

**GB** Gas oil/ Kerosene burners

Two stage operation



**B10**

CODE	MODEL	TYPE
3470610 - 3470611	RL 34 MZ	976 T
3470710 - 3470711	RL 44 MZ	977 T
3470740 - 3470741	RL 44 MZ	978 T



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

Manufacturer:	RIELLO S.p.A.	
Address:	Via Pilade Riello, 7 37045 Legnago (VR)	
Product:	Gas oil/ kerosene burners	
Model:	RL 34 - 44 MZ	
These products are in compliance with the following Technical Standards:		
EN 267		
EN 12100		
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, 03.05.2021

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

Mr. F. Maltempi


**Declaration of Conformity A.R. 8/1/2004 & 17/7/2009 – Belgium**

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It is hereby certified that the apparatuses specified below conform with the model of the type described in the CE conformity declaration and they are produced and placed in circulation in conformity with the provisions defined in L.D. dated January 8, 2004 and July 17, 2009.

Type of product:	Gas oil/ kerosene burners	
Model:	RL 34 - 44 MZ	
Regulation applied:	EN 267 and A.R. dated January 8, 2004 - July 17, 2009	
Measured value:	RL 34 MZ	RL 44 MZ
	CO max: 13 mg/kWh	CO max: 11 mg/kWh
	NOx max: 158 mg/kWh	NOx max: 173 mg/kWh

**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 Danger: live components**



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

**Other symbols**



**ENVIRONMENTAL PROTECTION**

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

- This symbol indicates a list.

**Abbreviations used**

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

**Delivery of the system and the instruction manual**

When the system is delivered, it is important that:

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

.....

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

.....

.....

.....

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

To ensure a periodic check, the manufacturer recommends the drawing up of a Maintenance Contract.

## 2.2 Guarantee and responsibility

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



**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;
- 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 valve 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.

## 2.3 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, hygroscopic 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 gas 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 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.

### 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 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 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.

### 2.3.2 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.



## 3 Safety and prevention

### 3.1 Introduction

The burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations.

It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:

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

In particular:

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

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

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

### 3.2 Safety warnings

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

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

This burner must only be used for the application it was designed for.

The manufacturer accepts no liability within or without the contract for any damage caused to people, animals and property due to installation, adjustment and maintenance errors or to improper use.

### 3.3 Basic safety rules

- Children or inexpert persons must not use the appliance.
- Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.
- Unauthorised persons must not attempt to repair the appliance.
- It is dangerous to pull or twist the electric leads.
- Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.
- Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not place anything on the burner.
- Do not block or reduce the size of the ventilation vents in the installation room.
- Do not leave containers and inflammable products or combustible materials in the installation room.

### 3.4 Personnel training

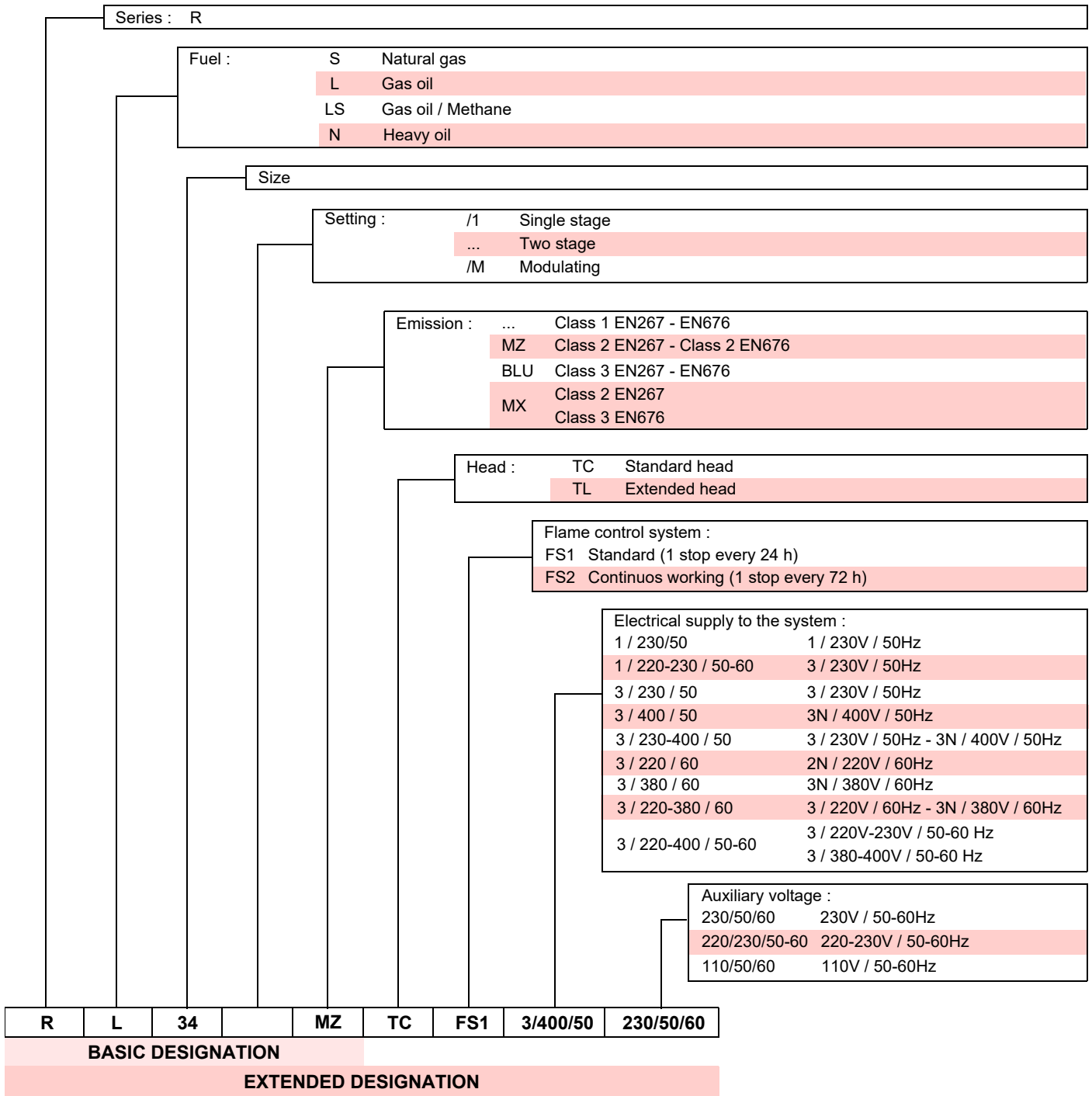
The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- 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.

**4 Technical description of the burner**

**4.1 Burner designation**



**4.2 Models available**

Designation	Blast tube length mm	Electrical supply	Code
RL 34 MZ	TC (216)	Single phase	3470610
RL 34 MZ	TL (351)	Single phase	3470611
RL 44 MZ	TC (216)	Single phase	3470710
RL 44 MZ	TL (351)	Single phase	3470711
RL 44 MZ	TC (216)	Three phase	3470740
RL 44 MZ	TL (351)	Three phase	3470741

**4.3 Technical data**

MODEL			RL 34 MZ	RL 44 MZ	RL 44 MZ
Type			976 T	977 T	978 T
Power (1) Output (1)	2 <sup>nd</sup> stage	kW	154 - 395	235 - 485	235 - 485
		Mcal/h	132 - 340	204 - 418	204 - 418
		kg/h	13 - 33.6	20 - 41	20 - 41
	1 <sup>st</sup> stage	kW	97 - 154	155 - 235	155 - 235
		Mcal/h	83 - 133	133 - 204	133 - 204
		kg/h	8.3 - 13	13 - 20	13 - 20
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	kWh/kg	11.86		
		Mcal/kg	10.2 (10.200 kcal/kg)		
	density	kg/dm <sup>3</sup>	0.82 - 0.85		
	viscosity at 20 °C	mm <sup>2</sup> /s max	6 (1.5 °E - 6 cSt)		
Kerosene	net calorific value	kWh/kg	11.97		
		Mcal/kg	10.3 (10.300 kcal/kg)		
	density	kg/dm <sup>3</sup>	0.77 - 0.83		
	viscosity at 20 °C	mm <sup>2</sup> /s max	6 (1.5 °E - 6 cSt)		
Operation			<ul style="list-style-type: none"> <li>Intermittent (min. 1 stop in 24 hours).</li> <li>Two-stage (high and low flame) and single-stage (all - nothing).</li> </ul>		
Nozzles		number	2		
Standard applications			Boilers: water, steam, diathermic oil		
Ambient temperature		°C	0 - 40		
Combustion air temperature		°C max	60		
Electrical supply		V	230 ~ +/-10%		230 - 400 with neutral ~ +/-10%
		Hz	50/60 - single-phase		50/60 - three-phase
Electric motor		rpm	2800	2800	2800
		W	300	420	450
		V	220 - 240	230	220/240 - 380/415
		A	2.4	2.65	2.0 - 1.2
Motor capacitor		µF/V	12.5/450	16/425	12.5/450
Ignition transformer		V1 - V2	230 V - 2 x 12 kV		
		I1 - I2	0.2 A - 30 mA		
Pump	output (at 12 bar)	kg/h	45		63
	pressure range	bar	7 - 15		7 - 15
	fuel temperature	°C max	60		60
Electrical power consumption		W max	600	700	750
Protection level			IP40		
Noise level (2)	Sound pressure	dB(A)	68		70
	Sound power		79		81

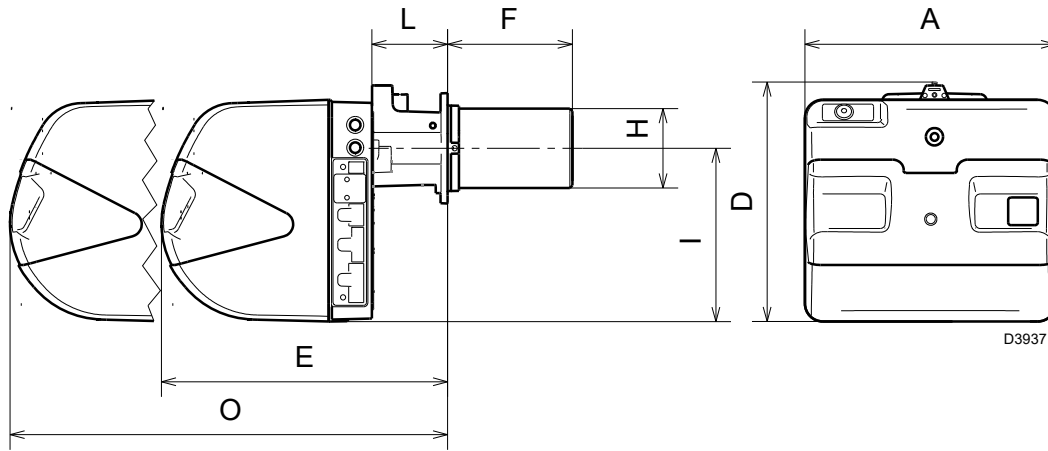
**Tab. A**

- (1) Reference conditions: Ambient temperature 20°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.
- (2) 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.

**4.4 Overall dimensions**

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, without casing, when open is given by measurement O.



**Fig. 1**

mm	A	D	E	F (1)	H	GB	L	O (1)
RL 34 MZ	442	422	508	216 - 351	140	305	138	780 - 915
RL 44 MZ	442	422	508	216 - 351	152	305	138	780 - 915

**Tab. B**

(1) Blast tube: short-long

**4.5 Firing rates**

The burners can work in two ways: one-stage and two-stage.

- **1st stage output** must be selected within area A of the adjacent diagrams.
- **2nd stage output** must be within area B. This supplies the maximum output of the burner according to the pressure in the combustion chamber.

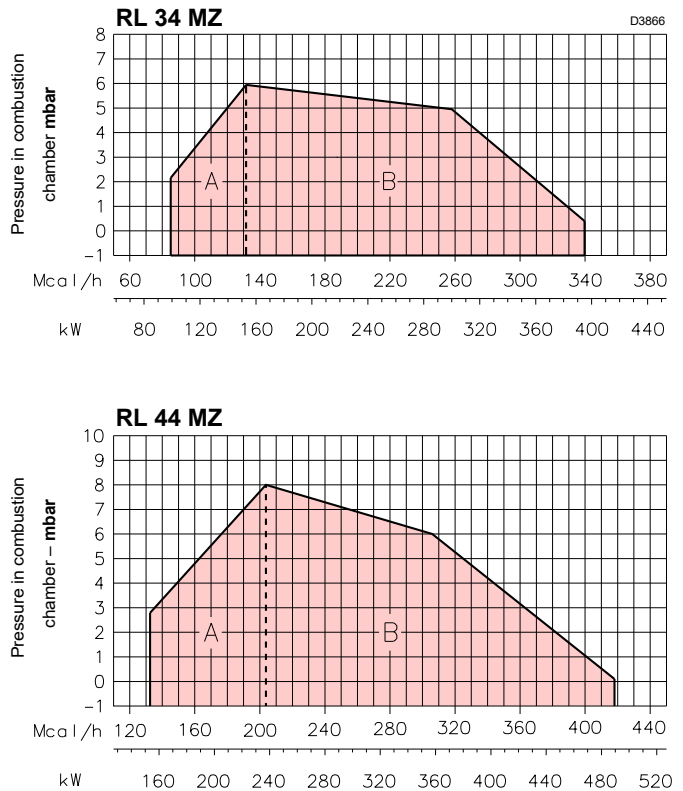
The work point may be found by plotting a vertical line from the desired delivery and a horizontal line from the pressure in the combustion chamber.

The intersection of these two lines is the work point which must lie within area B.



**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 page 18.



**Fig. 2**

4.6 Test boiler

The firing rate was 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 Output 35 kg/hour:**  
diameter = 50 cm; length = 1.5 m.

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

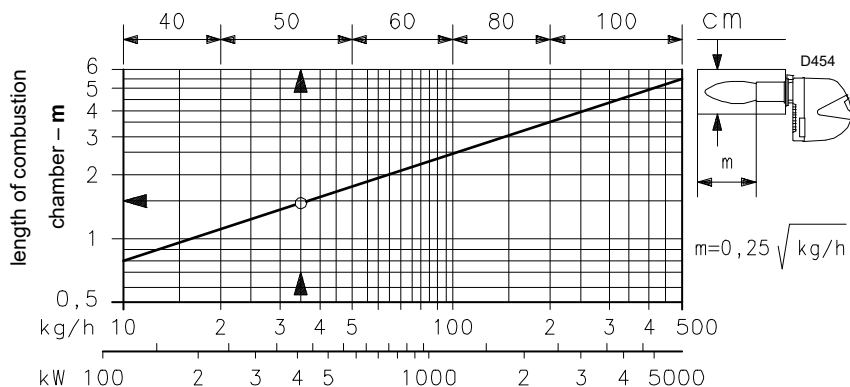


Fig. 3

4.7 Burner description

- 1 Ignition electrodes
- 2 Combustion head
- 3 Screw for combustion head adjustment
- 4 Photocell for flame presence control
- 5 Screw for fixing fan to flange
- 6 Slide bars for opening the burner and inspecting the combustion head
- 7 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.
- 8 1st and 2nd stage valve assembly
- 9 Pump
- 10 Plate prearranged to drill 4 holes for the passage of hoses and electrical cables.
- 11 Air inlet to fan
- 12 Fan pressure test point
- 13 Boiler mounting flange
- 14 Flame stability disk
- 15 Flame inspection window
- 16 Extensions for slide bars 6)
- 17 Motor contactor and thermal RELAY reset button (RL 44 MZ three-phase)
- 18 Motor capacitor (RL 34 -44 MZ single-phase)
- 19 Control box with lockout pilot light and lockout reset button
- 20 Two switches:  
- one "burner off - on"  
- one for "1st - 2nd stage operation"
- 21 Sockets for electrical connections
- 22 Air damper
- 23 Pump pressure adjustment
- 24 Plate prearranged to drill 2 holes for the passage of hoses.

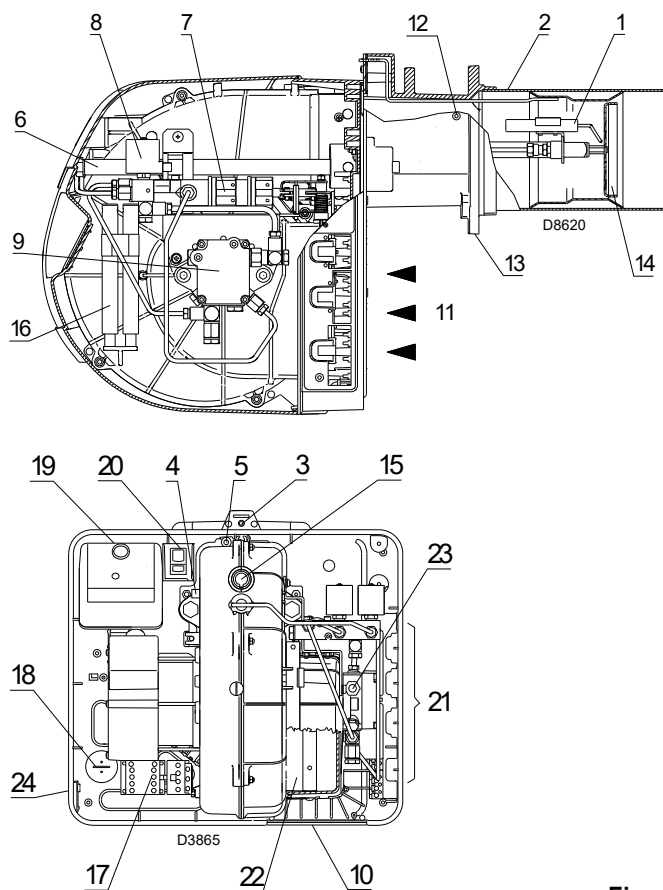


Fig. 4

Two types of burner failure may occur:

**Control box lockout:** if the control box 19)(Fig. 4) pushbutton (red led) lights up, it indicates that the burner is in lockout. To reset, hold the pushbutton down for between 1 and 3 seconds.

**Motor lockout (RL 44 MZ three-phase):** release by pressing the pushbutton on thermal relay 17)(Fig. 4).

### 4.8 Packaging - Weight

- The burners are shipped in cardboard boxes with the maximum dimensions shown in Tab. C.
- The weight of the burner complete with packaging is indicated in Tab. C.

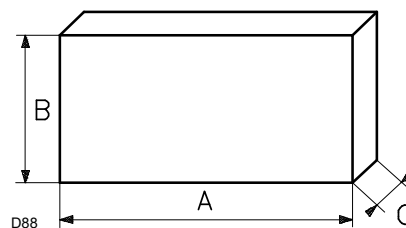


Fig. 5

mm	A	B	C	kg
RL 34 MZ	1000	500	485	32
RL 44 MZ	1000	500	485	33

Tab. C

### 4.9 Standard equipment

- 2 - Hoses
- 2 - Gaskets for hoses
- 2 - Nipples for hoses
- 1 - Thermal insulation screen
- 2 - Extensions 16)(Fig. 4 to page 11) for slide bars 6) (for model with 351 mm blast tube)
- 4 - Screws to secure the burner flange to the boiler: M8 x 25
- 2 - Plugs for electrical connections (RL 34 -44 MZ single-phase)
- 3 - Plugs for the electrical connection (RL 44 MZ three-phase)
- 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.

**5 Installation**

**5.1 Notes on safety for the installation**

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



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



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

**5.2 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.



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



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.





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

**Checking the characteristics of the burner**

Check the identification label of the burner, showing:

- the model (A)(Fig. 6) 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 fuel used and the relative supply pressures (G);
- the data of the burner's minimum and maximum output possibilities (H) (see Firing rate)

<b>R.B.L.</b>	<b>A</b>		
T I P O / T Y P / T Y P E	<b>B</b>	<b>C</b>	
N°	<b>D</b>	<b>F</b>	
	<b>E</b>	<b>H</b>	
<b>G</b>			
RIELLO S.p.A. I-37045 Legnago (VR)			

S8232

Fig. 6

### 5.4 Installer/Service notes for the use of Gas oil with Bio blends up to 10%

- During the burner installation, check that the gas oil 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 valve 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 short periods at least every three months.

### 5.5 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, page 28.



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

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

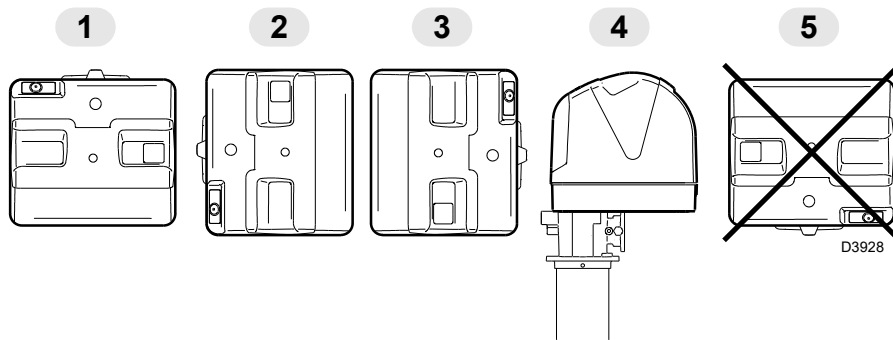
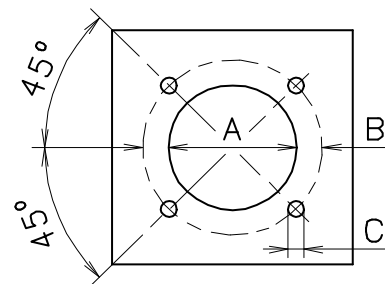


Fig. 7

### 5.6 Boiler plate

Drill the combustion chamber locking plate as shown in Fig. 8. The position of the threaded holes can be marked using the thermal screen supplied with the burner.



D455

Fig. 8

mm	A	B	C
RL 34 MZ	160	224	M 8
RL 44 MZ	160	224	M 8

Tab. D



### 5.7 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, is as follows:

Blast tube 7)(Fig. 9)	RL 34 MZ	RL 44 MZ
• short	216	216
• long	351	351

For boilers with front flue passes 10)(Fig. 9) or flame inversion chambers, protective fettling in refractory material 8) must be inserted between the boiler's fettling 9) and the blast tube 7).

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

For boilers having a water-cooled front the refractory fettling 8)-9)(Fig. 9) is not required unless it is expressly requested by the boiler manufacturer.

### 5.8 Securing the burner to the boiler

Dismantle the nozzle assembly 7)(Fig. 9) and the pipe coupling 5) from the burner 4):

- remove the screws 2) from the two slide bars 3);
- remove the screw 1) and move the burner on the guides 3);
- fix assembly 5) and 7) to the boiler plate and insert the supplied insulating gasket 6);

- use the four screws supplied after protecting the thread with antiseizing products.



The burner-boiler seal must be airtight

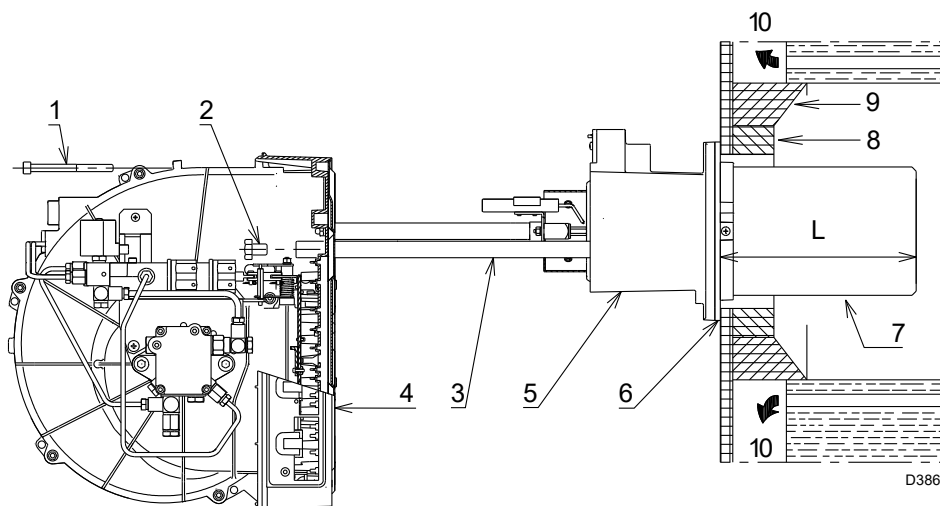


Fig. 9

#### 5.8.1 Shutter adjustment



The burner model RL 34 MZ leaves the factory already fitted to operate with gas oil.

In the event of operation with kerosene, it is necessary to draw the shutter 4) (Fig. 10) back by one hole compared with the standard position.

Proceed as follows:

- loosen the screws 1) and disassemble the blast tube 2);
- move the rod 3) from position A to position B, thereby drawing back the shutter 4).
- When the operation is completed, reassemble the blast tube 2) and retighten the screws 1).

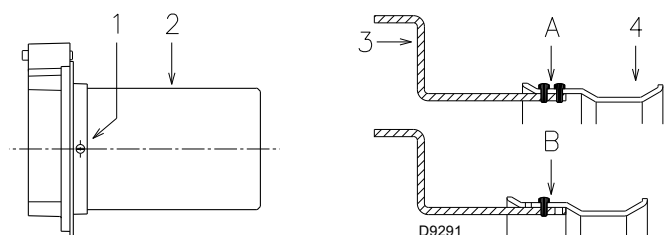


Fig. 10

### 5.9 Nozzle installation

#### 5.9.1 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.



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



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 and Tab. F.

**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 page 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;
- a delivery higher than 50% of the total delivery whenever the combustion during the 1st stage must be improved.

**Example** with RL 34 MZ (gas oil)

Boiler power = 270 kW - efficiency 90%

Power required by the burner =

$$270 : 0.9 = 300 \text{ kW}$$

$$300 : 2 = 150 \text{ kW per nozzle}$$

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

$$1^\circ = 3.00 \text{ GPH} - 2^\circ = 3.00 \text{ GPH},$$

or the following two different nozzles:

$$1^\circ = 2.50 \text{ GPH} - 2^\circ = 3.50 \text{ GPH},$$

or:

$$1^\circ = 3.50 \text{ GPH} - 2^\circ = 2.50 \text{ GPH}.$$

#### 5.9.2 Nozzles recommended

Model	Gas oil	Kerosene
RL 34 MZ	Delavan 60° A	Danfoss 60° S
RL 44 MZ	Delavan 45° A	Danfoss 60° S Delavan 45° A

#### Table nozzles - gas oil

GPH	kg/h (1)				kW 12 bar
	10 bar	12 bar	14 bar	12 bar	
1.00	3.9	4.3	4.7	51.0	
1.25	4.8	5.4	5.8	64.0	
1.50	5.8	6.5	7.0	77.0	
1.75	6.8	7.5	8.2	89.0	
2.00	7.7	8.5	9.2	100.8	
2.25	8.6	9.5	10.4	112.7	
2.50	9.6	10.6	11.5	125.7	
2.75	10.7	11.8	12.8	139.3	
3.00	11.5	12.7	13.8	150.6	
3.50	13.5	14.8	16.1	175.5	
4.00	15.4	17.0	18.4	201.6	
4.50	17.3	19.1	20.7	226.5	
5.00	19.2	21.2	23.0	251.4	
5.50	21.1	23.3	25.3	276.3	
6.00	23.1	25.5	27.7	302.4	

**Tab. E**

- (1) We get the indicated delivery when both nozzles are working and gas oil has the following characteristics: density 0.84 kg/dm<sup>3</sup> - viscosity 4.2 cSt/20 °C - temperature 10 °C.

#### Table nozzles - Kerosene

GPH	kg/h (1)			kW 10 bar
	8 bar	9 bar	10 bar	
1.25	3.66	3.90	4.12	49.3
1.35	3.95	4.21	4.45	53.3
1.5	4.39	4.68	4.95	59.3
1.65	4.83	5.14	5.44	65.1
1.75	5.12	5.45	5.77	69.0
2.00	5.85	6.23	6.60	79.0
2.25	6.58	7.01	7.42	89.0
2.50	7.31	7.79	8.25	99.0
2.75	8.04	8.57	9.07	108.6
3.00	8.77	9.35	9.90	118.6
3.25	9.51	10.13	10.72	128.4
3.50	10.24	10.91	11.55	138.3
4.00	11.70	12.47	13.20	158.0
4.50	13.16	14.03	14.85	177.8
5.00	14.62	15.58	16.50	197.6
5.50	16.09	17.14	18.15	217.4
6.00	17.55	18.70	19.80	237.1
6.50	19.01	20.26	21.44	256.8
7.00	20.47	21.82	23.09	276.5
7.50	21.94	23.38	24.74	296.3

**Tab. F**

- (1) We get the indicated delivery when both nozzles are working and gas oil has the following characteristics: density 0.81 kg/dm<sup>3</sup> - viscosity 1.6 cSt/20 °C - temperature 25 °C.

### 5.9.3 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. 11) (16 mm), after having removed the plastic plugs 2)(Fig. 11), 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 nozzle 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. 12)

Make sure that the electrodes are positioned as shown in (Fig. 12).



Place the electrode on the ignition pilot observing the dimensions specified in Fig. 12.

Finally remount the burner 4)(Fig. 13) to the slide bars 3) 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 2) on the slide bars 3) and screw 1) that attaches 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:

- Open the burner on its guides as shown in (Fig. 8 on page 14).
- Remove the nuts 1) (Fig. 14) and the diffuser disc assembly 2)
- Use spanner 3) (Fig. 14) to change the nozzles.

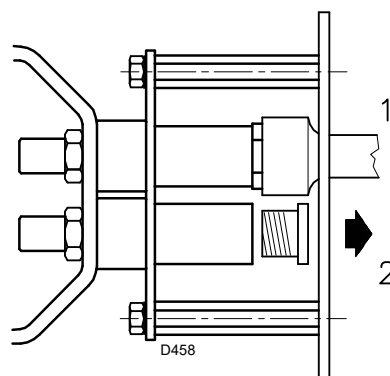


Fig. 11

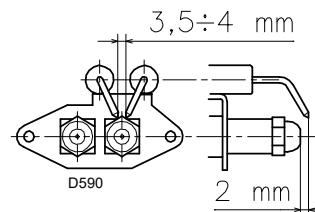


Fig. 12

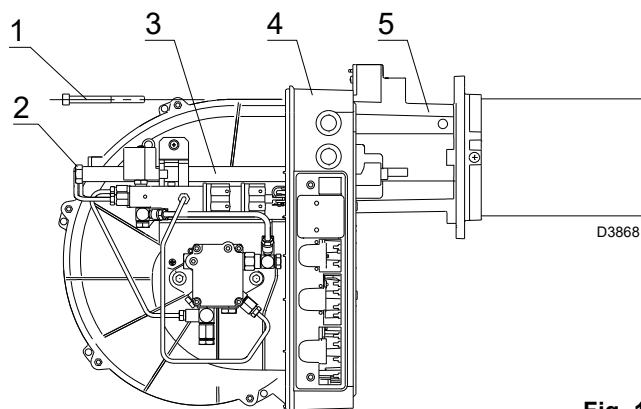


Fig. 13

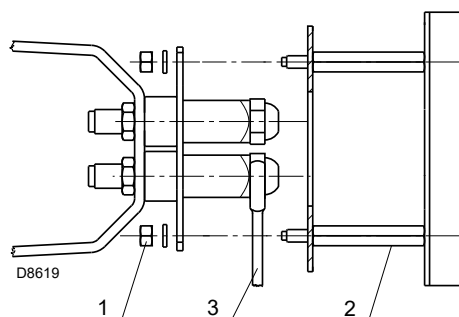


Fig. 14

**5.10 Combustion head adjustment**

At this point of the installation, nozzle and pipe coupling are fixed to the boiler as in (Fig. 9 on page 15). The setting of the combustion head depends exclusively on the output of the burner in the 2nd stage - in other words, the combined output of the two nozzles selected on page 16 is a particularly simple operation.

Turn screw 1)(Fig. 15) until the notch on the sheet 2)(Fig. 15) is level with the plate 3)(Fig. 15).

The RL 34 MZ Model with two 3.00 GPH nozzles and 12 bar pump pressure.

Find the delivery of the two 3.00 GPH nozzles in (Tab. E on page 16):

$$12.7 + 12.7 = 25.4 \text{ kg/h}$$

(corresponding to 300 kW).

Diagram (Fig. 16) shows that for an output of 25.4 kg/h the burner RL 44 MZ needs a combustion head notch regulation 3.

**NOTE:**

**If the pressure in the chamber is equal to 0 mbar, the air must be adjusted with reference to the hatched line on the diagram (Fig. 16).**

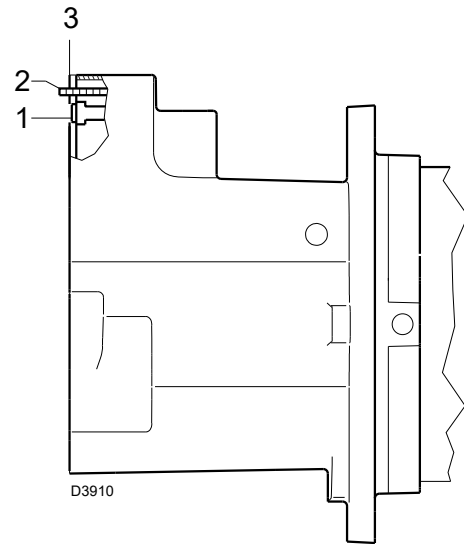
Once the regulation of the head has been concluded, refit the burner 4) (Fig. 9 on page 15) on the guides 3) (Fig. 9 on page 15) at approximately 100 mm from the pipe coupling 5) (Fig. 9 on page 15), insert the electrode cables and then slide the burner as far as the pipe coupling.

Replace the screws 2) (Fig. 9 on page 15) on the guides 3) (Fig. 9 on page 15).

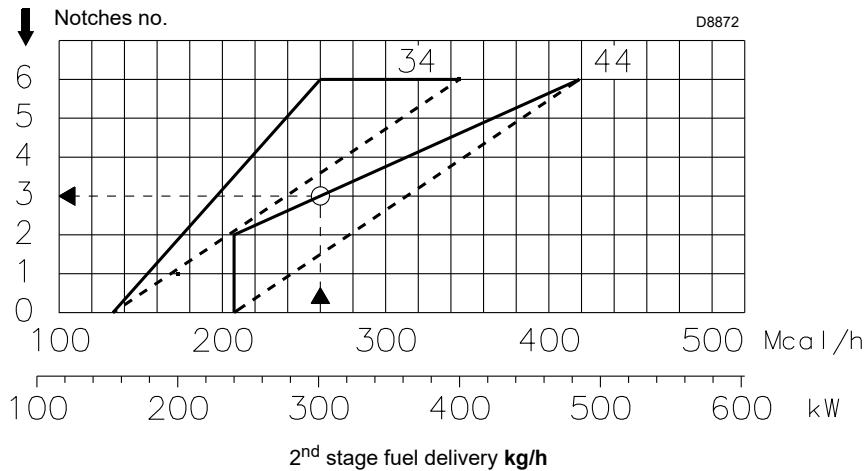
Fix the burner to the pipe coupling with the screw 1) (Fig. 9 on page 15).



On closing the burner on the two guides it is advisable to gently pull the high voltage wires outwards until they are under slight tension.



**Fig. 15**



**Fig. 16**

**6 Hydraulic system**

**6.1 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. 17 - Fig. 18) 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.

**6.1.1 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. 17)**

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. 17)**

Pump depression values higher than 0.4 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.

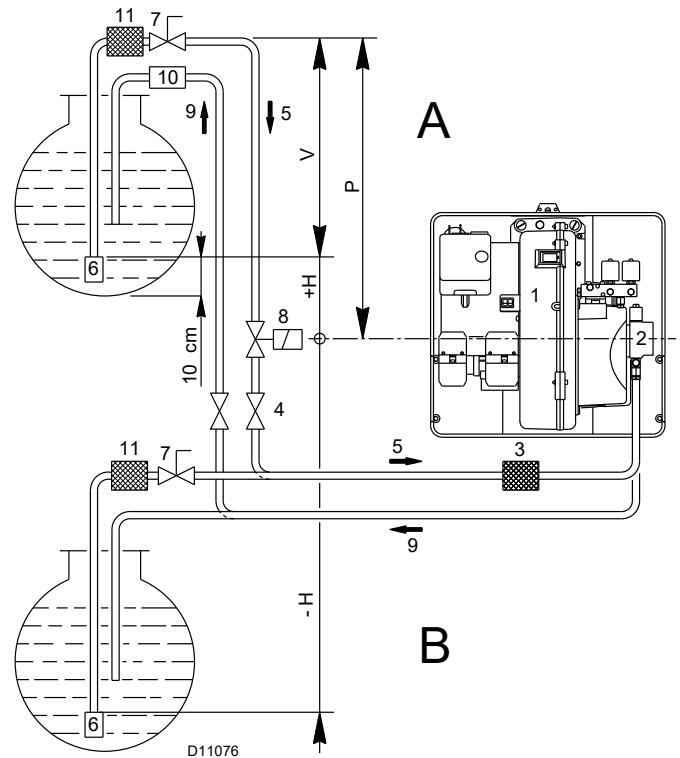
It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be less probable that the suction line fails to prime or stops priming.

**6.1.2 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 Tab. G.



**Fig. 17**

Key (Fig. 17)

- H Pump/Foot valve height difference
- L Piping length
- ∅ 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 (meters)	L (meters)		
	∅ 8 mm	∅ 10 mm	∅ 12 mm
+ 4.0	51	100	100
+ 3.0	45	100	100
+ 2.0	39	95	100
+ 1.0	33	80	100
+ 0.5	29	72	100
0	26	64	100
- 0.5	23	57	100
- 1.0	20	49	100
- 2.0	14	34	70
- 3.0	8	18	38
- 4.0	-	-	6

**Tab. G**

### 6.1.3 Single-pipe circuit

In order to obtain single-pipe working it is necessary to unscrew the return hose, remove the by-pass screw 6)(Fig. 29) and then screw the plug 7)(Fig. 29).

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. 20) in order to bleed off the air contained in the suction line and wait until the fuel flows out.

Key (Fig. 18)

H Pump/Foot valve height difference

L Piping length

∅ 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

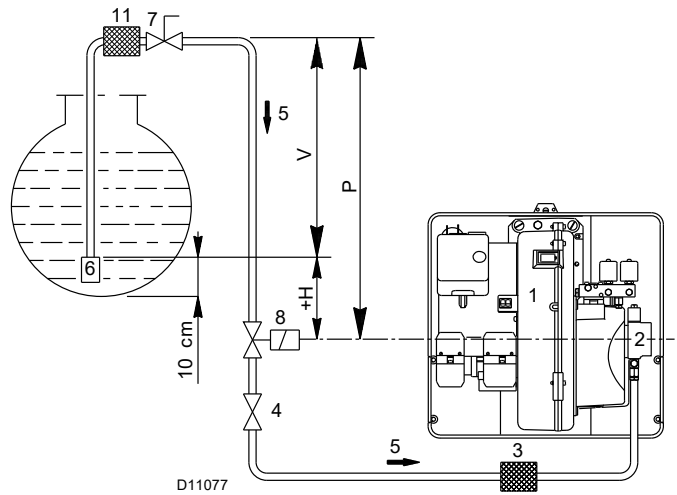


Fig. 18

+/- H (meters)	L (meters)		
	∅ 8 mm	∅ 10 mm	∅ 12 mm
+ 4.0	51	100	100
+ 3.0	45	100	100
+ 2.0	39	95	100
+ 1.0	33	80	100
+ 0.5	29	72	100

Tab. H

### 6.2 Hydraulic connections

The pumps are equipped with a by-pass that connects return line with suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(Fig. 29 on page 27).

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



WARNING

The pump will break down 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.



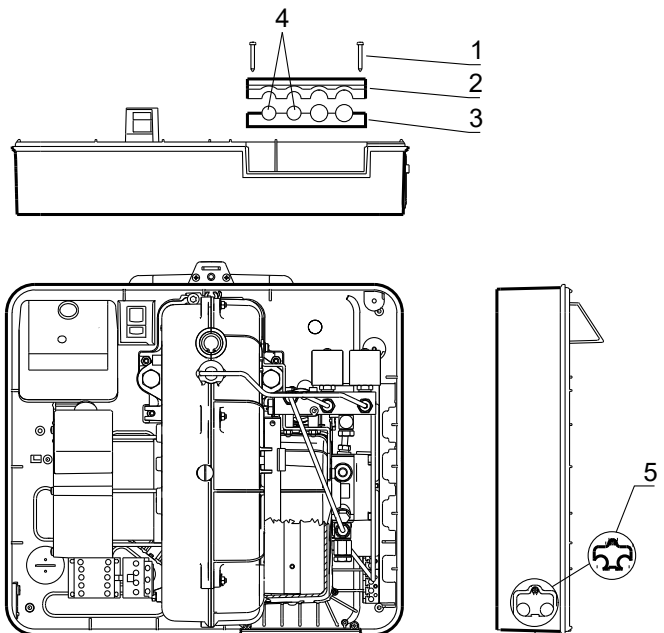
WARNING

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

Pass the hoses through the holes on the left-hand plate 5) (Fig. 19), removing the thin diaphragm that closes the two holes or as per the following instructions: unscrew the screws 1), now divide the insert piece into its two parts 2) and 3) and remove the thin diaphragm blocking the two passages 4).

Install the hoses where they cannot be stepped on or come into contact with hot surfaces of the boiler.

Now connect the other end of the hoses to the supplied nipples, using two wrenches, one to hold the nipple steady while using the other one to turn the rotary union on the hose.



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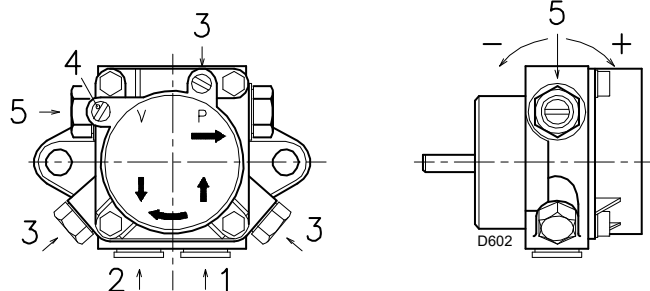
Fig. 19

**6.3 Pump**



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 34 MZ - PUMP SUNTEC ANV 57 CK**  
**RL 44 MZ - PUMP SUNTEC ANV 67 CK**



**Fig. 20**

Key (Fig. 20)

- 1 - Suction line G 1/4"
- 2 - Return line G 1/4"
- 3 - Gauge connection G 1/8"
- 4 - Vacuometer connection G 1/8"
- 5 - Pressure adjustment screw

**6.3.1 Technical data**

- A - Min. delivery rate at 12 bar gas oil pressure
- B - Delivery pressure range
- C - Max. suction depression
- D - Viscosity range
- E - Fuel max. temperature
- F - Max. suction and return pressure
- G - Pressure calibration in the factory
- H - Filter mesh width

		<b>ANV 57 CK</b>	<b>ANV 67 CK</b>
A	kg/h	45	63
B	bar	7 - 15	7 - 15
C	bar	0.45	0.45
D	cSt	1 - 12	1 - 12
E	°C	60	60
F	bar	2	2
G	bar	12	12
H	mm	0.15	0.15

**Tab. I**

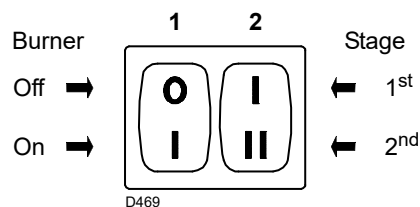
**6.3.2 Pump priming**



**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. 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. 21) 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 gas oil starts coming out of the screw 3).
- Stop the burner: switch 1)(Fig. 21) set to "OFF" and tighten the screw 3).



**Fig. 21**

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.

And so on. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

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



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.

## 7 Electrical system

### 7.1 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 control box 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.

Use flexible cables in compliance with the EN 60 335-1 standard.



**7.2 Electrical wiring**

All the cables to be connected to the burner are fed through the grommets (Fig. 22).

The use of the grommets can take various forms; by way of example we indicate the following mode:

**RL 34 - 44 MZ single phase**

- 1- 7 pole socket for single phase power supply, thermostat/pressure switch TL
- 2- 4 pole socket, thermostat/pressure switch TR
- 3- 5 pole socket
- 4- 2 pole socket for remote control box reset accessory
- 5 - 5A Housing for the nozzles  
(Drill if 5A nozzles are required)

**RL 44 MZ three-phase**

- 1- 7 pole socket for single-phase power supply, thermostat/pressure switch TL
- 2- 4 pole socket, thermostat/pressure switch TR
- 3- 5 pole socket for three phase supply
- 4- 2 pole socket for remote control box reset accessory
- 5 - 5A Housing for the nozzles (Drill if 5A nozzles are required)

**NOTE**

- The RL 44 MZ three-phase model leaves the factory with provision for a **400V** power supply. If **230V** power supply is used, change the motor connection from star to delta and change the setting of the thermal relay as well.
- The burners RL 34 - 44 MZ leave the factory ready for two-stage functioning and must therefore be connected to the thermostat/pressure switch TR.

Alternatively, if single stage operation is required, instead of thermostat/pressure switch TR install a jumper lead between terminals T6 and T7 of plug X4.

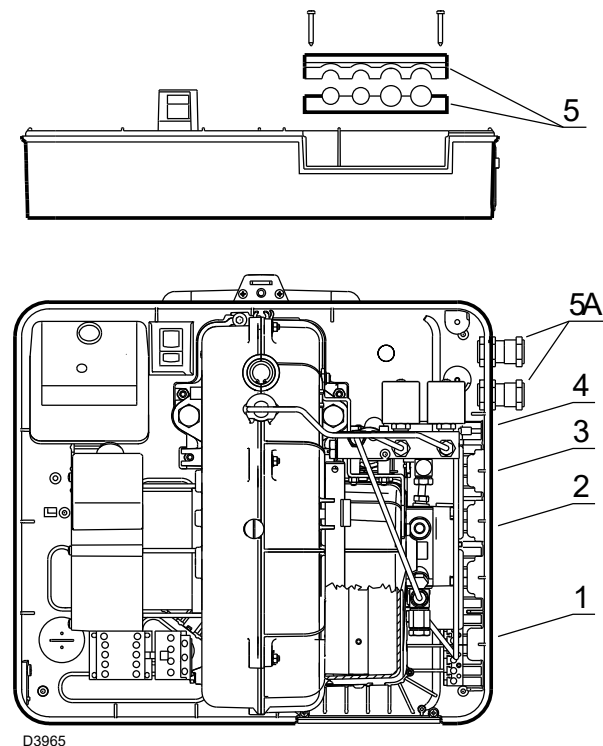


Fig. 22

**7.3 Thermal relay calibration (RL 44 MZ three phase)**

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

If the motor is star-powered, **400V**, the cursor should be positioned at "MIN".

If the motor is delta-powered, **230V**, the cursor should be positioned at "MAX".

Even if the scale of the thermal relay does not include rated motor input power at 400V, protection is still ensured in any case.

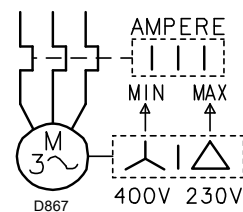


Fig. 23

**8 Start-up, calibration and operation of the burner**

**8.1 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.

**8.2 Burner calibration**



Qualified personnel with the right instruments must handle the burner's start-up.

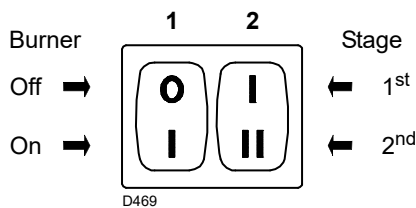
**8.2.1 Firing**

Set switch 1)(Fig. 24) 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 lockout 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 page 31: causes 34 to 42.



**Fig. 24**

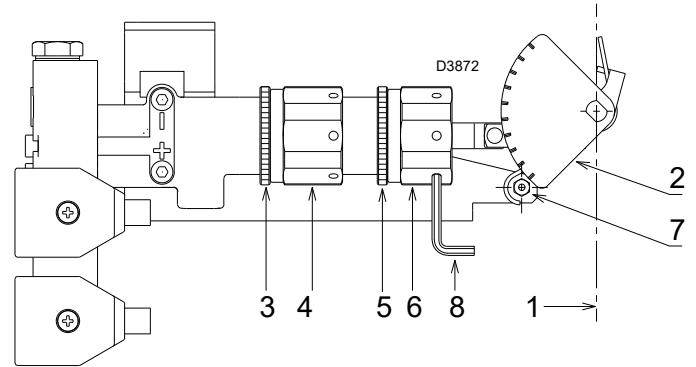
**• 1st stage fan air gate valve**

Keep the burner operating at 1st stage by setting the switch 2) (Fig. 24) to the 1st stage position.

Opening of the air gate valve 1)(Fig. 25) must be adjusted in proportion to the selected nozzle: the index 7)(Fig. 25) must be aligned with the specified in (Tab. J).

This adjustment is achieved by turning the hex element 4):

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



**Fig. 25**

**8.2.2 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 page 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 is only possible if the room temperature is above 0 °C. Never fall below 10 bar: at which pressures the cylinders may have difficulty in opening;

**14 bar:** in 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 screw 5)(Fig. 20 on page 21).

**• Pump pressure (kerosene)**

**10 bar:** maximum pressure for kerosene.

**1st stage**

**Gas oil**

RL 34 MZ		RL 44 MZ	
GPH	$\alpha$	GPH	$\alpha$
2.25	20	3.00	30
2.50	23	3.50	31
3.00	27	4.50	36
3.25	30	5.00	42
3.50	33	-	-
4.00	37	-	-
4.50	40	-	-

**Kerosene**

RL 34 MZ		RL 44 MZ	
kg/h	mbar	kg/h	mbar
13	2.4	4.5	30
16	3.2	4.5	31
20	3.8	5.5	35
25.5	4.0	6.0	42
30	4.5	-	-
34	5.9	-	-

**Tab. J**

$\alpha$  = Notch Nr.

**Example:**

RL 44 MZ - 1st stage nozzle 3.00 GPH:  
notch 22° aligned with index 7 (Fig. 25).

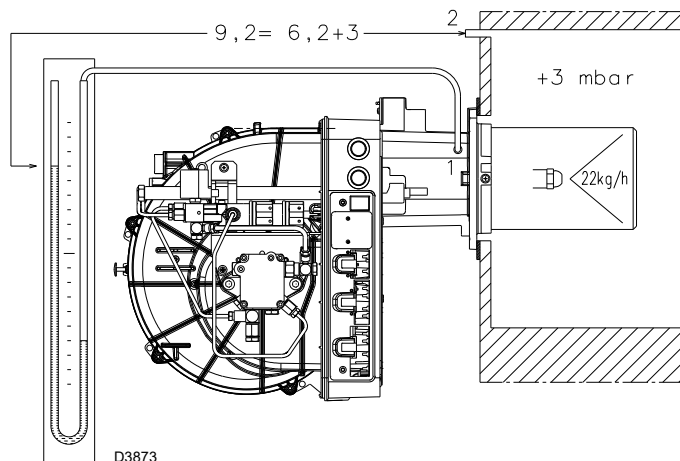
When the adjustment is terminated lock the hex element 4) with the ring nut 3).

• **2nd stage fan air damper valve**

Set switch 2) (Fig. 24) to the 2nd stage position and adjust the air gate valve 1) (Fig. 25) by turning the hex element 6), after having loosened the ring nut 5).

Air pressure at attachment 1) (Fig. 26) must be approximately the same as the pressure specified in (Tab. K) plus the combustion chamber pressure measured at attachment 2).

Refer to the example in the Fig. 26.



**Fig. 26**

**NOTE:**

in order to facilitate adjustment of hex elements 4) and 6) (Fig. 25 on page 24), use a 3 mmc Allen key 8) (Fig. 25 on page 24).

**2nd stage**

**Gas oil**

RL 34 MZ		RL 44 MZ	
kg/h	mbar	kg/h	mbar
13	5.4	20.1	4.1
14	5.6	29	6.35
16	5.7	35	6.9
18	5.9	41.3	7.9
20	6.0	-	-
22	6.2	-	-
24	6.4	-	-
26	6.6	-	-
28	6.7	-	-
30	6.9	-	-
32	7.0	-	-
34	7.1	-	-

**Kerosene**

RL 34 MZ		RL 44 MZ	
kg/h	mbar	kg/h	mbar
13	2.4	20.1	4.1
16	3.2	28.4	6.15
20	3.8	33.9	7.5
25,5	4.0	41.35	7.8
30	4.5	-	-
34	5.9	-	-

**Tab. K**

mbar = Air pressure in 1) with zero pressure in 2)

**8.3 Burner operation**

**8.3.1 Burner starting**

Starting phases with progressive time intervals shown in seconds:

- Control device TL closes.
- After about 3s:
- **0 s** : The control box starting cycle begins.
- **2 s** : The fan motor starts.
- **3 s** : 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), de-energized, close the passage to the nozzles.
- **22 s** : The solenoid valves open 8); 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.
- **29 s** : The ignition transformer switches off.
- **36 s** : 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.

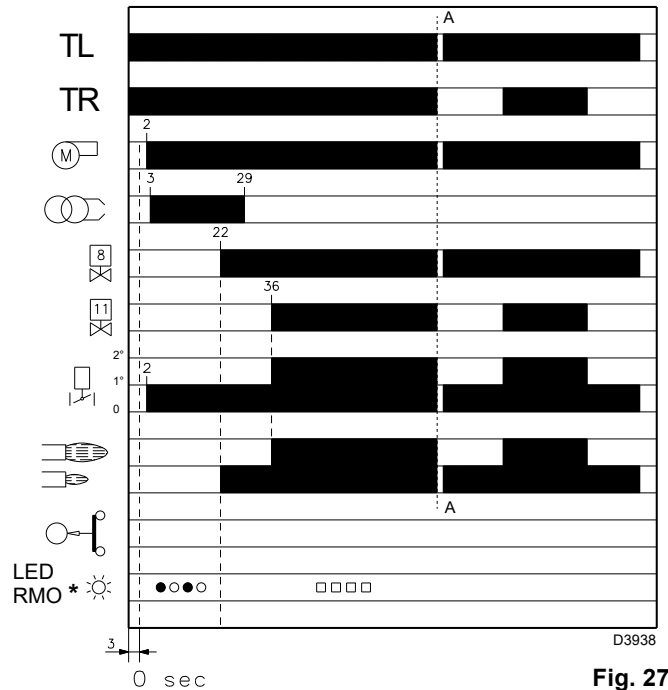
**8.3.2 Firing failure**

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

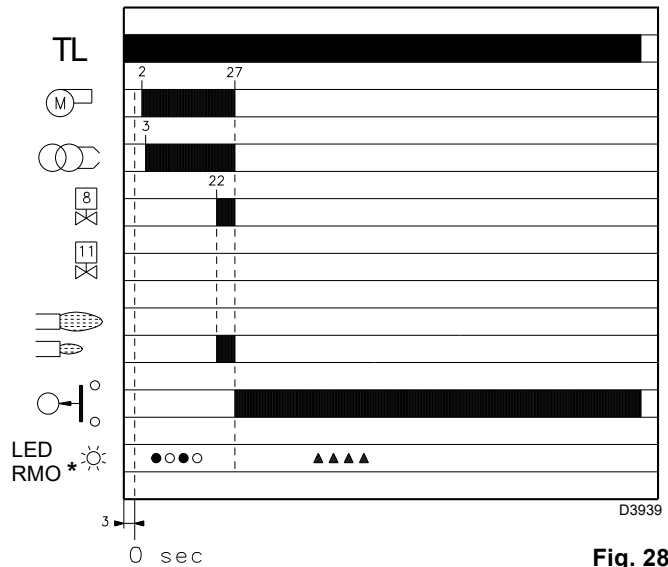
The control box red pilot light will light up.

**8.3.3 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.



**Fig. 27**



**Fig. 28**

\* ○ Off ● Yellow □ Green ▲ Red  
For further details see page 30.

**8.4 Steady state operation**

**8.4.1 System equipped with one control device TR**

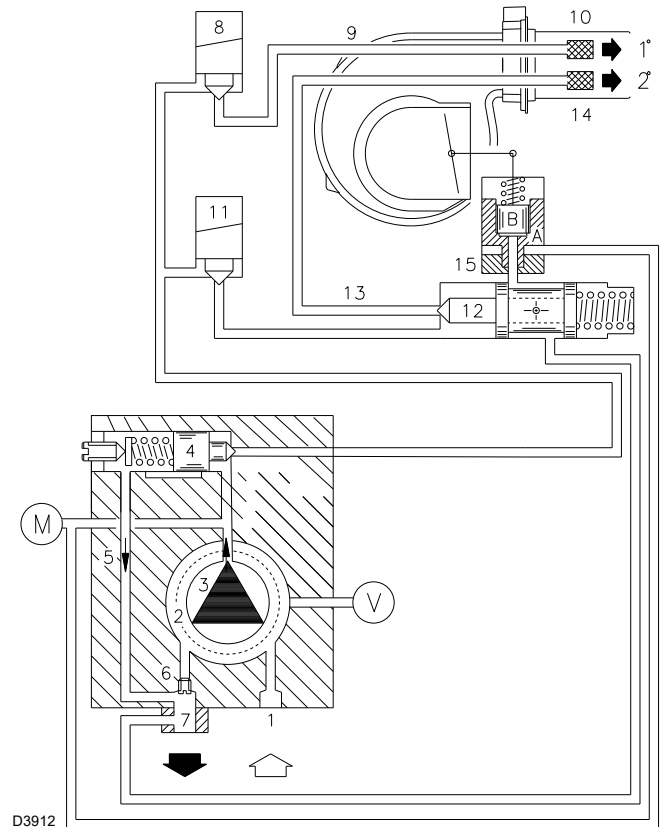
Once the starting cycle has come to an end, the command of the 2nd stage solenoid valve passes on to the control device TR that controls boiler temperature or pressure.

- 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 remote control device TL opens, solenoid valve 8) closes, the flame immediately goes out. The fan's air damper valve closes completely.

**8.4.2 System 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).



**Fig. 29**

**8.5 Final checks**

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

### 9 Maintenance

#### 9.1 Notes on safety for the maintenance

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

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



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.

#### 9.2 Maintenance programme

##### 9.2.1 Maintenance frequency

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

##### 9.2.2 Checking and cleaning

###### 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 gauge 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.

Delivery pressure must correspond with the table on Tab. J on page 24. please check that the supply line and filters are clear. The use of a pump vacuum gauge will assist in this. This measure permits the cause of the anomaly to be traced to either the suction line or the pump.

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

###### 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 bio fuel 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.

###### Filters (Fig. 30)

Check the following filter baskets:

- on line 1)
- in the pump 2)
- at the nozzle 3), and 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.

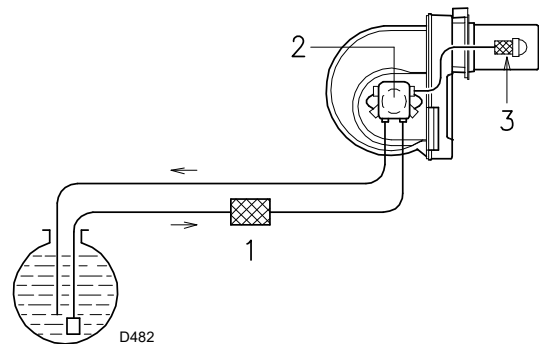


Fig. 30

###### 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.

###### Photocell

Clean the glass cover from any dust that may have accumulated. To extract the photocell 4)(Fig. 4 to page 11) pull it outward forcefully it is only pressed in.

###### 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.

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

The change of nozzle requires the combustion to be controlled.

**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 gas oil containing Bio diesel is in use. If in doubt about how to achieve this then please contact the fuel or oil tank supplier.

**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.

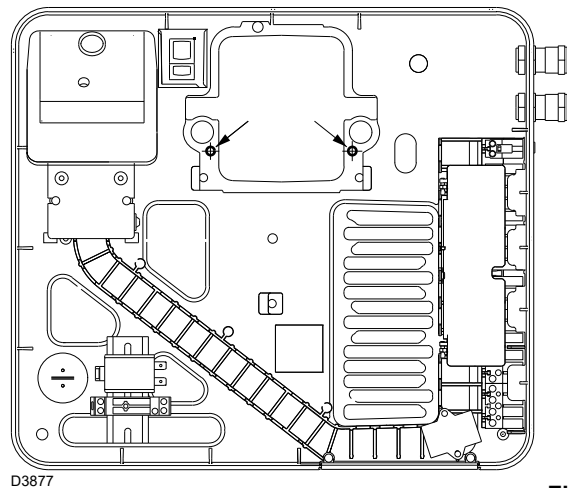
**9.2.3 Maintenance of the electrical panel**

If it is necessary to maintain the electrical panel A)(Fig. 33) it is possible just to remove the fan assembly B)(Fig. 33) to get better access to the electrical components.

With the burner open as in Fig. 33, disconnect the electrode cables and remove the head unit 8)(Fig. 33) by undoing the two screws 9)(Fig. 33).

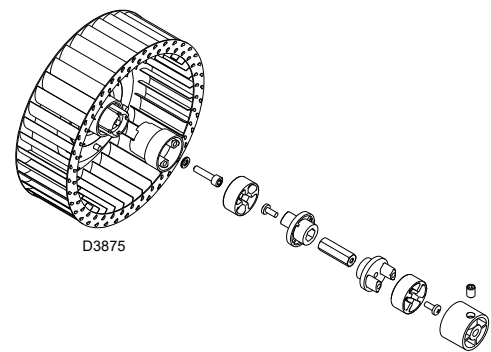
Disconnect the cables relative to the fan motor, remove the 3 screws 10)(Fig. 33) on the protective sheet and the two screws 11)(Fig. 33) and slide out the fan assembly B)(Fig. 33) from the guides 4) - 5)(Fig. 33).

Finally it is possible to use 2 of the 3 screws 10)(Fig. 33) to fix the electrical panel to the pipe coupling in the points indicated on Fig. 31, and then perform the maintenance operations.



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**Fig. 31**



**Fig. 32**

**9.2.4 Possible pump and/or coupling replacement**

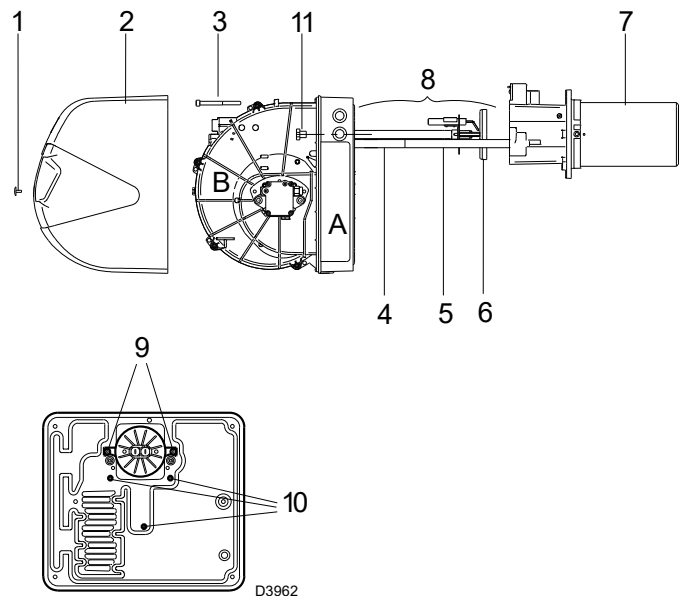
Carry out the fitting following the instructions in the Fig. 32.

**9.3 Opening the burner**



**Disconnect the electrical supply from the burner.**

- Remove screw 1)(Fig. 33) and withdraw the casing 2);
- unscrew screw 3);
- fit the two extensions 4), on the burner, on the guides 5) (model with nozzle 351 mm);
- pull part A backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).



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**Fig. 33**

**9.4 Closing the burner**

Refit following the steps described but in reverse order; refit all burner components as they were originally assembled.

**9.5 Burner start-up cycle diagnostics**

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

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. L

**9.6 Resetting the control box and using diagnostics**

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

**9.6.1 Resetting the control box**

- To reset the control box, 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.

**9.6.2 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 page 31.

BUTTON PRESSED FOR	CONTROL BOX STATUS
Between 1 and 3 seconds	Control box 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 control box identifies the possible types of malfunction, which are listed in the table on page 31.



In the event of a burner lockout, more than two consecutive burner reset operations could cause damage to the installation. On the third lockout, contact the Aftersales Service.



If further lockouts or burner faults occur, interventions must only be made by qualified, authorised personnel (as indicated in this manual, and in compliance with the laws and regulations currently in force).



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

SIGNAL	FAULT	POSSIBLE CAUSE	SOLUTION
	The burner does not pass to 2nd stage	43 - Control device TR does not close . . . . . 44 - Defective control box . . . . . 45 - 2nd stage sol. valve coil defective . . . . . 46 - Piston jammed in valve unit . . . . .	Adjust or replace Replace Replace Replace entire unit
	Fuel passes to 2nd stage but air remains in 1st	47 - Low pump pressure . . . . . 48 - 2nd stage operation of cylinder is faulty. . .	Increase Change cylinder
	Burner stops at transition between 1st and 2nd stage. Burner repeats starting cycle.	49 - Nozzle dirty . . . . . 50 - Photocell dirty. . . . . 51 - Excess air. . . . .	Renew nozzle Clean Reduce
	Uneven fuel supply	52 - Check if cause is in pump or fuel supply system	Feed burner from tank 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 . . . . . - Depression value too high (higher than 35 cm Hg): 55 - Tank/burner height difference too great . . . 56 - Piping diameter too small. . . . . 57 - Suction filters clogged . . . . . 58 - Suction valves closed. . . . . 59 - Paraffin solidified due to low temperature .	Tighten connectors Feed burner with loop circuit Increase Clean Open Add additive to fuel
	Pump unprimes after prolonged pause	60 - Return pipe not immersed in fuel. . . . . 61 - Air enters suction piping. . . . .	Bring to same height as suction pipe Tighten connectors
	Pump leaks fuel	62 - Leakage from sealing organ. . . . .	Replace pump
	Smoke in flame - dark Bacharach  - yellow Bacharach	63 - Not enough air . . . . . 64 - Nozzle worn or dirty . . . . . 65 - Nozzle filter clogged . . . . . 66 - Erroneous pump pressure . . . . . 67 - Flame stability disc dirty, loose, or deformed 68 - Boiler room air vents insufficient . . . . . 69 - Too much air. . . . .	Adjust head and fan air damper, see page 18 and page 24 Replace Clean or replace Adjust to between 10 - 14 bar Clean, tighten in place, or replace Increase Adjust head and fan air damper, see page 18 and page 24
	Dirty combustion head	70 - Nozzle or filter dirty . . . . . 71 - Unsuitable nozzle delivery or angle . . . . . 72 - Loose nozzle . . . . . 73 - Impurities on flame stability spiral . . . . . 74 - Erroneous head adjustment or not enough air 75 - Blast tube length unsuited to boiler . . . . .	Replace See recommended nozzles, page 16 Tighten Clean Adjust, see page 18 and page 24; open gate valve Contact boiler manufacturer
10 pulses ●●●●● ●●●●●		76 - Connection or internal fault . . . . . 77 - Presence of electromagnetic disturbance .	Use the radio disturbance protection kit

## A Appendix - Accessories (optional)

### LONG COMBUSTION HEAD KIT

Burner	Code
<b>RL 34</b>	3010426
<b>RL 44</b>	3010425

### CLEAN CONTACT KIT

Burner	Code
<b>RL 34 - 44</b>	3010419

### 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 control box and the burner.

Burner	Code
<b>RL 34 - 44</b>	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 de-pressurisation 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 units are provided in two versions:

Burner	Code
<b>RL 34 - 44</b> (without filter)	20034277
<b>RL 34 - 44</b> (with filter)	20034281

### Degassing unit characteristics

Burner output	80 kg/h max
Fuel pressure	0.7 bar max
Ambient temperature	40 °C max
Fuel temperature	40 °C max
Attachment connectors (without filter)	FF G 1/4 tank side FM G 3/8 conic burner side
Attachment connectors (with filter)	FF G 3/8 tank side FM G3/8 conic burner side

### SPACER KIT

If the burner head penetration into the combustion chamber needs reducing, varying thickness spacer is available:

Burner	Spacer Thickness (mm)	Code
<b>RL 34 - 44</b>	90	3010095

### CONNECTION FLANGE KIT

A kit is available for use where the burner opening on the boiler is of excessive diameter

Burner	Code
<b>RL 34 - 44</b>	3010138

### SOUND PROOFING BOX

If noise emission needs reducing even further, sound-proofing boxes is available:

Burner	Box type	Average noise [dB(A)](*)	Code
<b>RL 34 - 44</b>	C1/3	10	3010403

### VOLT FREE CONTACT KIT

A volt free contact kit is available for installation onto the burner. It can be used for a remote interface between burner operating signals. Every burner can be equipped with a single kit to remote the flame presence signal and the burner lockout indication.

Burner	Code
<b>RL 34 - 44</b>	3010419

### PC INTERFACE KIT

To connect the control box to a personal computer for the transmission of operation, fault signals and detailed service information, an interface adapter with PC software IS available.

Burner	Code
<b>RL 34 - 44</b>	3002719

### GROUND FAULT INTERRUPTER KIT

A "Ground fault interrupter kit" is available as a safety device for electrical system fault.

Burner	Code
<b>RL 34 - 44</b>	3010448

### POST-VENTILATION KIT

To have 20 s ventilation after opening of thermostats chain, a special kit is available.

Burner	Code
<b>RL 34 - 44</b>	3010453

### HOURS COUNTER KIT

To measure the burner working time a hours counter kit is available.

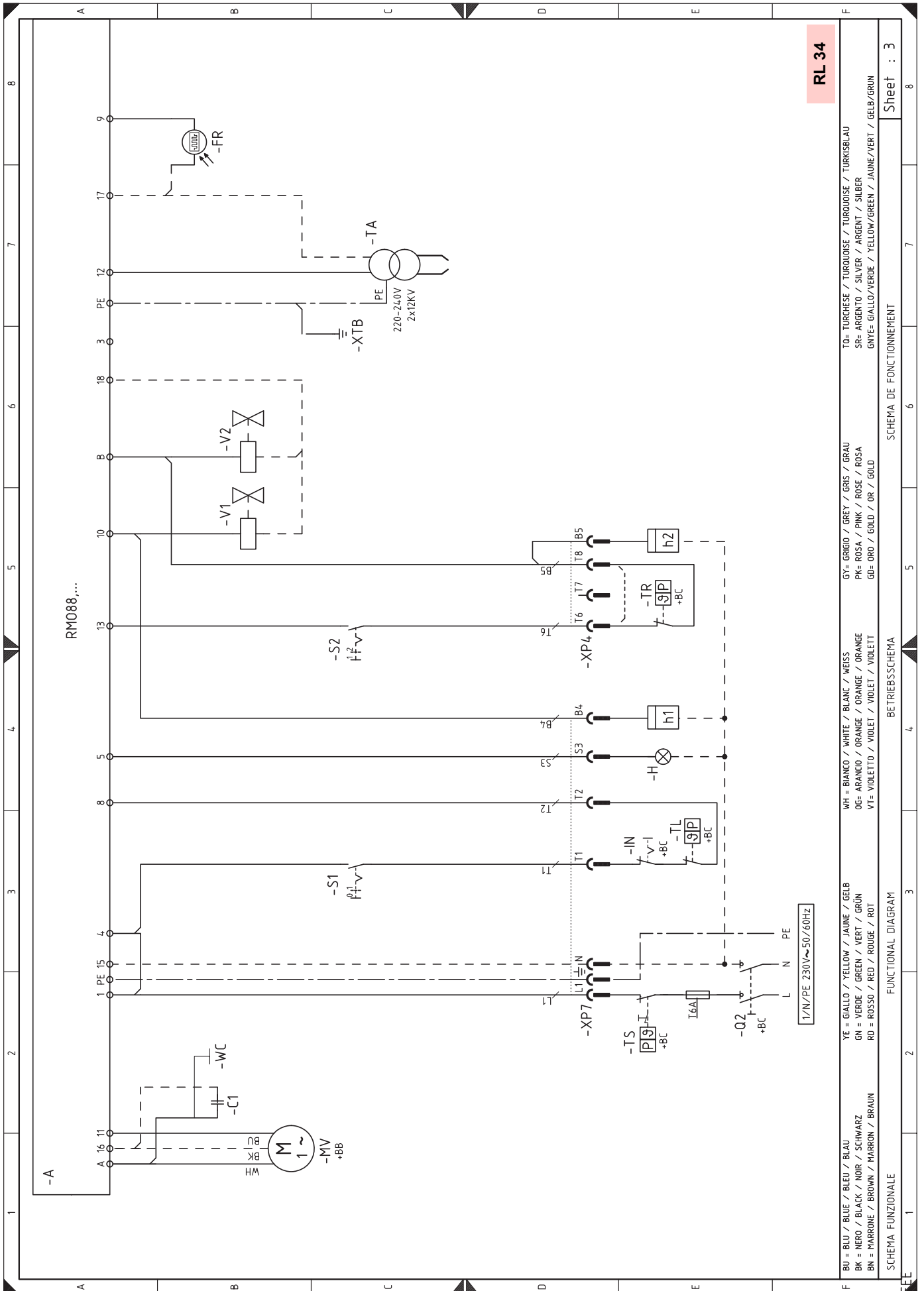
Burner	Code
<b>RL 34 - 44</b>	3010450

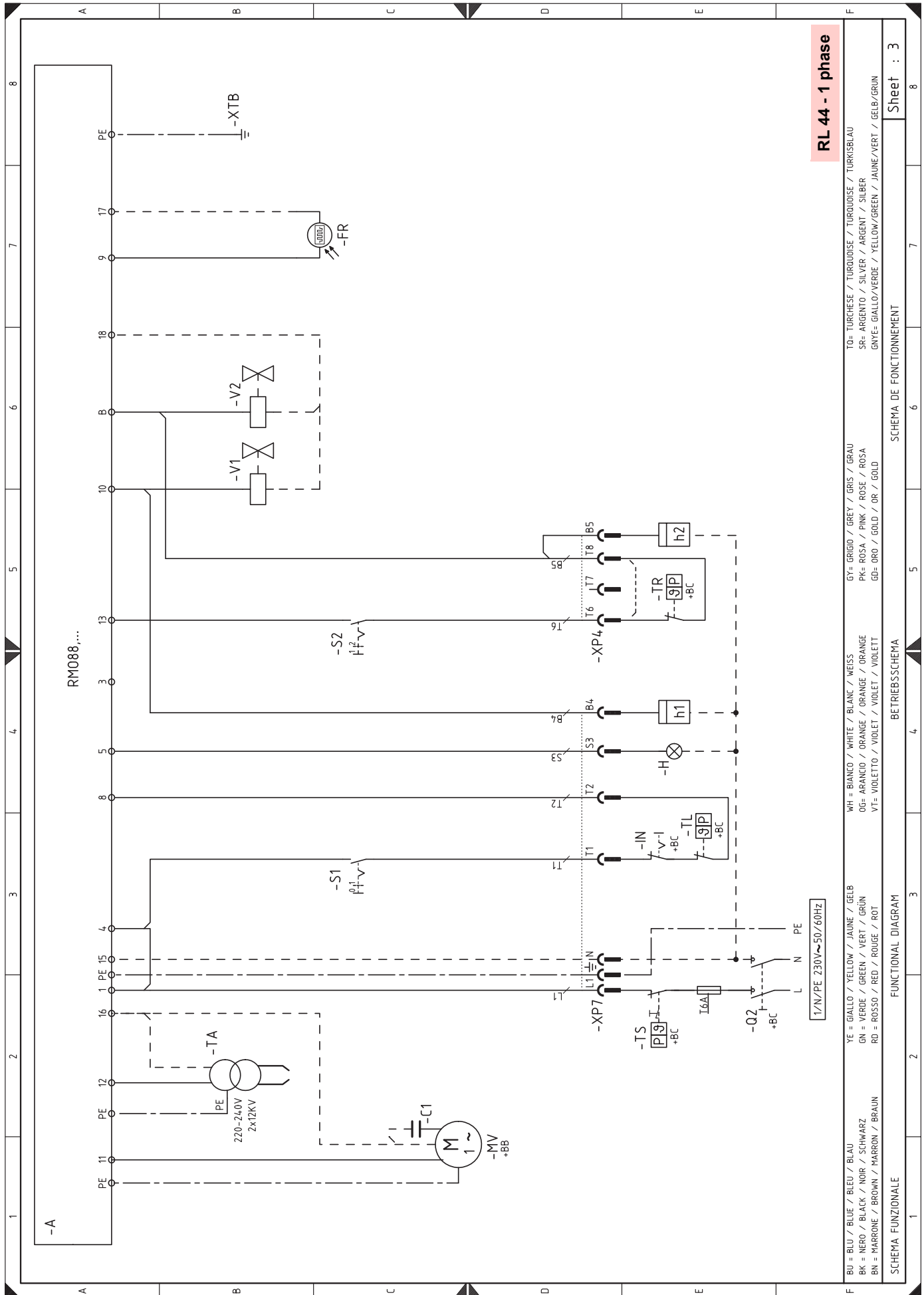
**B Appendix - Electrical panel layout**

<b>1</b>	<b>Contents</b>
<b>2</b>	Indication of references
<b>3</b>	<b>RL 34</b> functional diagram
<b>3</b>	<b>RL 44 - 1 phase</b> functional diagram
<b>3</b>	<b>RL 44 - 3 phase</b> functional diagram
<b>4</b>	Electrical connections set by installer

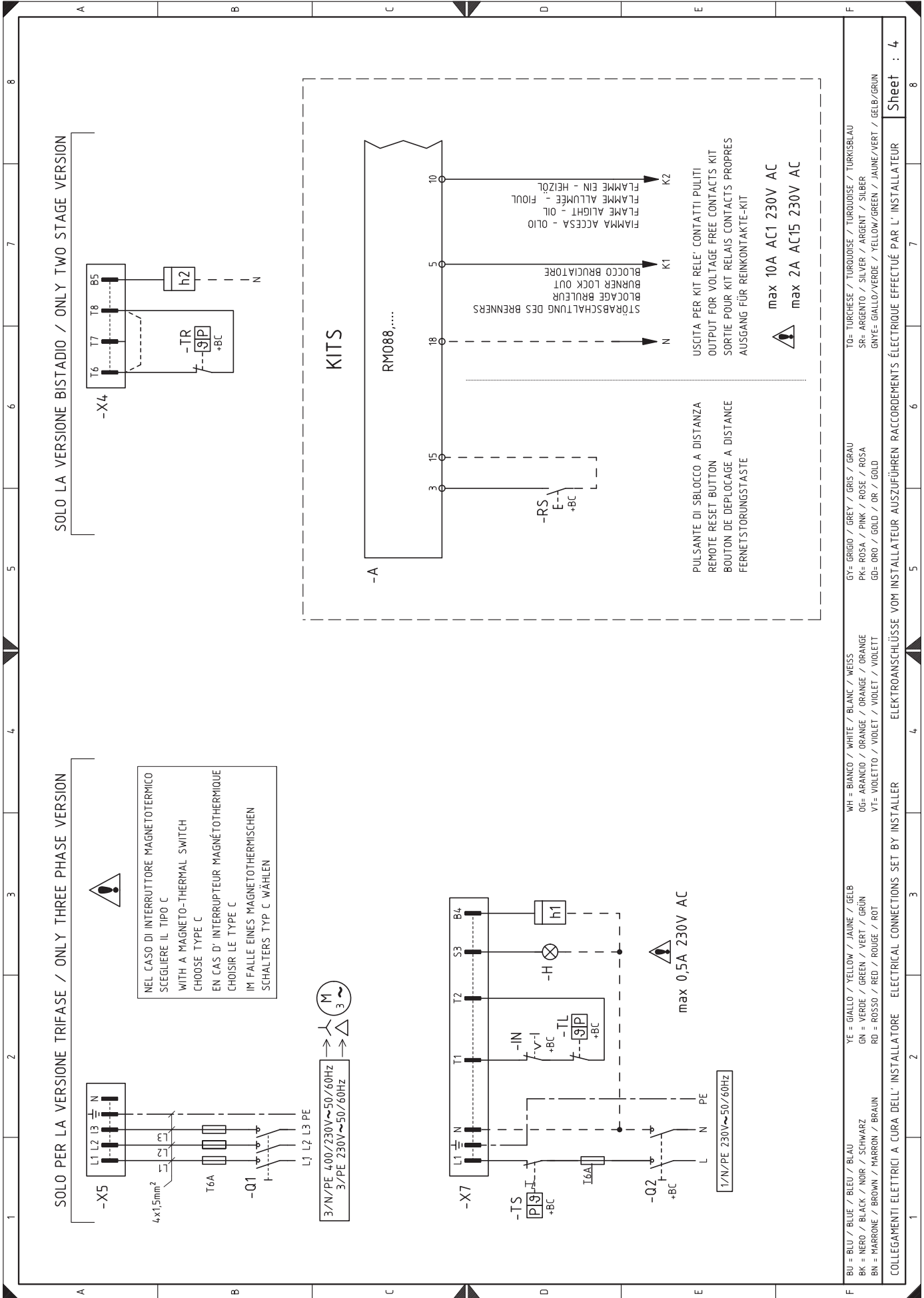
**2 Indication of references**













**WIRING DIAGRAM KEY**

<b>A</b>	- Electrical control box
<b>+BB</b>	- Components on burners
<b>+BC</b>	- Components on boiler
<b>C1</b>	- Capacitor
<b>F1</b>	- Fan motor thermal relay
<b>FR</b>	- Photocell
<b>H</b>	- Remote lockout signalling
<b>IN</b>	- Manual burner arrest switch
<b>h1</b>	- Hour counter
<b>h2</b>	- Hour counter
<b>KM</b>	- Motor contact maker
<b>MV</b>	- Fan motor
<b>Q1</b>	- Three-phase knife switch
<b>Q2</b>	- Single phase knife switch
<b>RS</b>	- Remote burner reset button (accessory)
<b>S1</b>	- Switch: burner on-off
<b>S2</b>	- Switch: 1st - 2nd stage
<b>TA</b>	- Ignition transformer
<b>TL</b>	- Extreme thermostat/pressure switch
<b>TR</b>	- Adjustment thermostat/pressure switch
<b>TS</b>	- Safety thermostat/pressure switch
<b>XP4</b>	- 4 pole socket
<b>XP5</b>	- 5 pole socket
<b>XP7</b>	- 7 pole socket
<b>XTB</b>	- Shelf earth
<b>XTM</b>	- Fan unit earth
<b>X4</b>	- 4 pin plug
<b>X5</b>	- 5 pin plug
<b>X7</b>	- 7 pin plug
<b>V1</b>	- Ignition solenoid /1st stage
<b>V2</b>	- 2nd stage solenoid





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