	49.49	54.61	592.7
15.5	45.33	48.31	51.14	56.43	612.5
16.0	46.79	49.87	52.79	58.25	632.2
17.0	49.72	52.98	56.09	61.89	671.8
17.5	51.18	54.54	57.74	63.71	691.5
18.0	52.64	56.10	59.39	65.53	711.3
19.0	55.57	59.22	62.69	69.17	750.8
19.5	57.03	60.78	64.33	70.99	770.5
20.0	58.49	62.33	65.98	72.81	790.2
21.5	62.88	67.01	70.93	78.27	849.5
22.0	64.34	68.57	72.58	80.09	869.3
24.0	70.19	74.80	79.18	87.37	948.3
26.0	76.04	81.04	85.78	94.65	1027.4
28.0	81.89	87.27	92.38	101.94	1106.4

Tab. F

(1) We get the indicated delivery when both nozzles are working and kerosene has the following characteristics: density 0.81 kg/dm3 - viscosity 1.6 cSt/20 °C - temperature 25 °C.

4.10.2 Nozzle assembly

At this stage of installation the burner is still disassembled from the blast tube; it is therefore possible to fit two nozzles with the box spanner 1)(Fig. 12) (16 mm), after having removed the plastic plugs 2)(Fig. 12), fitting the spanner through the central hole in the flame stability disk. Do not use any sealing products such as gaskets, sealing compound, or tape. Be careful to avoid damaging the nozzle sealing seat. The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

The nozzle for the 1st stage of operation is the one lying beneath the firing electrodes (Fig. 13).

Make sure that the electrodes are positioned as shown in Fig. 13.

Finally remount the burner 3)(Fig. 14 on page 18) to the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.

Tighten the screws 1) on the slide bars 2) and screws 4) fixing the burner to the flange.

If it proves necessary to change a nozzle with the burner already fitted to the boiler, proceed as outlined below:

– Retract the burner on its slide bars as shown in Fig. 8 on page 15.
– Remove the nuts 1)(Fig. 15 on page 18) and the disk 2).
– Use spanner 3)(Fig. 15 on page 18) to change the nozzles.

WARNING

Do not use any sealing products such as gaskets, sealing compound, or tape.
Be careful to avoid damaging the nozzle sealing seat. The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

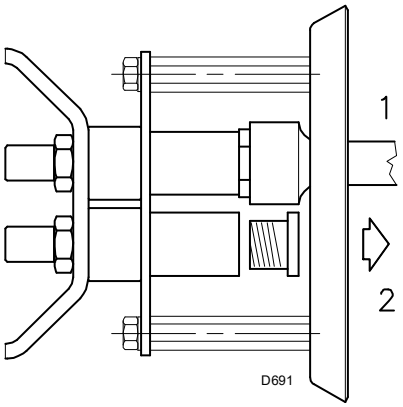


Fig. 12

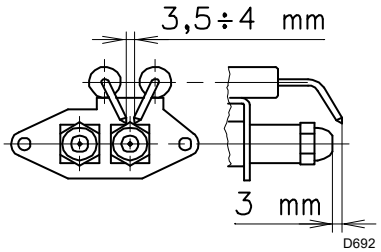


Fig. 13

The nozzle for the 1st stage of operation is the one lying beneath the firing electrodes (Fig. 13 on page 17).

WARNING

Make sure that the electrodes are positioned as shown in Fig. 13 on page 17.

Finally remount the burner 3)(Fig. 14) to the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.

Tighten the screws 1) on the slide bars 2) and screws 4) fixing the burner to the flange.

If it proves necessary to change a nozzle with the burner already fitted to the boiler, proceed as outlined below:

– Retract the burner on its slide bars as shown in (Fig. 8 on page 15).
– Remove the nuts 1)(Fig. 15) and the disk 2).
– Use spanner 3)(Fig. 15) to change the nozzles.

WARNING

When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cables until they are slightly stretched.

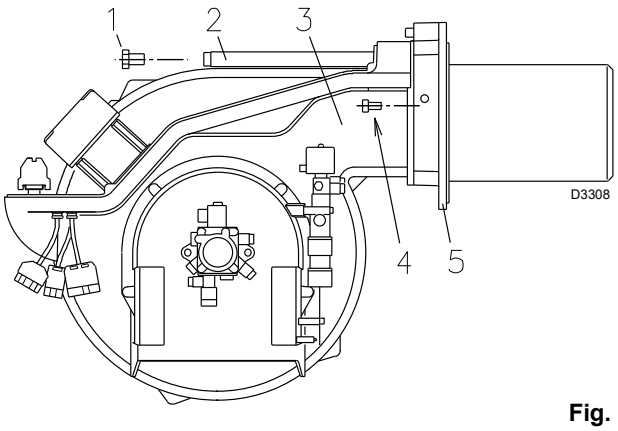


Fig. 14

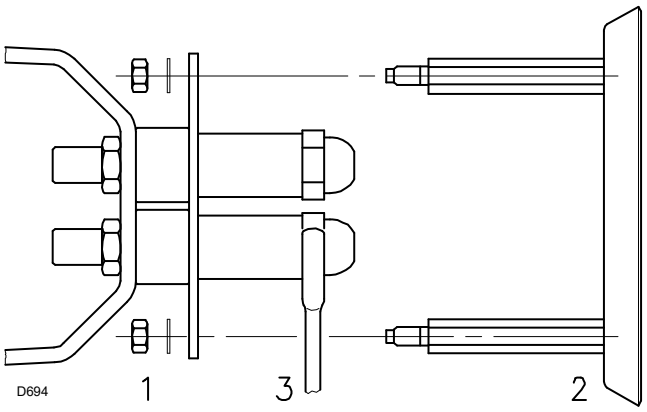


Fig. 15

4.11 Gas oil supply

WARNING

Where gas oil containing bio diesel is in use, it is recommended to avoid over oxygenation of the blended fuels.
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 gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use.

Please contact Riello for further information.

DANGER

It is strongly recommended a periodic check of the pump pressure operation (annually or better every six months, if the burner operation is continuous).

CAUTION

You are advised to use additional filters on the fuel supply line.
Riello recommends a good quality fuel filter at the tank (Fig. 16 - Fig. 17) and a secondary filter (100 µ for gas oil and 15 µ for kerosene) are used to protect the burner pump and nozzle from contamination.
In case of Biodiesel use, pay attention to install Biocompatible filters.

4.11.1 Double-pipe circuit

The burner is equipped with a self-priming pump which is capable of feeding itself within the limits listed in the Tab. G.

The tank higher than the burner A (Fig. 16)

The distance “P” must not exceed 10 meters in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters in order to permit pump self-priming even when the tank is almost completely empty.

The tank lower than the burner B (Fig. 16)

Pump depression values higher than 0.45 bar (35 cm Hg) must not be exceeded because at higher levels gas is released from the fuel, the pump starts making noise and its working life-span decreases.

It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be more improbable that the suction line fails to prime or stops priming.

4.11.2 The loop circuit

A loop circuit consists of a loop of piping departing from and returning to the tank with an auxiliary pump that circulates the fuel under pressure. A branch connection from the loop goes to feed the burner. This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the table.

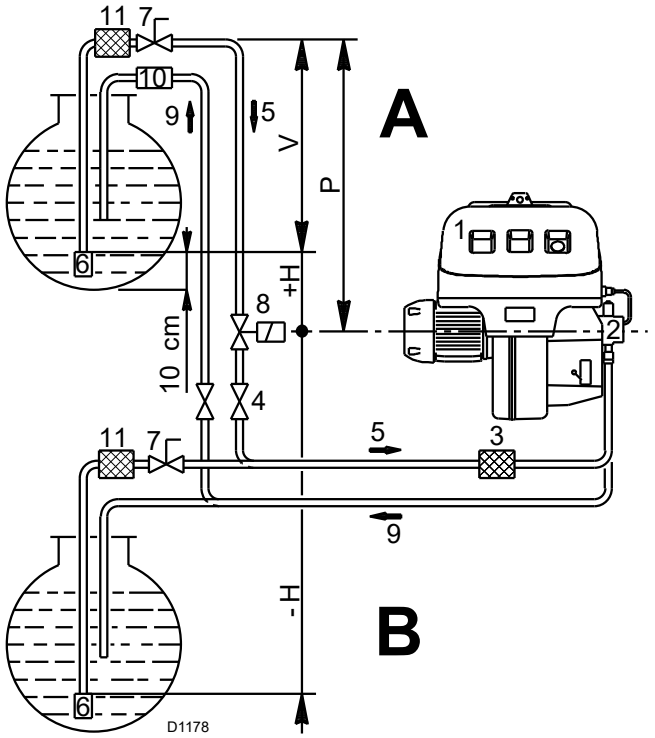


Fig. 16

Key (Fig. 16)

H Pump/Foot valve height difference
L Piping length
ø Inside pipe diameter
1 Burner
2 Pump
3 Filter
4 Manual on/off valve
5 Suction line
6 Foot valve
7 Rapid closing manual valve remote controlled (only Italy)
8 On/off solenoid valve (only Italy)
9 Return line
10 Check valve (only Italy)
11 Tank filter

+ H - H (m)	L (m) RL 70-100 Ø (mm)			RL 130 Ø (mm)		
	10	12	14	12	14	16
+ 4.0	39	81	100	71	138	150
+ 3.0	34	71	100	62	122	150
+ 2.0	29	61	100	53	106	150
+ 1.0	25	51	100	44	90	150
+ 0.5	22	46	100	40	82	150
0	20	41	100	36	74	137
- 0.5	18	36	89	32	66	123
- 1.0	15	31	77	28	58	109
- 2.0	10	22	53	19	42	81
- 3.0	6	12	29	10	26	53
- 4.0	1	2	5	-	10	25

Tab. G

4.11.3 Single-pipe circuit

In order to obtain single-pipe working it is necessary to unscrew the return hose, remove the by-pass screw 5)(Fig. 19 - Fig. 20 on page 21) and then screw the plug 2)(Fig. 19 - Fig. 20 on page 21).

The distance “P” must not exceed 10 meters in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters.

For the priming pump loosen the screw 3)(Fig. 19) in order to bleed off the air contained in the suction line and wait until the fuel flows out.

Key (Fig. 17)

H Pump/Foot valve height difference
L Piping length
ø Inside pipe diameter
1 Burner
2 Pump
3 Filter
4 Manual on/off valve
5 Suction line
6 Foot valve
7 Rapid closing manual valve remote controlled (only Italy)
8 On/off solenoid valve (only Italy)
11 Tank filter

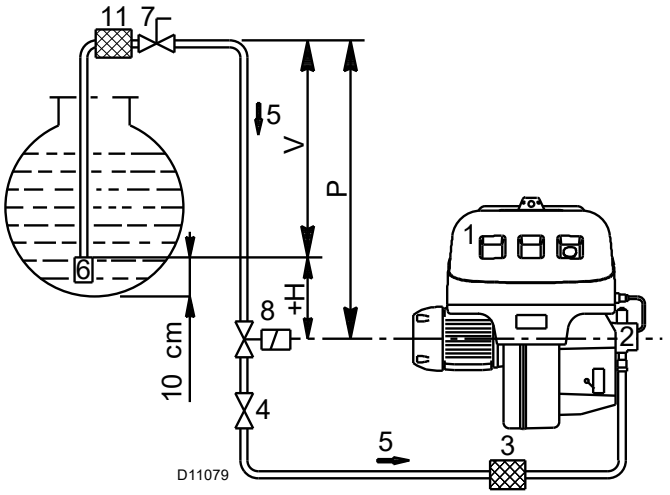


Fig. 17

+ H - H (m)	L (m) RL 70-100 Ø (mm)			RL 130 Ø (mm)		
	10	12	14	12	14	16
+ 4.0	39	81	100	71	138	150
+ 3.0	34	71	100	62	122	150
+ 2.0	29	61	100	53	106	150
+ 1.0	25	51	100	44	90	150
+ 0.5	22	46	100	40	82	150

Tab. H

4.12 Hydraulic connections

The pumps are equipped with a by-pass that connects return line and suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(Fig. 19 - Fig. 20 on page 21).

It is therefore necessary to connect both hoses to the pump.

The pump will break immediately if it is run with the return line closed and the by-pass screw inserted.

➤ Remove the plugs from the suction and return connections of the pump.

➤ Insert the hose connections with the supplied seals into the connections and screw them down.

➤ Take care that the hoses are not stretched or twisted during installation.

➤ Install the hoses where they cannot be stepped on or come into contact with hot surfaces of the boiler and where they do not hamper the opening of the burner.

Now connect the other end of the hoses to the suction and return lines by using the supplied nipples.

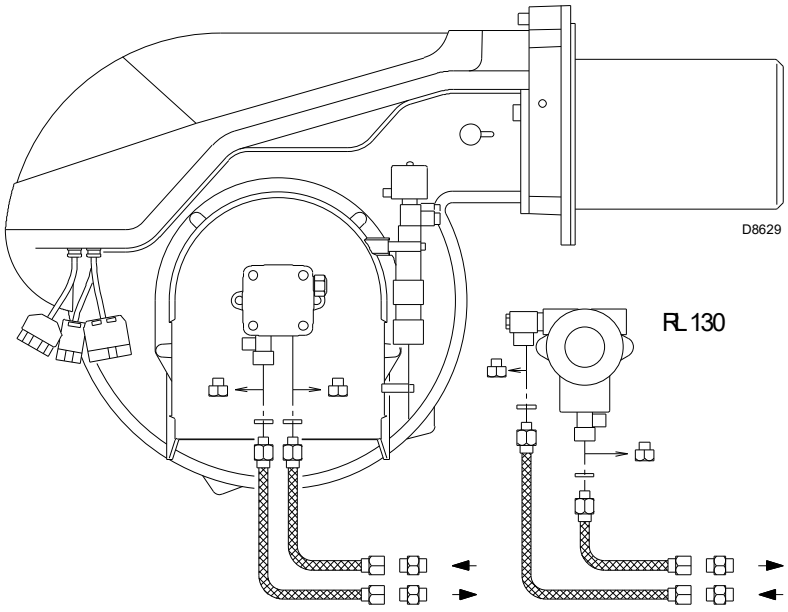


Fig. 18

4.13 Pump

WARNING

In case of use with gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use.

Please contact Riello for further information.

RL 70-100
PUMP DANFOSS RSA125

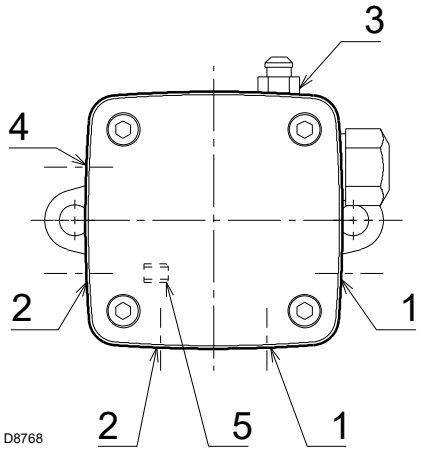


Fig. 19

RL 130
PUMP SUNTEC J6PCC

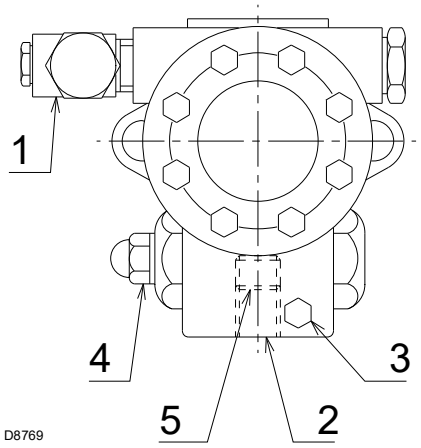


Fig. 20

Pump		RSA125	J6PCC
1	Suction	G 1/4"	G 1/2"
2	Return	G 1/4"	G 1/2"
3	Pressure gauge attach.	G 1/8"	G 1/8"
4	Pressure adjustment screw		
5	Screw for by-pass		

4.13.1 Technical data

Pump DANFOSS RSA125

Min. delivery rate at 12 bar pressure	kg/h	140
Delivery pressure range	bar	5.5 - 21
Max. suction depression	bar	0.4
Viscosity range	mm^2/s (cSt)	1.3 - 75
Max. gas oil temperature	°C	120
Max. suction and return pressure	bar	4
Pressure calibration in the factory	bar	12
Filter mesh width	mm	0.150

Tab. I

Pump SUNTEC J6PCC

Min. delivery rate at 12 bar pressure	kg/h	150
Delivery pressure range	bar	10 - 21
Max. suction depression	bar	0.45
Viscosity range	mm^2/s (cSt)	1.3 - 75
Max. gas oil temperature	°C	90
Max. suction and return pressure	bar	1.5
Pressure calibration in the factory	bar	12
Filter mesh width	mm	0.170

Tab. J

4.13.2 Pump priming

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 leaves the factory with the by-pass closed).

– In order for self-priming to take place, one of the screws 3)(Fig. 19 - Fig. 20) of the pump must be loosened in order to bleed off the air contained in the suction line.
– Start the burner by closing the control devices and with switch 1)(Fig. 25 on page 25) in the "ON" position. The pump must rotate in the direction of the arrow marked on the cover.
– The pump can be considered to be primed when the fuel starts coming out of the screw 3). Stop the burner: switch 1)(Fig. 25 on page 25) set to "OFF" and tighten the screw 3).

The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

Do not illuminate the flame sensor or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.

WARNING

the a.m. operation is possible because the pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize. Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump.

5 Electrical system

5.1 Notes on safety for the electrical wiring

DANGER

- 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. Any inversion would cause a lockout due to firing failure.
- 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 flame control to perform checks of its own start-up efficiency. Normally the boiler's thermostat/pressure switch ensures the stopping of the burner. If this is not the case, it is necessary to apply in series with IN a timer switch that turns off the burner at least once every twenty-four 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 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:

DANGER

disconnect the electrical supply from the burner by means of the main system switch;

DANGER

isolate the fuel supply.

If the cover is still present, remove it and proceed with the electrical wiring according to the wiring diagrams.

5.1.1 Electrical connections

Use flexible cables according to EN 60 335-1.
– if in PVC sheath, use at least H05 VV-F;
– if in rubber sheath, use at least H05 RR-F.

All the wires to connect to the burner terminal strip 8)(Fig. 21) must enter through the supplied fairleads. The fair leads and precut holes can be used in various ways.

One example is given below:

1	- Pg 13,5	Three-phase power supply
2	- Pg 9	Fitting hole for fair lead, if required
3	- Pg 11	Fitting hole for fair lead, if required
4	- Pg 13,5	Fitting hole for fair lead, if required

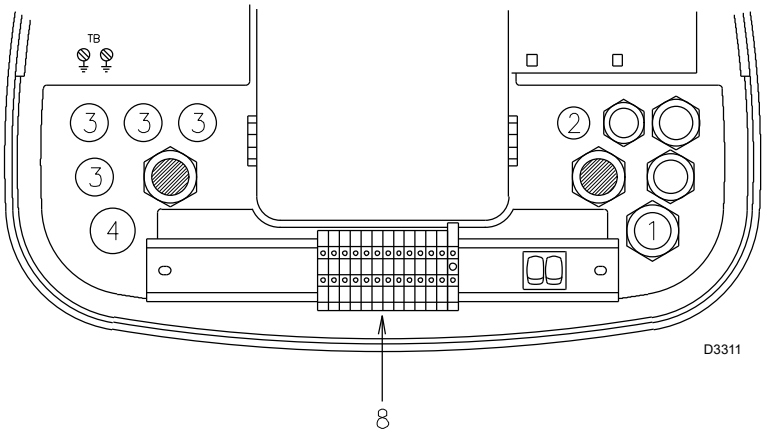


Fig. 21

5.1.2 Electrical wiring factory-set

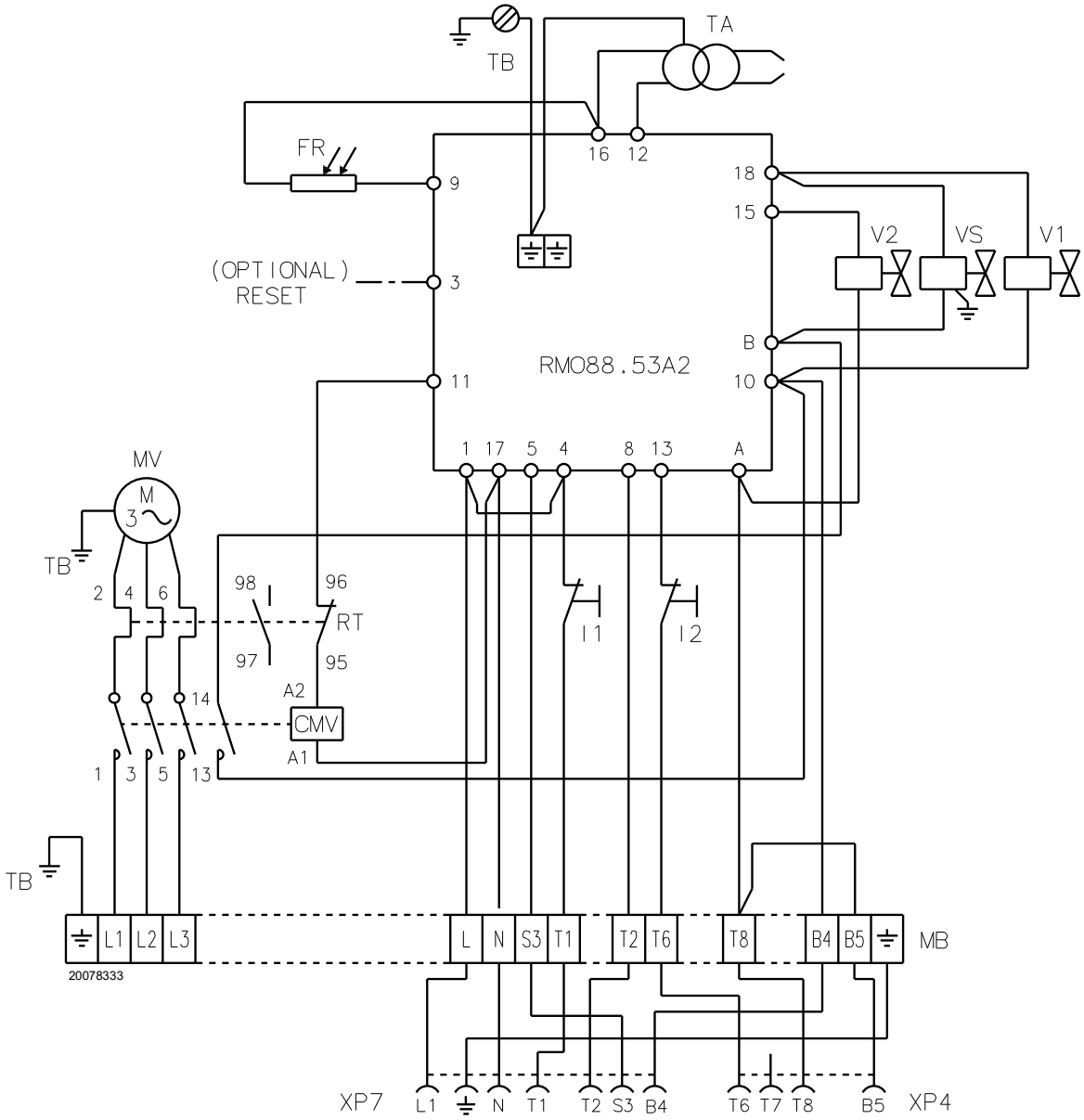


Fig. 22

WARNING

The burners leave the factory preset for **400V** power supply.

If **230V** power supply is used, change the motor connection from star to delta and change the setting of the thermal cut-out as well.

NOTE:

In case of remote-reset, connect a push-button with a normally open contact (NA) between the terminal 3 and the neutral of the flame control (for example, terminals 15, 16, 17 and 18).

Key to layout (Fig. 22)

CMV	Motor contactor
FR	Flame sensor
I1	Switch: burner off - on
I2	Switch: 1st - 2nd stage operation
MB	Terminal strip
MV	Fan motor
RMO88.53A2	Flame control
RT	Thermal cut-out
TA	Ignition transformer
TB	Burner ground (earth) connection
V1	1st stage solenoid valve
V2	2nd stage solenoid valve
VS	Safety solenoid valve
XP4	4 pole socket
XP7	7 pole socket

5.1.3 Electrical wiring to be completed by the installer

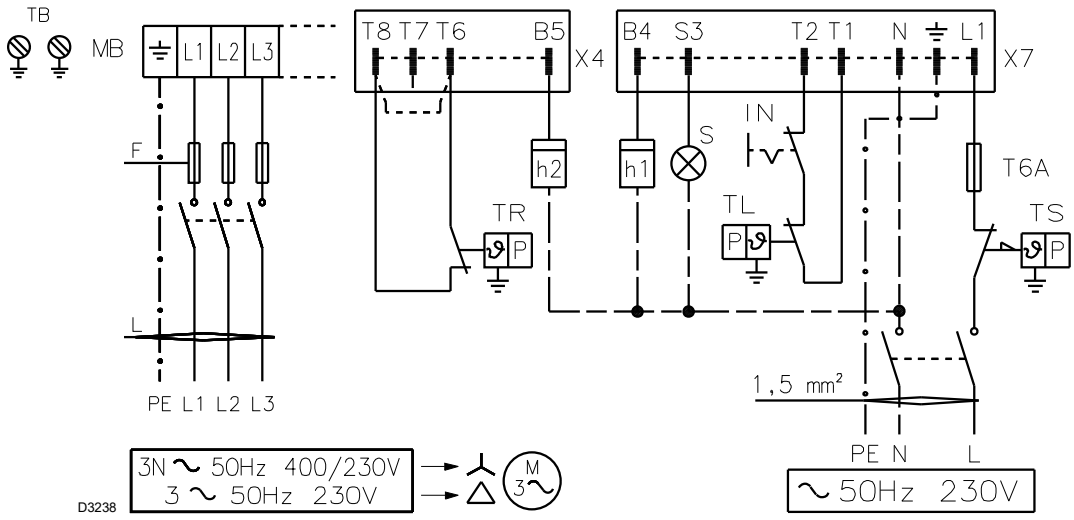


Fig. 23

Fuses and cables cross-section (Fig. 23), see Tab. K.

Cross-section when not indicated: 1.5 mm^2.

		RL 70		RL 100		RL 130	
		230 V	400 V	230 V	400 V	230 V	400 V
F	A	T10	T6	T16	T10	T16	T10
L	mm^2	1.5	1.5	1.5	1.5	1.5	1.5

Tab. K

WARNING

The burner is factory set for two-stage operation and it must therefore be connected to the TR remove control device to command fuel valve V2.

Alternatively, if single stage operation is required, instead of control device TR install a jumper lead between terminal T8 and T6 (Fig. 23).

Key to layout (Fig. 23)

h1	1st stage hourcounter
h2	2nd stage hourcounter
IN	Manual burner stop switch
MB	Terminal strip
S	Remote lock-out signal
TB	Burner ground (earth) connection
TL	Limit control device system: This shuts down the burner when the boiler temperature or pressure exceeds the setpoint value.
TR	High-low mode control device system: This controls operating stages 1 and 2 and is necessary only for two-stage operation.
TS	Safety control device system: This operates when TL is faulty.
X4	4 pole plug
X7	7 pole plug

5.2 Calibration of thermal relay

This is required to avoid motor burn-out in the event of a significant increase in power absorption caused by a missing phase.

- If the motor is star-powered, 400V, the cursor should be positioned to "MIN".
- If the motor is delta-powered, 230V, the cursor should be positioned to "MAX".

Even if the scale of the thermal cut-out does not include rated motor absorption at 400V, protection is still ensured in any case.

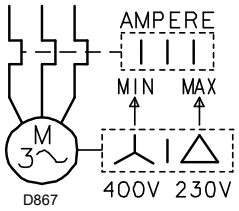


Fig. 24

NOTE

➤ The burners leaves the factory preset for 400V power supply. If 230V power supply is used, change the fan motor connection from star to delta and change the setting of the thermal cut-out as well.

➤ The burners are factory set for two-stage operation and must therefore be connected to control device TR. Alternatively, if single stage operation is required, instead of control device TR install a jumper lead between terminals T8 and T6 (Fig. 23).

6 Start-up, calibration and operation of the burner

6.1 Notes on safety for the first start-up

WARNING

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.

WARNING

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

6.2 Burner calibration

WARNING

It is advisable to first set the burner for operating on oil and then for gas.

Execute the fuel exchange when the burner is off.

6.2.1 Firing

Set switch 1)(Fig. 25) to "ON".

During the first firing, during the passage from the 1st to the 2nd stage, there is a momentary lowering of the fuel pressure caused by the filling of the 2nd stage nozzle tubing. This lowering of the fuel pressure can cause the burner to lock-out and can sometimes give rise to pulsations.

Once the following adjustments have been made, the firing of the burner must generate a noise similar to the noise generated during operation. If one or more pulsations or a delay in firing in respect to the opening of the fuel solenoid valve occur, see the suggestions provided on p. 16: causes 34 to 42.

6.2.2 Operation

The optimum calibration of the burner requires an analysis of the flue gases at the boiler outlet and interventions on the following points:

- **1st and 2nd nozzles**

See the information listed on pag. 16.

- **Combustion head**

The adjustment of the combustion head already carried out need not be altered unless the 2nd stage delivery of the burner is changed.

- **Pump pressure (gas oil)**

12 bar: this is the pressure calibrated in the factory which is usually sufficient for most purposes. Sometimes, this pressure must be adjusted to:

10 bar in order to reduce fuel delivery. This adjustment is possible only if the surrounding temperature remains above 0°C. Never calibrate to pressures below 10 bar, at which pressures the cylinders may have difficulty in opening;

14 bar order to increase fuel delivery or to ensure firings even at temperatures of less than 0°C.

In order to adjust pump pressure, use the relevant screw 5)(Fig. 19 - Fig. 20 on page 21).

- **Pump pressure (kerosene)**

10 bar: maximun pressure for kerosene.

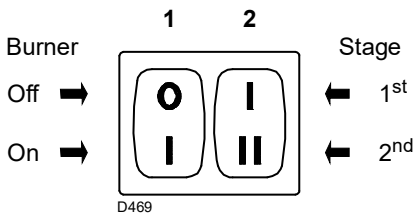


Fig. 25

- **1st stage fan air gate valve**

Keep the burner operating at 1st stage by setting the switch 2)(Fig. 25 on page 25) to the 1st stage position. Opening of the air gate valve 6)(B, Fig. 26) must be adjusted in proportion to the selected nozzle: the index 1)(A, Fig. 26) must be aligned with the notch 2)(A, Fig. 26) specified in (Tab. L). This adjustment is achieved by turning the hex element 2)(B, Fig. 26):

– in rh direction (- sign) the opening is reduced;
– in lh direction (+ sign) the opening increases.

Gas oil

RL 70		RL 100		RL 130	
GPH	N°	GPH	N°	GPH	N°
5	2.0	7	2.0	10	2.0
6	2.3	8	2.1	11	2.1
7	2.6	9	2.2	12	2.2
8	2.7	10	2.4	13	2.3
9	2.8	11	2.6	14	2.5
		12	2.7	15	2.6
		13	2.8	16	2.7
		14	2.9	17	2.8
				18	2.9
				19	3.0

Kerosene

RL 70		RL 100		RL 130	
GPH	N°	GPH	N°	GPH	N°
6	1.5	10	2.0	13	2.2
7	1.7	11	2.3	14	2.5
8	1.9	12	2.5	15	2.7
9	2.1	13	2.7	16	3.0
10	2.3	14	2.8	18	3.5
11	2.5	16	3.0	20	3.8
12	2.7			22	4.0
13	3.0			22 (1)	3.8

N° = Notch 2)(Fig. 26)

Tab. L

Example RL 70 - 1st stage nozzle 6.0 GPH:

2,3 (Fig. 26) notch aligned with index 1)(Fig. 26).

When the adjustment is terminated lock the hex element 2)(Fig. 27) with the ring nut 1).

- **2nd stage fan air gate valve**

Set switch 2)(Fig. 25 on page 25) to the 2nd stage position and adjust the air gate valve 6)(B, Fig. 26) by turning the hex element 4)(B, Fig. 26), after having loosened the ring nut 3)(B, Fig. 26).

Air pressure at attachment 1)(Fig. 27) must be approximately the same as the pressure specified in (Tab. M) plus the combustion chamber pressure measured at attachment 2).

Refer to the example in the adjacent figure.

NOTE:
in order to facilitate adjustment of hex elements 2) and 4)(A, Fig. 26), use a 3 mm Allen key 5)(B, Fig. 26).

Gas oil

RL 70		RL 100		RL 130	
kg/h	**mbar**	**kg/h**	**mbar**	**kg/h**	**mbar**
40	8.5	60	7.2	80	7.0
50	8.6	70	7.7	90	7.2
60	8.8	80	8.4	100	7.6
70	9.2	90	9.3	110	8.1
		100	11.0	120	9.0
				130	11.0
				130	8.5 (1)

Kerosene

RL 70		RL 100		RL 130	
kg/h	**mbar**	**GPH**	**mbar**	**kg/h**	**mbar**
40	7.2	58	6.8	80	7.5
45	7.4	65	7.1	90	7.9
50	7.7	73	7.5	95	8.1
55	8.0	80	8.2	100	8.5
60	8.2	86	9.8	115	9.8
70	8.3	99	11.3	120	10
				130	12.4
				130	8.5

(1) With shutter 4)(Fig. 11 on page 16) retracted
mbar = air pressure in 1) with zeropressure in 2)

Tab. M

FAN AIR GATE VALVE ADJUSTMENT

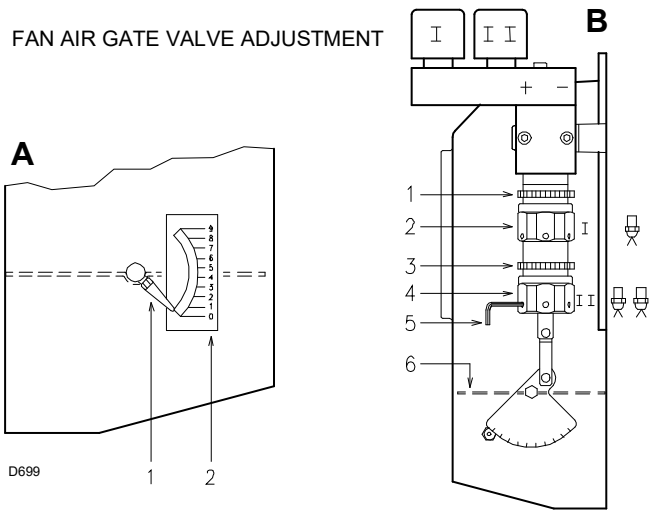


Fig. 26

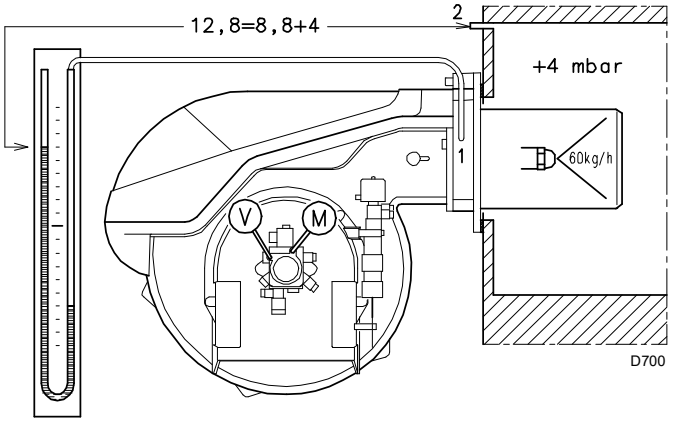


Fig. 27

6.3 Burner operation

6.3.1 Burner starting

Starting phases with progressive time intervals shown in seconds:

- Control device TL closes.
  After about 3s:
- **0s:** The flame control starting cycle begins.
- **2s:** The fan motor starts.
- **3s:** The ignition transformer is connected. The pump 3) sucks the fuel from the tank through the piping 1) and the filter 2) and pumps it under pressure to delivery. The piston 4) rises and the fuel returns to the tank through the piping 5) - 7). The screw 6) closes the by-pass heading towards suction and the solenoid valves 8) - 11) - 16), de-energized, close the passage to the nozzles. The hydraulic cylinder 15), piston A, opens the air gate valve: pre-purging begins with the 1st stage air delivery.
- **22s:** Solenoid valves 8) and 16) open and the fuel passes through the piping 9) and filter 10) and is then sprayed out through the nozzle, igniting when it comes into contact with the spark. This is the 1st stage flame.
- **29s:** The ignition transformer switches off.
- **36s:** If the control device TR is closed or has been replaced by a jumper wire, the 2nd stage solenoid valve 11) is opened and the fuel enters the valve 12) and raises the piston which opens two passages: one to piping 13), filter 14), and the 2nd stage nozzle, and the other to the cylinder 15), piston B, that opens the fan air gate valve in the 2nd stage. The starting cycle comes to an end.

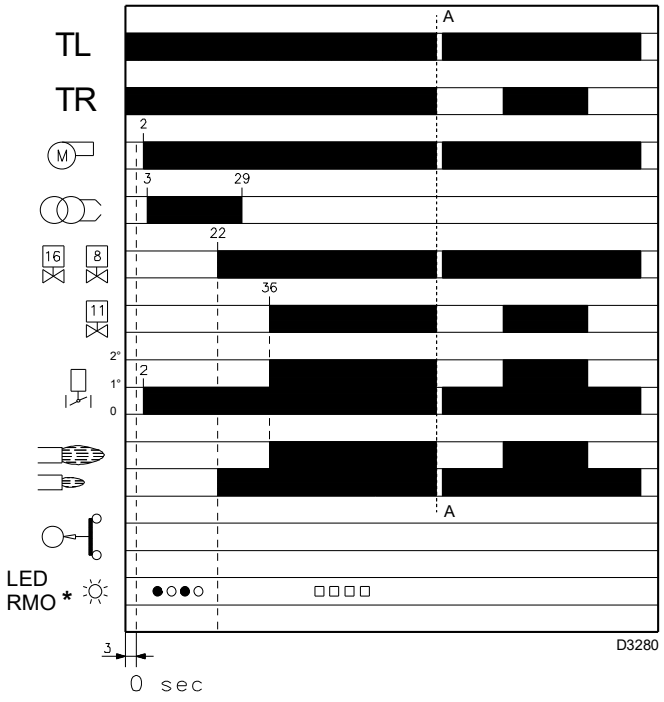


Fig. 28

* ○ Off ● Yellow □ Green ▲ Red

For further details see pag. 28.

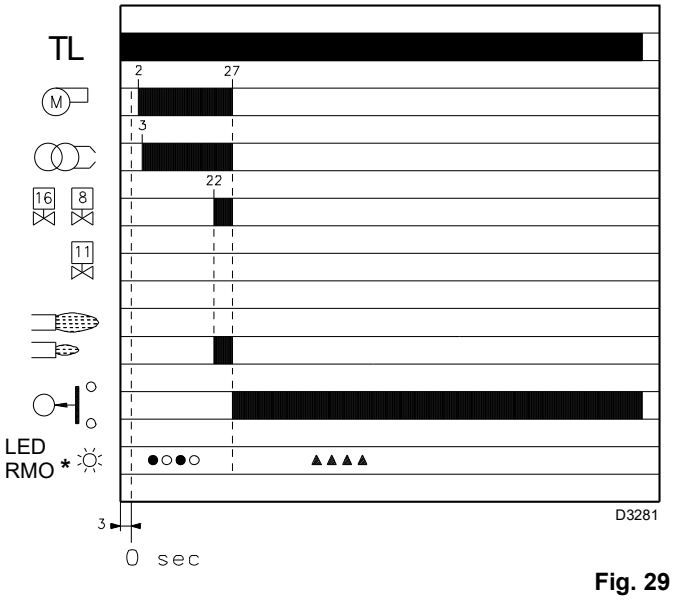


Fig. 29

* ○ Off ● Yellow □ Green ▲ Red

For further details see pag. 28.

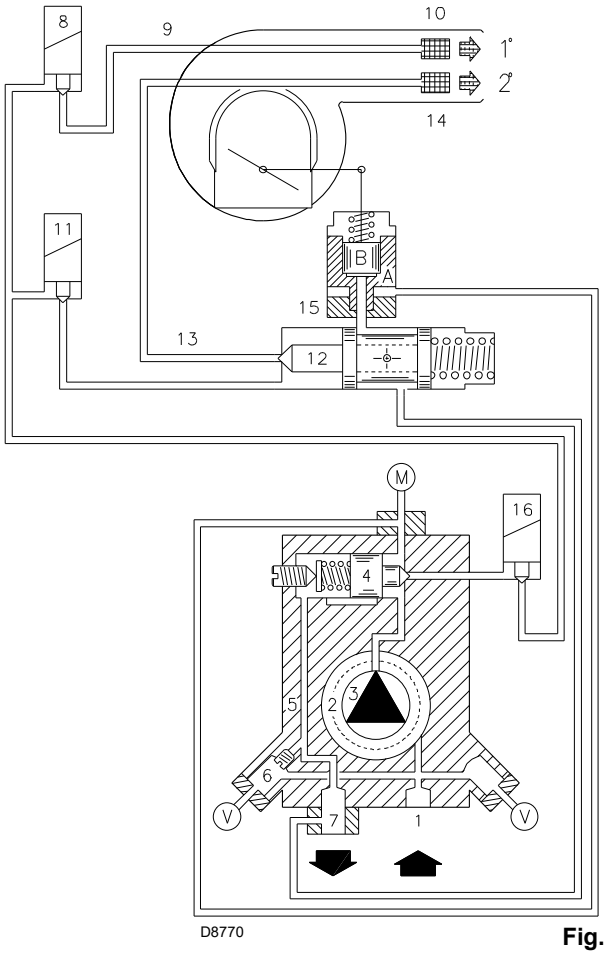


Fig. 30

6.3.2 Steady state operation

System equipped with one control device TR

Once the starting cycle has come to an end, the command of the 2nd stage solenoid valve passes on to the control device TR that controls boiler temperature or pressure.

- When the temperature or the pressure increases until the control device TR opens, solenoid valve 11) closes, and the burner passes from the 2nd to the 1st stage of operation.
- When the temperature or pressure decreases until the control device TR closes, solenoid valve 11) opens, and the burner passes from the 1st to the 2nd stage of operation, and so on.
- The burner stops when the demand for heat is less than the amount of heat delivered by the burner in the 1st stage. In this case, the control device TL opens, and solenoid valves 8)-16) close, the flame immediately goes out. The fan's air gate valve closes completely.

Systems not equipped with control device TR (jumper wire installed)

The burner is fired as described in the case above. If the temperature or pressure increase until control device TL opens, the burner shuts down (Section A-A in the diagram).

When the solenoid valve 11) de-energizes, the piston 12) closes the passage to the 2nd stage nozzle and the fuel contained in the cylinder 15), piston B, is discharged into the return piping 7).

6.3.3 Firing failure

If the burner does not fire, it goes into lock-out within 5 s of the opening of the 1st nozzle valve and 30 s after the closing of control device TL.

The flame control red pilot light will light up.

6.3.4 Undesired shutdown during operation

If the flame goes out during operation, the burner shuts down automatically within 1 second and automatically attempts to start again by repeating the starting cycle.

6.3.5 Final checks

- Obscure the flame sensor and switch on the control devices: the burner should start and then lock-out about 5 s after opening of the 1st stage operation valve.
- Illuminate the flame sensor and switch on the control devices: the burner should start and then go into lock-out after about 10 s.
- Obscure the flame sensor while the burner is in 2nd stage operation, the following must occur in sequence: flame extinguished within 1 s, pre-purging for about 20 s, sparking for about 5 s, burner goes into lock out.
- Switch off control device TL followed by control device TS while the burner is operating: the burner should stop.

6.4 Burner start-up cycle diagnostics

During start-up, indication is according to the Tab. N:

Sequences	Colour code
Pre-purging	●❍●❍●❍●❍●
Ignition phase	●❍●❍●❍●❍●
Operation, flame ok	❒❒❒❒❒❒❒❒❒
Operating with weak flame signal	❒❍❒❍❒❍❒❍❒
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●
Lock-out	▲▲▲▲▲▲▲▲▲
Extraneous light	▲❒▲❒▲❒▲❒▲

Key: ❍ Off ● Yellow ❒ Green ▲ Red

Tab. N

6.5 Resetting the flame control and using diagnostics

The flame control features a diagnostics function through which any causes of malfunctioning are easily identified (indicator: **RED LED**).

To use this function, you must wait at least 10 seconds once it has entered the safety condition (lockout), and then press the reset button.

The flame control generates a sequence of pulses (1 second apart), which is repeated at constant 3-second intervals.

Once you have seen how many times the light pulses and identified the possible cause, the system must be reset by holding the button down for between 1 and 3 seconds.

RED LED on wait at least 10s	Lock-out	Press reset for > 3s	Pulses	Interval 3s	Pulses
			●●●●		●●●●

The methods that can be used to reset the flame control and use diagnostics are given below.

6.5.1 Resetting the flame control

To reset the flame control, proceed as follows:

– Hold the button down for between 1 and 3 seconds. The burner restarts after a 2-second pause once the button is released. If the burner does not restart, you must make sure the limit thermostat is closed.

6.5.2 Visual diagnostics

Indicates the type of burner malfunction causing lockout.

To view diagnostics, proceed as follows:

– Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit. A yellow light pulses to tell you the operation is done. Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, according to the coding system indicated in the table on pag. 33.

6.5.3 Software diagnostics

Reports burner life by means of an optical link with the PC, indicating hours of operation, number and type of lock-outs, serial number of flame control etc ...

To view diagnostics, proceed as follows:

– Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit. A yellow light pulses to tell you the operation is done. Release the button for 1 second and then press again for over 3 seconds until the yellow light pulses again. Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

Once the operations are done, the flame control's initial state must be restored using the resetting procedure described above.

BUTTON PRESSED FOR	flame control STATUS
Between 1 and 3 seconds	flame control reset without viewing visual diagnostics.
More than 3 seconds	Visual diagnostics of lockout condition: (Led pulses at 1-second intervals).
More than 3 seconds starting from the visual diagnostics condition	Software diagnostics by means of optical interface and PC (hours of operation, malfunctions etc. can be viewed)

The sequence of pulses issued by the flame control identifies the possible types of malfunction, which are listed in the table on pag. 33.

7 Maintenance

7.1 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.

7.2 Maintenance programme

7.2.1 Maintenance frequency



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

7.2.2 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 more care should be exercised during maintenance.

Pump

The delivery pressure must be stable.

The depression must be less than 0.4 bar.

Unusual noise must not be evident during pump operation.

If the pressure is found to be unstable or if 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 pump is found to be responsible, check to make sure that the filter is not dirty. The vacuum meter is installed upstream from the filter and consequently will not indicate whether the filter is clogged or not.

Contrarily, if the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

Filters (Fig. 31)

Check the following filter boxes:

• on line 1) • in the pump 2) • at the nozzle 3), and clean or replace as required.

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. Then clean the insides of the pump and the cover sealing surface.

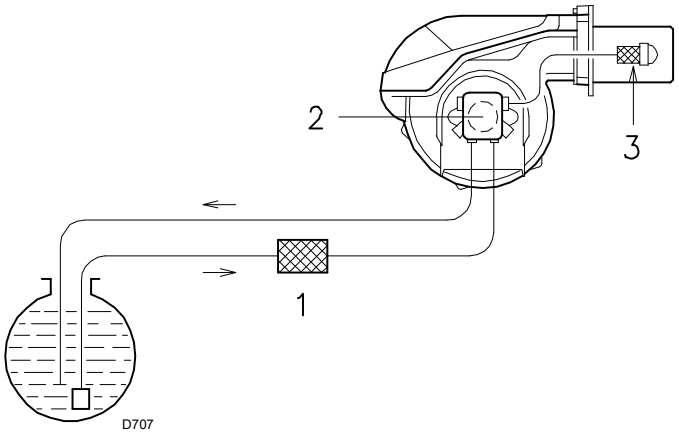


Fig. 31

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.

Combustion Head

Check to make sure that all the parts of the combustion head are in good condition, positioned correctly, free of all impurities, and that no deformation has been caused by operation at high temperatures.

Nozzles

Do not clean the nozzle openings; do not even open them. The nozzle filters however may be cleaned or replaced as required.

Replace the nozzles every 2-3 years or whenever necessary.

Combustion must be checked after the nozzles have been changed.

Flame sensor (Fig. 32)

Clean the glass cover from any dust that may have accumulated. Flame sensor 1) is held in position by a pressure fit and can therefore be removed by pulling it outward forcefully.

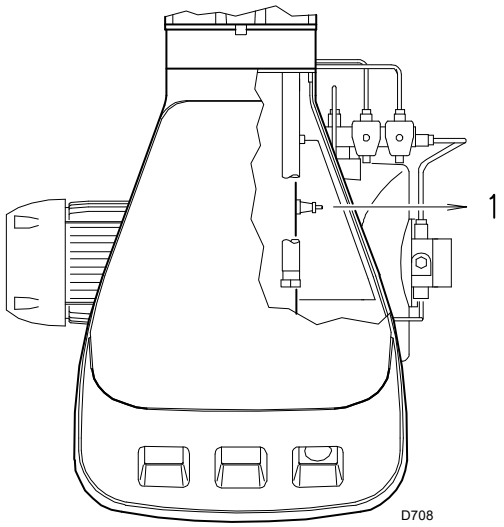


Fig. 32

Flame inspection window (Fig. 33)

Clean the glass whenever necessary.

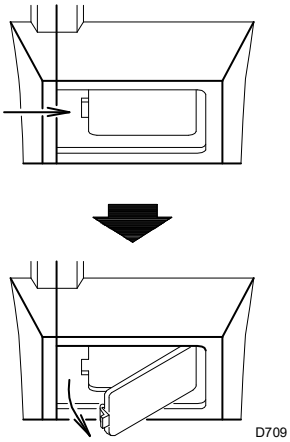


Fig. 33

Flexible hoses

Check to make sure that the flexible hoses are still in good condition and that they are not crushed or otherwise deformed. Check periodically the flexible pipes conditions. Using kerosene, they have to be replaced at least every 2 years.

Fuel tank

Approximately every 5 years, or whenever necessary, suck any water or other impurities present on the bottom of the tank using a separate pump.

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.

Fuel pump and/or couplings replacement

In conformity with (Fig. 34).

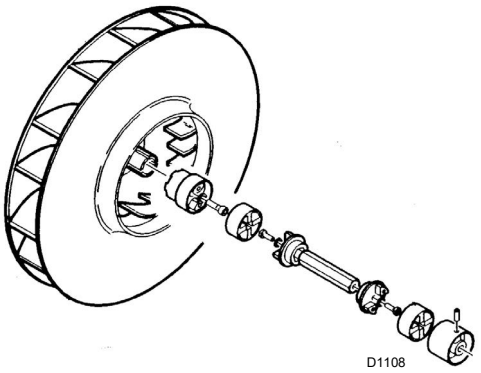


Fig. 34

7.3 Opening the burner



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.

➤ Remove screw 1)(Fig. 35) and withdraw the casing 2).
➤ Unscrew screw 3).
➤ Fit the two extensions 4) supplied with the burner onto the slide bars 5) (model with 385 mm blast tube).
➤ Pull part A backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).

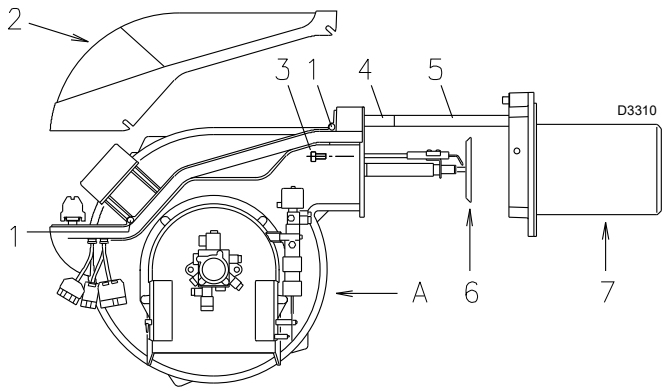


Fig. 35

7.4 Closing the burner



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

8 Faults - Possible causes - Solutions

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.

SIGNAL	FAULT	POSSIBLE CAUSE	SOLUTION
No blink	The burner does not start	1 - No electrical power supply	Close all switches - Check fuses
		2 - A limit or safety control device is open	Adjust or replace
		3 - Flame control lock-out	Reset flame control (no sooner than 10 s after the lockout)
		4 - Pump is jammed	Replace
		5 - Erroneous electrical connections	Check connections
		6 - Defective flame control	Replace
		7 - Defective electrical motor	Replace
		8 - Defective motor capacitor (RL 34 - RL 44 single-phase)	Replace it
2 pulses ●●	After pre-purge and the safety time, the burner goes to lock-out at the end of the safety time	9 - No fuel in tank; water on tank bottom	Top up fuel level or suck up water
		10 - Inappropriate head and air damper adjustments.	Adjust, see pag. 16 and pag. 25
		11 - Fuel solenoid valves fail to open (1st stage or safety)	Check connections; replace coil
		12 - 1st nozzle clogged, dirty, or deformed	Replace
		13 - Dirty or poorly adjusted firing electrodes	Adjust or clean
		14 - Grounded electrode due to broken insulation	Replace
		15 - High voltage cable defective or grounded	Replace
		16 - High voltage cable deformed by high temperature	Replace and protect
		17 - Ignition transformer defective	Replace
		18 - Erroneous valves or transformer electrical connections	Check
		19 - Defective flame control	Replace
		20 - Pump unprimed	Prime pump and see “Pump unprimes”
		21 - Pump/motor coupling broken	Replace
		22 - Pump suction line connected to return line	Correct connection
		23 - Valves up-line from pump closed	Open
		24 - Filters dirty: line - pump - nozzle	Clean
		25 - Defective flame sensor or flame control	Replace flame sensor or flame control
		26 - Flame sensor dirty	Clean
		27 - 1st stage operation of cylinder is faulty	Change the cylinder
		28 - Motor lockout (RL 44 three-phase)	Reset thermal relay
		29 - Defective motor command remote control device (RL 44 three-phase)	Substitute it
		30 - Electrical power supply two-phase (RL 44 three-phase) thermal cut-out trips when third phases are re-connected	Reset thermal relay
		31 - Incorrect motor rotation direction	Change motor electrical connections
4 pulses ●●●●	The burner starts and then goes into lockout	32 - Flame sensor short-circuit	Replace sensor
		33 - Light is entering or flame is simulated	Eliminate light or replace flame control
7 pulses ●●●●●●●	Flame detachment	34 - Poorly adjusted head	Adjust, see pag. 15,
		35 - Poorly adjusted or dirty firing electrodes	Adjust, see Fig. 13 on page 17
		36 - Poorly adjusted fan air gate: too much air	Adjust
		37 - 1st nozzle is too big (pulsation)	Reduce 1st nozzle delivery
		38 - 1st nozzle is too small (flame detachment)	Increase 1st nozzle delivery
		39 - 1st nozzle dirty, or deformed	Replace
		40 - Pump pressure not suitable	Adjust it: between 10 - 14 bar
		41 - 1st stage nozzle unsuited to burner or boiler	See Nozzle Table, pag. 16; reduce 1st stage nozzle
		42 - Defective 1st stage nozzle	Replace

SIGNAL	FAULT	POSSIBLE CAUSE	SOLUTION
	The burner does not pass to 2nd stage	43 - Control device TR does not close	Adjust or replace
		44 - Defective flame control	Replace
		45 - 2nd stage sol. valve coil defective	Replace
		46 - Piston jammed in valve unit	Replace entire unit
	Fuel passes to 2nd stage but air remains in 1st	47 - Low pump pressure	Increase
		48 - 2nd stage operation of cylinder is faulty	Change cylinder
	Burner stops at transition between 1st and 2nd stage. Burner repeats starting cycle.	49 - Nozzle dirty	Renew nozzle
		50 - Flame sensor dirty	Clean
		51 - Excess air	Reduce
	Uneven fuel supply	52 - Check if cause is in pump from tank or fuel supply system	Feed burner located near burner
	Internally rusted pump	53 - Water in tank	Suck water from tank bottom with separate pump
	Noisy pump, unstable pressure	54 - Air has entered the suction line	Tighten connectors
		- Depression value too high (higher than 35 cm Hg):	
		55 - Tank/burner height difference too great	Feed burner with loop circuit
		56 - Piping diameter too small	Increase
		57 - Suction filters clogged	Clean
		58 - Suction valves closed	Open
		59 - Paraffin solidified due to low temperature	Add additive to fuel
	Pump unprimes after prolonged pause	60 - Return pipe not immersed in fuel	Bring to same height as suction pipe
		61 - Air enters suction piping	Tighten connectors
	Pump leaks fuel	62 - Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach	63 - Not enough air	Adjust head and fan air damper, see pag. 15 and pag. 25
		64 - Nozzle worn or dirty	Replace
		65 - Nozzle filter clogged	Clean or replace
		66 - Erroneous pump pressure	Adjust to between 10 - 14 bar
		67 - Flame stability disc dirty, loose, or deformed	Clean, tighten in place, or replace
		68 - Boiler room air vents insufficient	Increase
	- yellow Bacharach	69 - Too much air	Adjust head and fan air damper, see pag. 15 and pag. 25
	Dirty combustion head	70 - Nozzle or filter dirty	Replace
		71 - Unsuitable nozzle delivery or angle	See recommended nozzles, pag. 16
		72 - Loose nozzle	Tighten
		73 - Impurities on flame stability spiral	Clean
		74 - Erroneous head adjustment or not enough air	Adjust, see pag. 15 and pag. 25; open gate valve
		75 - Blast tube length unsuited to boiler	Contact boiler manufacturer
10 pulses ●●●●● ●●●●●		76 - Connection or internal fault	
		77 - Presence of electromagnetic disturbance	Use the radio disturbance protection kit)

Tab. O

A Appendix - Accessories

- **Radio disturbance protection kit**

If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the flame control and the burner.

Burner	Code
RL 70 - RL 100 - RL 130	3010386

- **Degassing unit**

It may occur that a certain amount of air is contained in the fuel sucked up by the pump. This air may originate from the fuel itself as a consequence of depressurisation or air leaking past imperfect seals.

In double-pipe systems, the air returns to the tank from the return pipe; in single-pipe systems, the air remains in circulation causing pressure variations in the pump and burner malfunctions. For this reason, we advise installing a degassing unit near the burner in single-pipe installations.

Degassing with filter - code 3010055

Degassing unit characteristics:

- Burner delivery	: max. 80 kg/h
- Fuel pressure	: max. 0.7 bar
- Ambient temperature	: max. 40 °C
- Fuel temperature	: max. 40 °C
- Attachment connectors	: 1/4 inch

For burner deliveries higher than 80 kg/h, install two parallel degassing units.

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Subject to modifications