

**GB** Kerosene and Gas oil burner

Progressive two-stage or modulating operation



**RL / MB<sub>10</sub>**


CODE	MODEL	TYPE
20032828	RL 190/M	674 T1





<b>1</b>	<b>Declaration</b>	<b>3</b>
<b>2</b>	<b>Information and general warnings</b>	<b>4</b>
2.1	Information about the instruction manual	4
2.1.1	Introduction	4
2.1.2	General dangers	4
2.1.3	Danger: live components	4
2.2	Guarantee and responsibility	5
2.3	Guidance for the use of bio fuel blends up to 10%	5
2.3.1	Information and general instructions	6
2.3.2	Product Disclaimer Statement	6
<b>3</b>	<b>Safety and prevention</b>	<b>7</b>
3.1	Introduction	7
3.2	Safety warnings	7
3.3	Basic safety rules	7
3.4	Personnel training	7
<b>4</b>	<b>Technical description of the burner</b>	<b>8</b>
4.1	Burner designation	8
4.2	Models available	8
4.3	Technical data	9
4.4	Electrical data	10
4.5	Packaging - Weight	11
4.6	Overall dimensions	11
4.7	Firing rate	11
4.7.1	Burner firing rate according to air density	12
4.7.2	Test boiler	12
4.8	Burner description	13
4.9	Standard equipment	13
<b>5</b>	<b>Installation</b>	<b>14</b>
5.1	Notes on safety for the installation	14
5.2	Handling	14
5.3	Preliminary checks	14
5.4	Installer/Service notes for the use of Gas oil with Bio blends up to 10%	15
5.5	Operating position	15
5.6	Boiler plate	15
5.7	Blast tube length	16
5.8	Securing the burner to the boiler	16
5.9	Nozzle installation	16
5.9.1	Recommended nozzles	16
5.9.2	Choice of nozzle	16
5.9.3	Nozzle assembly	17
5.10	Gas oil supply	18
5.10.1	Double-pipe circuit	18
5.10.2	The loop circuit	18
5.10.3	Single-pipe circuit	19
5.11	Hydraulic connections	19
5.12	Pump	20
5.12.1	Technical data	20
5.12.2	Pump priming	20
<b>6</b>	<b>Electrical system</b>	<b>21</b>
6.1	Notes on safety for the electrical wiring	21
6.2	Electrical connections	21
6.3	Calibration of thermal relay	22

<b>7</b>	<b>Start-up, calibration and operation of the burner .....</b>	<b>23</b>
7.1	Notes on safety for the first start-up .....	23
7.2	Burner firing .....	23
7.3	Burner calibration .....	23
7.3.1	Combustion head setting .....	23
7.3.2	Servomotor .....	23
7.3.3	Pressure regulator .....	24
7.3.4	MIN burner output .....	24
7.3.5	MAX burner output .....	24
7.3.6	Intermediate outputs between MAX and MIN output .....	24
7.4	Oil pressure switch .....	25
7.5	Burner operation .....	26
7.5.1	Burner starting .....	26
7.5.2	Steady state operation .....	26
7.5.3	Firing failure .....	26
7.5.4	Firing failure .....	26
7.6	Final checks .....	27
<b>8</b>	<b>Maintenance .....</b>	<b>28</b>
8.1	Notes on safety for the maintenance .....	28
8.2	Maintenance programme .....	28
8.2.1	Maintenance frequency .....	28
8.2.2	Checking and cleaning .....	28
8.3	Opening the burner .....	29
8.4	Closing the burner .....	29
<b>9</b>	<b>Faults - Possible causes - Solutions .....</b>	<b>30</b>
<b>A</b>	<b>Appendix - Accessories (optional) .....</b>	<b>32</b>
<b>B</b>	<b>Appendix - Electrical panel layout .....</b>	<b>33</b>

**1 Declaration**

Declaration of conformity in accordance with ISO / IEC 17050-1		
Manufacturer:	RIELLO S.p.A.	
Address:	Via Pilade Riello, 7 37045 Legnago (VR)	
Product:	Kerosene and Gas oil burner	
Model:	RL 190/M	
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	2006/95/EC	Low Voltage Directive
EMC	2004/108/EC	Electromagnetic Compatibility
Tali prodotti sono marcati come indicato a seguire:		
 CE-0440/B		

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

Manufacturer's Declaration			
RIELLO S.p.A. declares that the following products comply with the NOx emission limits specified by German standard "1. BImSchV release 26.01.2010".			
Product	Type	Model	Power
Kerosene and Gas oil burner	674 T1	RL 190/M	534 - 2431 kW
Legnago, 01.02.2013	Executive Director RIELLO S.p.A. - Burner Department Mr. I. Zinna	Research & Development Director RIELLO S.p.A. - Burner Department Mr. R. Cattaneo	
			

**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.



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 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 require-

ments 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 inexperienced 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

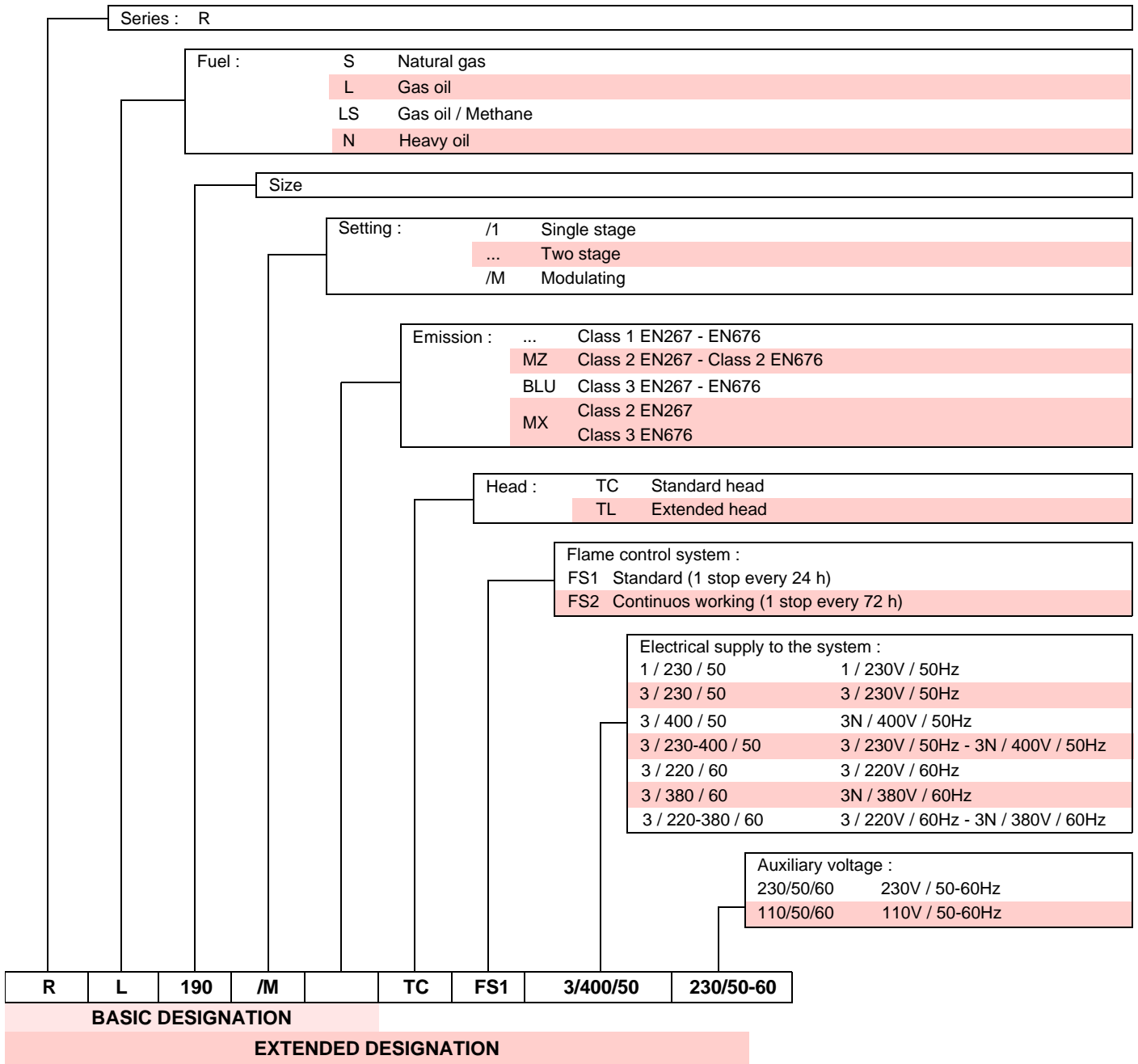
The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

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	Electrical supply	Code
RL 190/M TC	3/400/50	20032828

**4.3 Technical data**

Model			RL 190/M
Type			674 T1
Output <sup>(1)</sup> Delivery <sup>(1)</sup>	2 <sup>nd</sup> stage	kW	1423 - 2431
		Mcal/h	1224 - 2091
		kg/h	120 - 205
	1 <sup>st</sup> stage	kW	534 - 1423
		Mcal/h	459 - 1224
		kg/h	45 - 120
Fuel			Gas oil and Blends of gas oil and bio fuel (FAME in accordance with EN 14214) up to 10%
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)
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)
Operation			– Intermittent (min. 1 stop in 24 hours). These burners are also fitted for the continuous operation, if they are equipped with the control box LANDIS type LOK 16.250 A27 (interchangeable with the burner control box LANDIS LAL 1.25) – Progressive two-stage (modulating by Kit)
Nozzles		number	1 (nozzle with return)
Standard applications			Boilers: water, steam, diathermic oil
Ambient temperatur		°C	0 - 40
Combustion air temperature		°C max	60
Pump	delivery (at 12 bar)	kg/h	665
	pressure range	bar	7 - 40
	fuel temperatur	° C max	140
Noise levels <sup>(3)</sup>		dB(A)	83.9

**Tab. A**

<sup>(1)</sup> Reference conditions: ambient temperature 20°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.

<sup>(3)</sup> Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

**4.4 Electrical data**
**Motor IE1**

Electrical supply	V/Ph/Hz	400/3/50
Auxiliary power supply	V/Ph/Hz	230/1/50
Electric motor	rpm	2860
	W	4500
	V	400
	A	9.1
Ignition transformer	V1 - V2	230 V - 2 x 5 kV
	I1 - I2	1.9 A - 35 mA
Electrical power consumption	W max	5500
Electrical protection		IP 44

**Motor IE2**

Electrical supply	V/Ph/Hz	400/3/50
Auxiliary power supply	V/Ph/Hz	230/1/50
Electric motor	rpm	2900
	W	4500
	V	400
	A	8.7
Ignition transformer	V1 - V2	230 V - 2 x 5 kV
	I1 - I2	1.9 A - 35 mA
Electrical power consumption	W max	5500
Electrical protection		IP 44

**Tab. B**

**4.5 Packaging - Weight**

- The burners stands on a wooden base which can be lifted by fork-lifts. Outer dimensions of packaging are indicated in Tab. C.
- The weight of the burner complete with packaging is indicated in Tab. C.

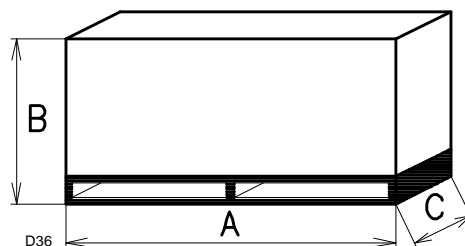


Fig. 1

mm	A	B	C	kg
RL 190/M	1200	850	800	95

Tab. C

**4.6 Overall dimensions**

The maximum dimensions of the burner are given in Fig. 2. 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 give by measurement I.

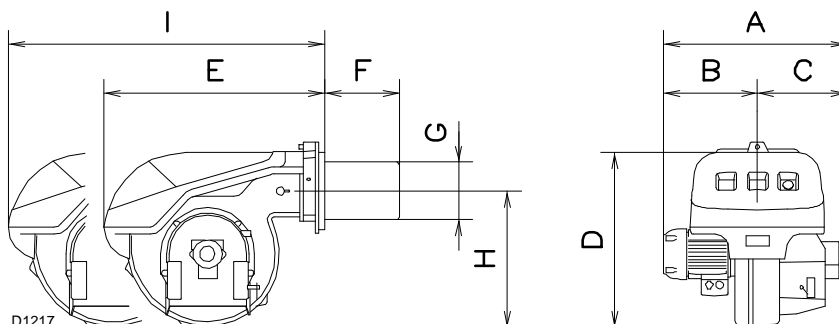


Fig. 2

mm	A	B	C	D	E	F	G	H	I
RL 190/M	813	366	447	555	712	370	222	430	1166

Tab. D

**4.7 Firing rate**

During operation, burner output varies between:

- minimum output : area A
- maximum output : area B

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 A, for MIN output, and within area B, for MAX output.



The firing rate value (Fig. 3) 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 23.

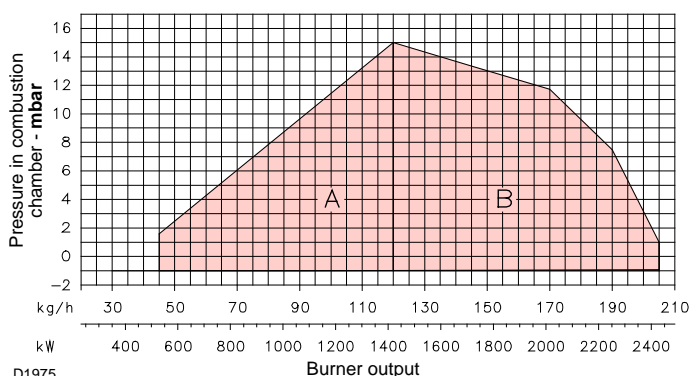


Fig. 3

**4.7.1 Burner firing rate according to air density**

It may be that a burner has to operate with combustive air at a higher temperature and/or higher altitudes.

The heating of the air and the increase in altitude produce the same effect: the expansion of the air volume (i.e. the reduction of its density).

The delivery of the burner fan remains essentially the same, but the oxygen per cubic meter of air, and the thrust (discharge head) of the fan are reduced.

It is therefore important to know if the maximum output requested from the burner at a determinate combustion chamber pressure remains within the firing rate of the burner even with the changed temperature and altitude conditions.

Proceed as follows:

- 1 Find the correction factor F in the Tab. E for the plant's air temperature and altitude.
- 2 Divide the burner's delivery Q by F in order to obtain the equivalent delivery Qe:

$$Q_e = Q : F \quad (\text{kg/h})$$

- 3 In the firing rate range of the burner (Fig. 4), indicate the work point defined by:  
 Qe = equivalent delivery  
 H1 = combustion chamber pressure  
 The resulting point A must remain within the firing rate range.
- 4 Trace a vertical line from point A, (Fig. 4), and find the maximum pressure H2 of the firing rate.
- 5 Multiply H2 by F to obtain the maximum lowered pressure H3 of the firing rate

$$H_3 = H_2 : F \quad (\text{mbar})$$

If H3 is greater than H1, as in Fig. 4, the burner can produce the delivery requested.

If H3 is lower than H1, the burner's delivery must be reduced. A reduction in delivery is accompanied by a reduction of the pressure in the combustion chamber:

- Qr = reduced delivery
- H1r = reduced pressure

$$H_{1r} = H_1 \times \left(\frac{Q_r}{Q}\right)^2$$

**Example**, a 5% delivery reduction:

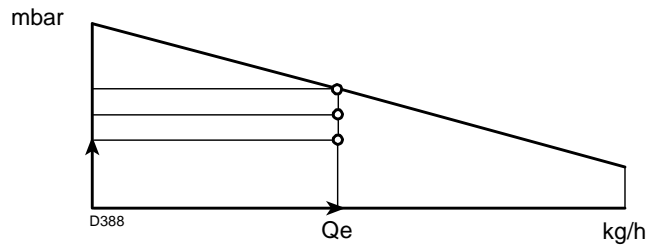
$$Q_r = Q \times 0.95$$

$$H_{1r} = H_1 \times (0.95)^2$$

With the new values - Qr and H1r - repeat steps 2 - 5.



The combustion head must be adjusted in respect to the equivalent delivery Qe.



**Fig. 4**

m a.s.l.	Average barometric pressure	F							
		Air °C							
M	mbar	0	5	10	15	20	25	30	40
0	1013	1.087	1.068	1.049	1.031	1.013	0.996	0.980	0.948
100	1000	1.073	1.054	1.035	1.017	1.000	0.983	0.967	0.936
200	989	1.061	1.042	1.024	1.006	0.989	0.972	0.956	0.926
300	978	1.050	1.031	1.013	0.995	0.978	0.962	0.946	0.916
400	966	1.037	1.018	1.000	0.983	0.966	0.950	0.934	0.904
500	955	1.025	1.007	0.989	0.972	0.955	0.939	0.923	0.894
600	944	1.013	0.995	0.977	0.960	0.944	0.928	0.913	0.884
700	932	1.000	0.982	0.965	0.948	0.932	0.916	0.901	0.872
800	921	0.988	0.971	0.954	0.937	0.921	0.906	0.891	0.862
900	910	0.977	0.959	0.942	0.926	0.910	0.895	0.880	0.852
1000	898	0.964	0.946	0.930	0.914	0.898	0.883	0.868	0.841
1200	878	0.942	0.925	0.909	0.893	0.878	0.863	0.849	0.822
1400	856	0.919	0.902	0.886	0.871	0.856	0.842	0.828	0.801
1600	836	0.897	0.881	0.866	0.851	0.836	0.822	0.808	0.783
1800	815	0.875	0.859	0.844	0.829	0.815	0.801	0.788	0.763
2000	794	0.852	0.837	0.822	0.808	0.794	0.781	0.768	0.743

**Tab. E**

**4.7.2 Test boiler**

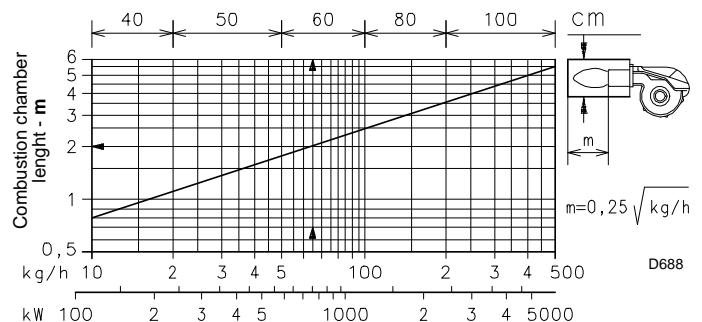
The firing rate was set in relation to special test boilers in accordance with the methods defined in EN 267 standards.

Fig. 5 indicates the diameter and length of the test combustion chamber.

**Example:**

delivery 200 kg/hour: diameter = 80 cm; length = 3,5 m.

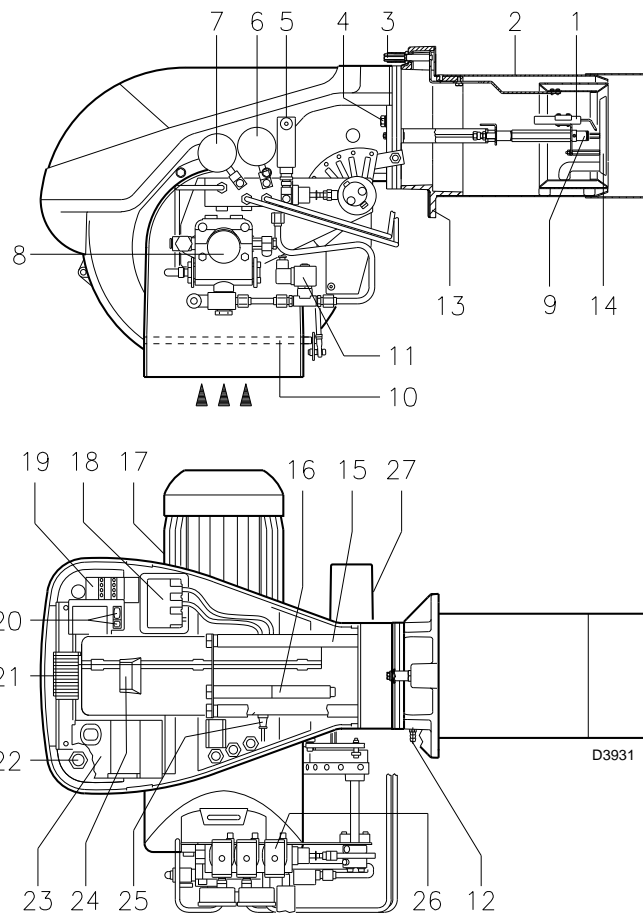
Whenever the burner is operated in a much smaller commercialy-available combustion chamber, a preliminary test should be performed.



**Fig. 5**

**4.8 Burner description**

- 1 Ignition electrodes
- 2 Combustion head
- 3 Screw for combustion head adjustment
- 4 Screw for fixing fan to flange
- 5 Oil pressure switch
- 6 Pressure gauge for pressure on nozzle return
- 7 Pressure gauge for pressure on nozzle delivery
- 8 Pump
- 9 Non-drip nozzle holder
- 10 Air gate valves
- 11 Safety solenoid valve
- 12 Fan pressure test point
- 13 Boiler mounting flange
- 14 Flame stability disk
- 15 Slide bars for opening the burner and inspecting the combustion head
- 16 Extensions for slide bars 15)
- 17 Electrical motor
- 18 Ignition transformer
- 19 Motor contactor and thermal cut-out with reset button
- 20 Power switch for different operations:  
automatic - manual - off.  
Button for:  
power increase - power reduction.
- 21 Terminal strip
- 22 Fairleads for electrical connections by installer
- 23 Control box with lock-out pilot light and lock-out reset button
- 24 Flame inspection window
- 25 Photocell for flame presence control
- 26 Valve assembly with pressure regulator on nozzle return
- 27 Servomotor, provides adjustment of fuel delivery regulator and of air gate valve.  
When the burner is not operating the air gate valve is fully closed in order to reduce to a minimum heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.



**Fig. 6**

Two types of burner failure may occur:

**Control box lock-out:**

if the control box 23)(Fig. 6) pushbutton lights up, it indicates that the burner is in lock-out. To reset, press the pushbutton.

**Motor trip:**

release by pressing the pushbutton on thermal relay 19)(Fig. 6).

**4.9 Standard equipment**

- 2 - Hoses (L = 1340 mm)
- 2 - Gaskets for flexible hoses
- 2 - Nipples for flexible hoses
- 1 - Thermal insulation screen
- 4 - Extensions 16) for slide bars 15)(Fig. 6)
- 4 - Screws to secure the burner flange to the boiler: M 16 x 40
- 1 - Instruction booklet
- 1 - Spare parts list



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 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. 7) and type of burner (B);
- the year of manufacture, in cryptographic form (C);
- the serial number (D);
- the electrical input power (E);
- the types of fuel used and the relative supply pressures (F);
- the data of the burner's minimum and maximum output possibilities (G) (see Firing rate).

R.B.L.	A		G	
	B	C	D	
	D		E	
	F			
RIELLO Sp.A I-37045 Legnago (VR)				CE 0036

D8965

**Fig. 7**



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



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.



**5.4 Installer/Service 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.

**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.

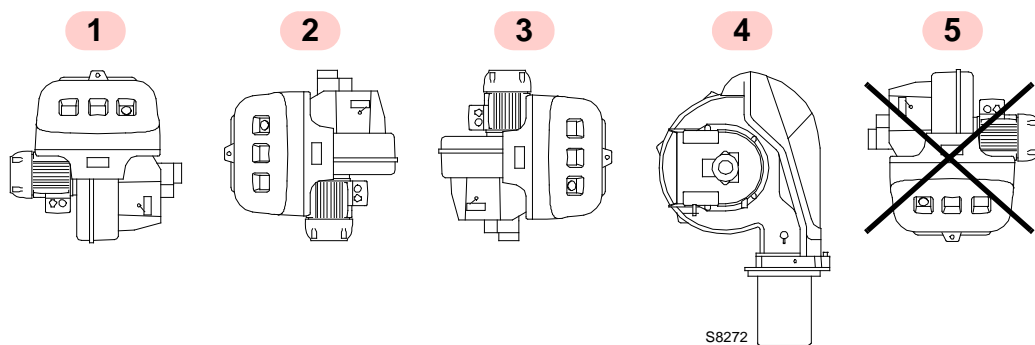


Fig. 8

**5.6 Boiler plate**

Drill the combustion chamber locking plate as shown in Fig. 9. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

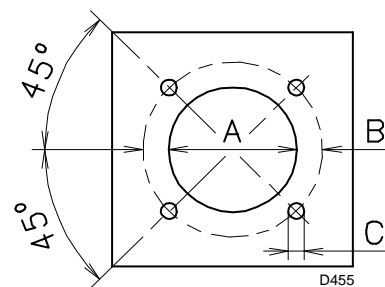


Fig. 9

mm	A	B	C
RL 190/M	230	325 - 368	M 16

Tab. F

**5.7 Blast tube length**

The length of the blast tube 9)(Fig. 10) 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.

For boilers with front flue passes 12)(Fig. 10) or flame inversion chambers, protective fettling in refractory material 10) must be inserted between the boiler fettling 11) and the blast tube 9).

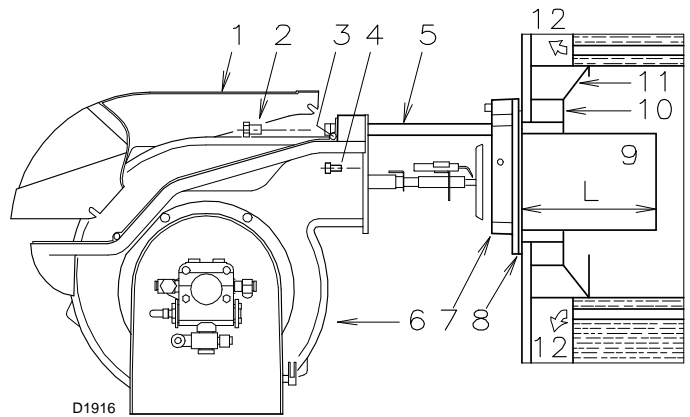
This protective fettling must not compromise the extraction of the blast tube.

For boilers having a water-cooled front the refractory fettling 10)-11) is not required unless it is expressly requested by the boiler manufacturer.

**5.8 Securing the burner to the boiler**

Disassemble the blast tube 9)(Fig. 10) 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 7);
- withdraw the blast tube 9) complete with flange 7) and slide bars 5).
- Secure flange 7) to the boiler plate interposing the supplied gasket 8).
- Use the 4 screws provided after having protected the thread with anticruffing products.



**Fig. 10**



The burner-boiler seal must be airtight.

**5.9 Nozzle installation**

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.

**5.9.1 Recommended nozzles**

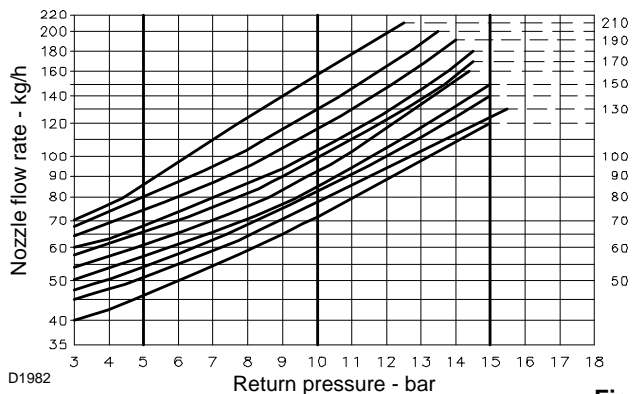
Type A3 or A4 Bergonzo nozzles - 45° angle.

**5.9.2 Choice of nozzle**

In case an intermediate delivery between the two values indicated in the diagrams (Fig. 11 and Fig. 12), is required, a nozzle with higher delivery must be chosen.

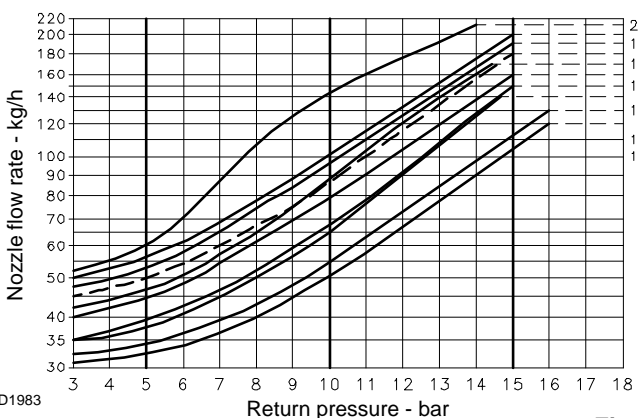
Delivery reduction will be obtained by means of the pressure regulator.

**Type A3 Bergonzo nozzles (45°) - delivery pressure 20 bar**



**Fig. 11**

**Type A4 Bergonzo nozzles (45°) - delivery pressure 20 bar**



**Fig. 12**

**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 the nozzle with the box spanner 1)(Fig. 13), 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.

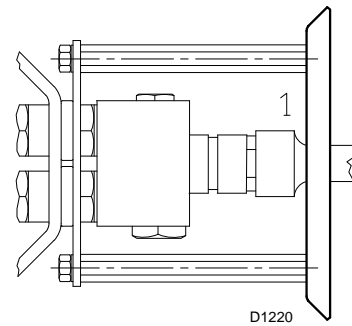
Make sure that the electrodes are positioned as shown in Fig. 14.

Finally refit the burner 3)(Fig. 15) on 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.

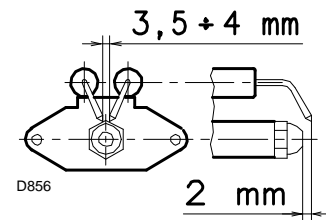
Tighten the screws 1) on the slide bars 2) and screw 4) that attaches the burner to the flange.

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

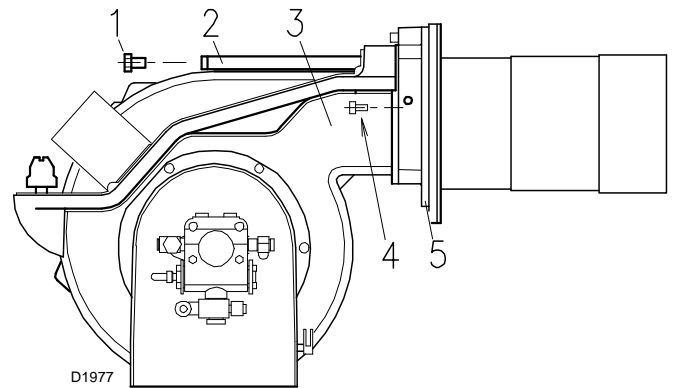
- retract the burner on its slide bars as shown in Fig. 10 at page 16);
- remove the nuts 1)(Fig. 16) and the disk 2);
- use spanner 3)(Fig. 16) to change the nozzles.



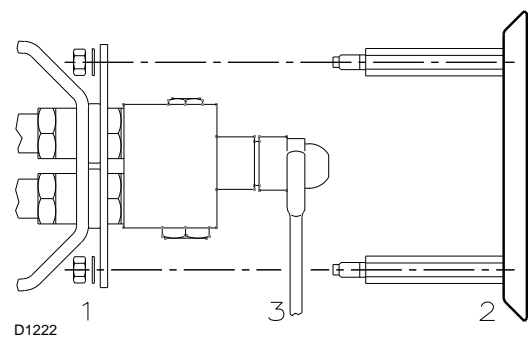
**Fig. 13**



**Fig. 14**



**Fig. 15**



**Fig. 16**

**5.10 Gas oil supply**



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.



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.



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



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.

**5.10.1 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 0.45 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.

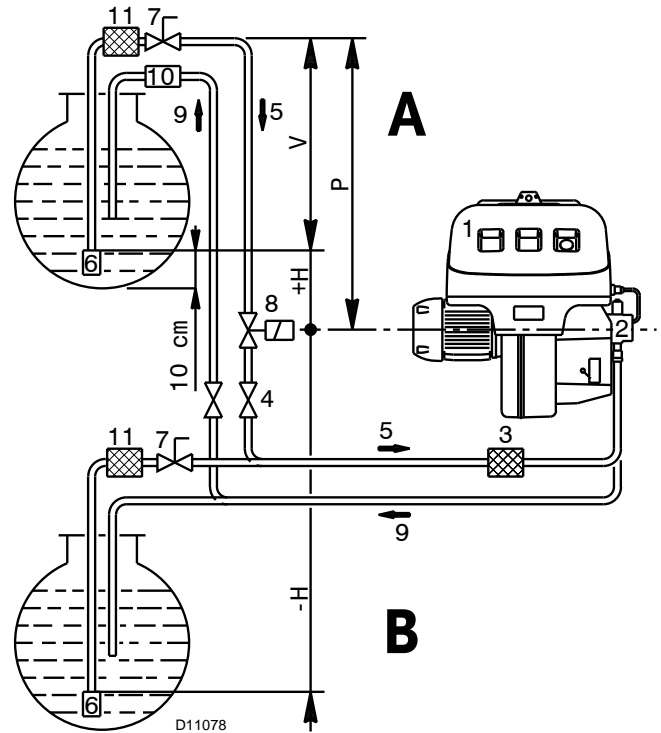
It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be more improbable that the suction line fails to prime or stops priming.

**5.10.2 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)	
	∅ 16 (mm)	∅ 18 (mm)
+ 4.0	60	80
+ 3.0	50	70
+ 2.0	40	60
+ 1.5	35	55
+ 1.0	30	50
+ 0.5	25	45
0	20	40
- 0.5	18	35
- 1.0	15	30
- 1,5	13	25
- 2.0	10	20
- 3.0	5	10
- 4.0	-	6

**Tab. G**

**5.10.3 Single-pipe circuit**

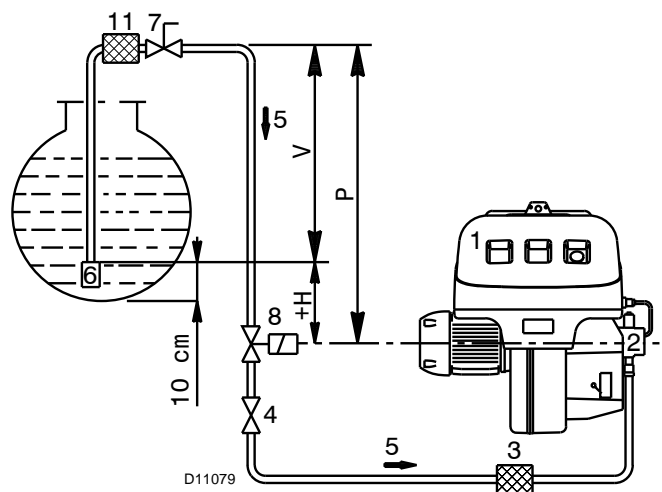
In order to obtain single-pipe working it is necessary to unscrew the return hose, remove the by-pass screw 6)(Fig. 32) and then screw the plug 7)(Fig. 32).

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)	
	∅ 16 (mm)	∅ 18 (mm)
+ 4.0	60	80
+ 3.0	50	70
+ 2.0	40	60
+ 1.5	35	55
+ 1.0	30	50
+ 0.5	25	45

**Tab. H**

**5.11 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. 20).

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

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

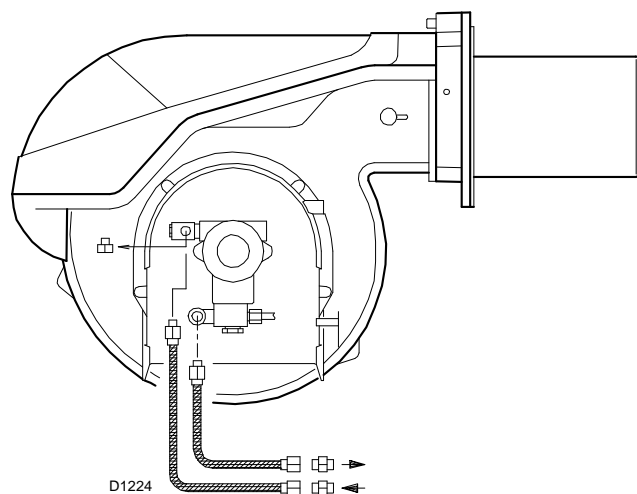
Remove the plugs from the suction and return connections of the pump.

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

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.

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

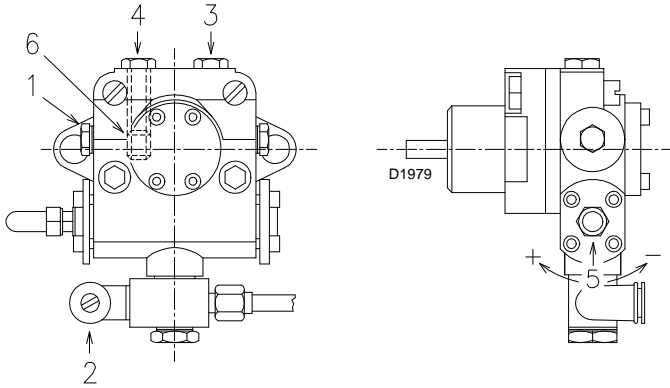


**Fig. 19**

**5.12 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.



**Fig. 20**

- 1 Suction G 1/2"
- 2 Return G 1/2"
- 3 Pressure gauge connection G 1/8"
- 4 Vacuum meter connection G 1/8"
- 5 Pressure adjustment screw
- 6 Screw for by-pass

**5.12.1 Technical data**

**Suntec TA3C**

Min. delivery rate at 12 bar pressure	kg/h	665
Delivery pressure range	bar	7 - 40
Max. suction depression	bar	0.45
Viscosity range	mm <sup>2</sup> /s (cSt)	4 - 800
Max. gas oil temperature	°C	140
Max. suction and return pressure	bar	1.5
Pressure calibration in the factory	bar	30
Filter mesh width	mm	0.17

**Tab. I**

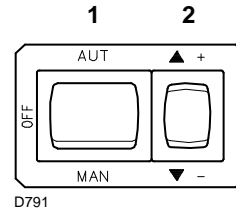
**5.12.2 Pump priming**



**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 screw 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 with switch 1) (Fig. 21) in the "MAN" position. As soon as the burner starts, check the direction of rotation of the fan blade, by looking through the flame inspection window 24)(Fig. 6 at page 13).
- The pump can be considered primed when the light 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, as often as required.

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



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.

**6 Electrical system**

**6.1 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.

**6.2 Electrical connections**



**WARNING**

Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Riello S.p.A. declines all liability for modifications or connections other than those shown on these diagrams.

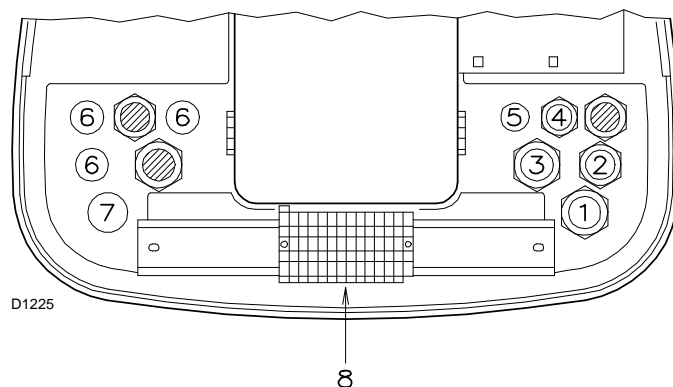
Use flexible cables according to regulations EN 60 335-1:

- if in PVC boot, use at least H05 VV-F
- if in rubber boot, use at least H05 RR-F

All the cables to be connected to the burner terminal strip 8)(Fig. 22) must be routed through the fairleads.

The fairleads can be used in various ways. One example is given below:

- |   |         |                                    |
|---|---------|------------------------------------|
| 1 | Pg 13.5 | Three-phase power supply           |
| 2 | Pg 11   | Single-phase power supply          |
| 3 | Pg 11   | Control device TL                  |
| 4 | Pg 9    | Control device TR or probe (RWF40) |
| 5 | Pg 9    | Set up for fair lead               |
| 6 | Pg 11   | Set up for fair lead               |
| 7 | Pg 13.5 | Set up for fair lead               |



**Fig. 22**



### 6.3 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 on "MIN".
- If the motor is delta-powered, **230V**, the cursor should be positioned on "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.

#### NOTA

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 relay.

These burners are also fitted for the continuous operation, if they are equipped with the control box LANDIS type LOK 16.250 A27 (interchangeable with the burner control box LANDIS LAL 1.25).

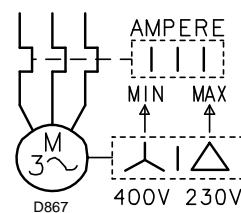


Fig. 23



- Do not invert the neutral with the phase wire in the electricity supply line. Any inversion would cause a lockout due to firing failure.
- Only use original spare parts to replace the components.



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

**7.1 Notes on safety for the first start-up**



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



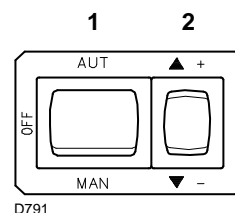
Check the correct working of the adjustment, command and safety devices.

**7.2 Burner firing**

Before firing the burner, make sure that the air and fuel regulation parts are workable:

- loosen the screws 4)(Fig. 29 at page 24) of the cam 2)(Fig. 29);
- loosen the nut and lock nut 5)(Fig. 28) and the two screws 8)(Fig. 28) of the pressure transformer unit and eccentric.
- Close load controls and set switch 1)(Fig. 24) to "MAN".

The burner will start and after the pre-purge stage the flame will light.



**Fig. 24**

**7.3 Burner calibration**

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

Adjust successively:

- Combustion head
- Servomotor, cams I - II - IV - V
- MIN burner output
- MAX burner output
- Intermediate outputs between MAX and MIN output

**7.3.1 Combustion head setting**

The setting of the combustion head depends exclusively on the maximum burner delivery at which it will be operating.

Turn screw 4)(Fig. 25) until the notch shown in diagram (Fig. 26) is level with the front surface of flange 5)(Fig. 25).

**Example:**

maximum light oil delivery = 150 kg/h.

Diagram (Fig. 26) indicates that for a delivery of 150 kg/h the burner requires the combustion head to be set to approx. three notches, as shown in Fig. 25.

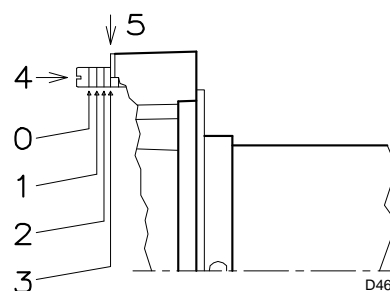
**7.3.2 Servomotor**

The servomotor (Fig. 27) provides simultaneous adjustment of the air gate valve, by means of the variable profile cam and the pressure regulator.

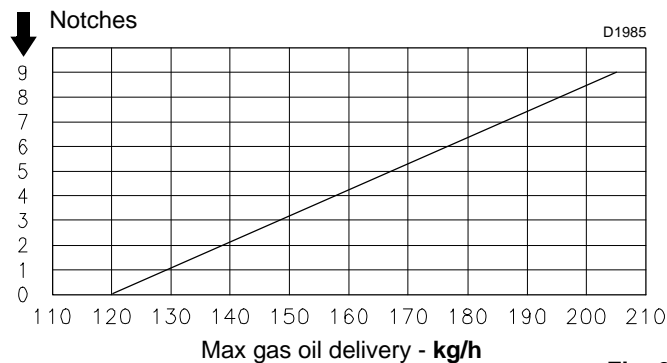
The servomotor rotates through 130° in 42 seconds.

Do not alter the factory setting for the 5 cams; simply check that they are set as indicated below:

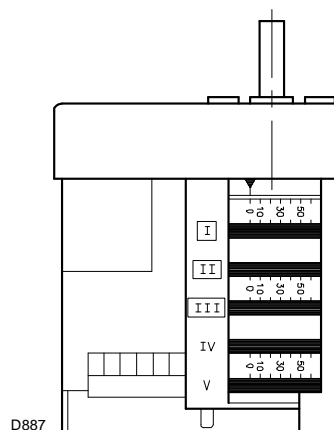
- Cam I:** 130°  
Limits rotation toward maximum position.
- Cam II:** 0°  
Limits rotation toward the minimum position. When the burner is shut down the air gate valve must be closed: 0°.
- Cam III:** 20°  
Adjusts the ignition position and the MIN output.
- Cam IV-V:** not utilized.



**Fig. 25**



**Fig. 26**

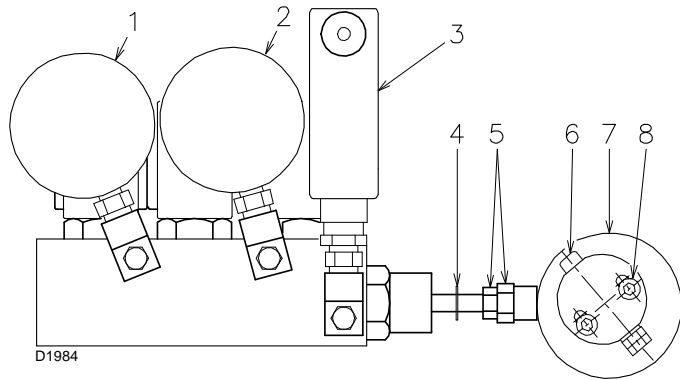


**Fig. 27**

**7.3.3 Pressure regulator**

Using the pressure-output diagram which characterises the return-type nozzles, see (Fig. 11 and Fig. 12 at page 16), it is possible to determine the size of the nozzle to use in relation to the maximum fuel output to be burnt and consequently establish the minimum and maximum pressure of the fuel on the nozzle return in relation to the corresponding minimum and maximum modulation output.

- The fuel pressure on the nozzle delivery is adjusted on the pressure transformer unit and displayed on the pressure gauge 1)(Fig. 28).
- The fuel pressure on the nozzle return is adjusted on the pressure transformer unit and displayed on the pressure gauge 2)(Fig. 28).
- The **adjustment of the MINIMUM pressure** of the fuel on the nozzle return must be carried out solely by means of the nut 5)(Fig. 28); screw down said nut to decrease the pressure and unscrew to increase it.
- The **adjustment of the MAXIMUM pressure** of the fuel on the nozzle return must be carried out solely by means of the eccentric 6)(Fig. 28) screw 7); screw down said screw to increase the pressure and unscrew to decrease it.
- **Adjustment of the air** is carried out by means of the screws 3)(Fig. 29 at page 24) of the variable profile cam 2)(Fig. 29), which control the air damper; screw down said screws to increase the air delivery and unscrew to decrease it.



**Fig. 28**

Key (Fig. 28)

- 1 Pressure gauge for pressure on nozzle delivery
- 2 Pressure gauge for pressure on nozzle return
- 3 Oil pressure switch
- 4 Ring for piston stop
- 5 Nut and lock-nut for piston setting
- 6 Eccentric adjusting screw
- 7 Variable eccentric
- 8 Eccentric locking screws

**7.3.4 MIN burner output**

Min. output must be selected within the firing rate range seen on page 11.

Press button 2)(Fig. 24) “output reduction“ and keep it pressed until the servomotor has reached 20° (factory setting).

Adjust the pressure of the fuel on the nozzle return, operating solely by means of the nut 5) (Fig. 28); the desired pressure for firing and minimum output is set in this manner.

**7.3.5 MAX burner output**

Max output of the burner must be set within the firing rate range shown on page 11.

After adjusting the firing and minimum modulation output, proceed with adjusting the maximum output by pressing the button

2)(Fig. 24) towards the “+” sign until the servomotor (Fig. 27) reaches the maximum position of 130°.

Once maximum opening of the servomotor has been achieved, adjust the pressure of the fuel on the nozzle return again only by means of the screw 6)(Fig. 28) of the eccentric; the desired pressure for maximum output is set in this manner.

Screw down the screw 6) only until it corresponds to an increase in pressure; in this way a variation on the whole rotation angle is ensured.

At this point lock the nut and the lock nut 5) and the two screws 8) of the pressure transformer unit.

**7.3.6 Intermediate outputs between MAX and MIN output**

The setting of the minimum and maximum pressure automatically determines the pressure values and therefore those of the intermediate outputs.

**Combustion setting**

During setting of the minimum and maximum pressure it is sufficient to regulate an acceptable excess of combustion air judged visibly solely.

Only after having set the minimum and maximum pressure, carry out an accurate setting of the combustion on different positions of modulation operating solely on the setting of the air delivery by means of the screws 3)(Fig. 29) of the cam.

Press the switch 2)(Fig. 24) “output increase” a little so that the servomotor turns by about 15°.

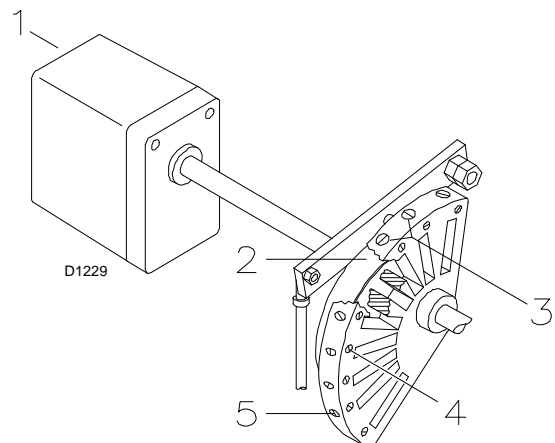
Adjust the screws until optimal combustion is obtained. Proceed in the same way with the other screws.



Take care that the cam profile variation is progressive.

Once the setting of the combustion is complete, lock the screws 4)(Fig. 29) and check ignition once again: noise emission at this stage must be identical to the following stage of operation.

If you notice any sign of pulsations, reduce the ignition stage delivery.



**Fig. 29**

Key (Fig. 29)

- 1 Servomotor
- 2 Adjustable profile cam
- 3 Adjustment screws for cam profile
- 4 Adjustment fixing screws
- 5 Adjustment screws for cam profile

**NOTE**

The servomotor follows the adjustment of cam III only when the cam angle is reduced.

- If it is necessary to increase the cam angle, first increase the servomotor angle with the key "output increase", then increase the III cam angle, and finally bring the servomotor back to the MIN output position with the key "output decrease".
- In order to adjust cam III, especially for fine movements, key 10)(Fig. 30), held by a magnet under the servomotor, can be used.

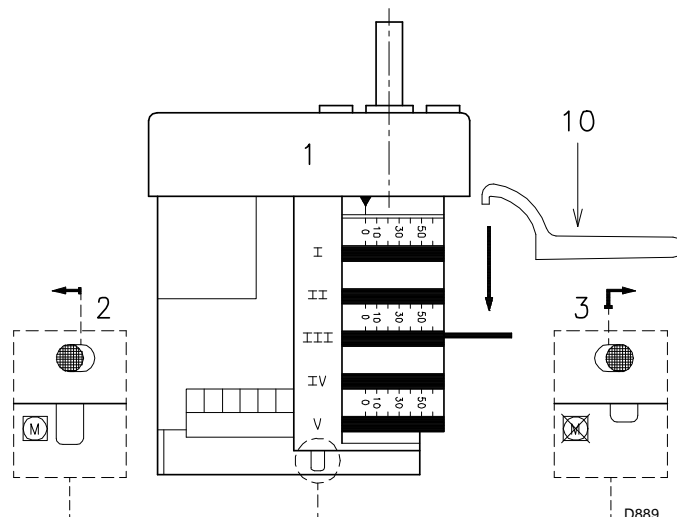


**WARNING**

- The proper setting of the eccentric 7)(Fig. 28) is possible when its operation field follows the servomotor operation field (20° - 130°): so, that every variation of the servomotor position corresponds to a pressure variation.
- Do not let the piston beat repeatedly: the stop ring 4)(Fig. 28) determines the max. stroke.
- When the setting has been carried out and the burner switched off, verify manually, after having released the servomotor pushing and moving the button 3)(Fig. 30) towards the right, that no slow-down occurs.

- If you wish to check the delivery capacity of the nozzle, open the burner, attach the nozzle, simulate the start-up and then proceed with weighing of the maximum and minimum pressures of the fuel.
- In the minimum modulation position, in order to facilitate the firing of the flame, adjust the pressure on the nozzle return to a value ranging between 3 and 6 mbar with an air pressure to the head, measured at the socket 12)(Fig. 6 at page 13) ≤ 5 mbar.

- If, during adjustment of the maximum output, flame instability or pressure fluctuations on the return arise, then it is necessary to decrease this pressure until such problems have been eliminated.
- During adjustment of the intermediate outputs it is advisable to adjust the air in certain positions so that the bearing which slides over the variable profile foil of the cam is found directly by the side of one of the screws 3)(Fig. 29); this is necessary in order that the adjustment carried out on a screw alters the contiguous adjustments as little as possible.



**Fig. 30**

**7.4 Oil pressure switch**

The oil pressure switch 5)(Fig. 6 at page 13) is factory set to 3 bar. If the gas oil pressure reaches this value in the return piping, the pressure switch stops the burner.

Burner starts again automatically if the pressure goes down under 3 bar after burner shut down.

If a loop circuit with Px pressure feeds the burner, the pressure switch should be adjusted to Px + 3 bar.

**7.5 Burner operation**

**7.5.1 Burner starting**

- 0 s:** Control device TL closes, the motor starts.  
The pump 3)(Fig. 32) 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).
- 5 s:** Servomotor starts: 130° rotation to right, until contact is made on cam I)(Fig. 27 at page 23).  
The air gate valve is positioned on MAX. output.
- 47 s:** Pre-purge stage with air delivery at MAX. output.
- 69 s:** Servomotor rotates to left until contact is made on cam III)(Fig. 27 at page 23).
- 106 s:** Air gate valve and pressure regulator are positioned on MIN output.
- 108 s:** Ignition electrode strikes a spark.
- 111 s:** Solenoid valves 8) - 9) - 16) open; the fuel passes through the piping 10) and filter 11), finally it enters the nozzle.  
A part of the fuel is then sprayed out through the nozzle, igniting when it comes into contact with the spark: flame at a low output level, point A; the rest of the fuel passes through piping 12) at the pressure adjusted by the regulator 13), then, through piping 7), it goes back into the tank.
- 116 s:** The spark goes out.
- 126 s:** The starting cycle ends.

**7.5.2 Steady state operation**

**Burner without output regulator RWF40**

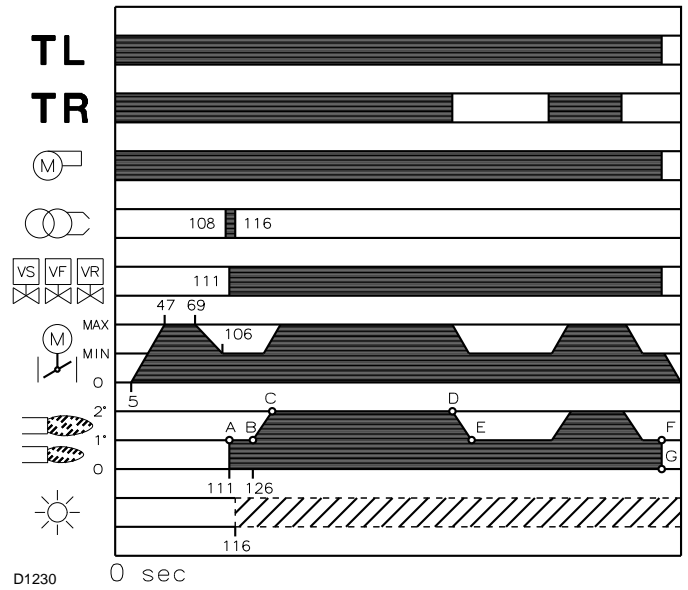
At the end of the starting cycle, the servomotor control then passes to load control TR for boiler pressure or temperature, point B.

- If the temperature or pressure is low (and the TR load control is consequently closed), the burner progressively increases output up to MAX (section B-C).
- If subsequently the temperature or pressure increases until TR opens, the burner progressively decreases output down to MIN (section D-E). And so on.
- The burner locks out when demand for heat is less than the heat supplied by the burner in the MIN output (section F-G). Load control TL opens.  
The servomotor returns to the 0° angle limited by contact with cam II)(Fig. 27 at page 23).  
The gate valve closes completely to reduce thermal dispersion to a minimum.

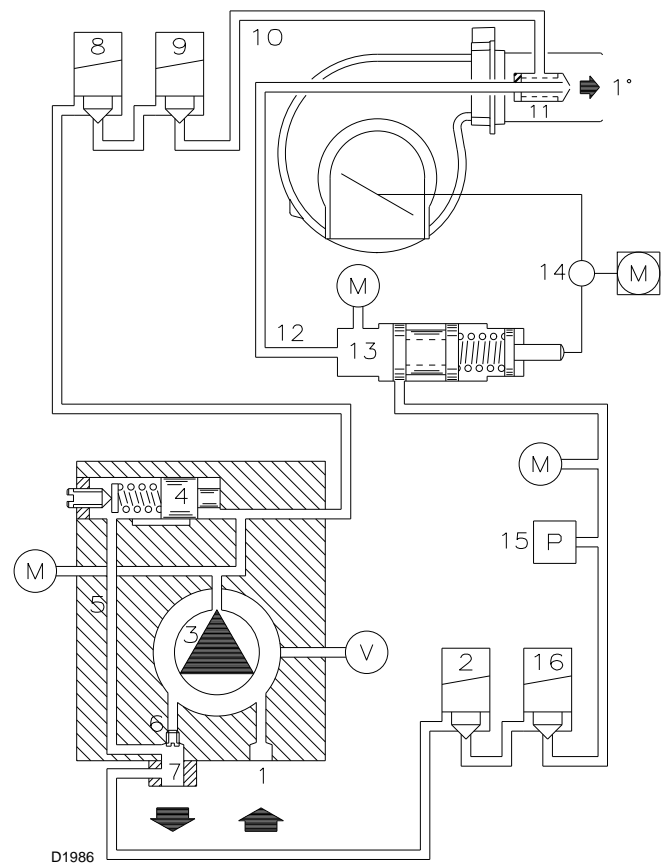
Every time output is changed, the servomotor automatically modifies gas oil delivery (pressure regulator) and air delivery (fan gate valve).

**Burner with output regulator RWF40**

See the handbook enclosed with the regulator.



**Fig. 31**



**Fig. 32**

**7.5.3 Firing failure**

If the burner does not fire, it goes into lock-out within 5 s of the opening of the gas oil valve.

**7.5.4 Firing failure**

If the flame should go out for accidental reasons during operation, the burner will lock out in 1 s.

**7.6 Final checks**

---

- Obscure the photocell and switch off the control devices:  
the burner should start and then lock-out about 5 s after opening of the valves.
- Illuminate the photocell and switch off the control devices:  
the burner should start and then go into lock-out after about 10 s.
- Obscure the photocell while the burner is in operation, the following must occur in sequence:  
flame extinguished within 1 s, and starting cycle repetition.
- Switch on control device TL followed by control device TS while the burner is operating:  
the burner should stop.

**8 Maintenance**

**8.1 Notes on safety for the maintenance**

The periodic maintenance is essential for the good operation, safety, yield and duration of the burner. It allows you to reduce consumption and polluting emissions and to keep the product in a reliable state over time.



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel interception tap.

**8.2 Maintenance programme**

**8.2.1 Maintenance frequency**

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

**8.2.2 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.

**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.

**Fan**

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

**Boiler**

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

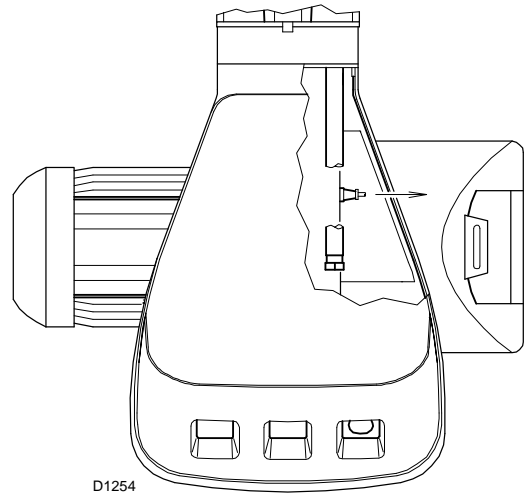
**Burner**

Check for excess wear or loose screws. Also make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner.

**Photocell**

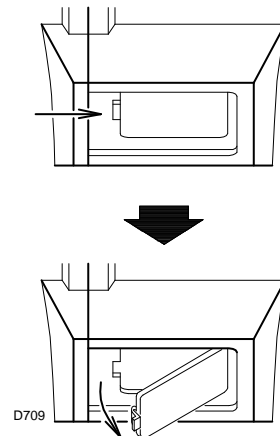
Clean the glass cover from any dust that may have accumulated. Photocell 1)(Fig. 33) can be removed by pulling it outward forcefully.



**Fig. 33**

**Flame inspection window**

Clean the glass (Fig. 34).



**Fig. 34**

**Filters**

Check the filtering baskets on line and at nozzle present in the system. Clean or replace if necessary. If rust or other impurities are observed inside the pump, use a separate pump to lift any water and other impurities that may have deposited on the bottom of the tank.

**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 vacuumeter 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.

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.

**Nozzles**

Do not clean the nozzle openings; do not even open them. The nozzle filters however may be cleaned or replaced as required. It is advisable to replace nozzles every year during regular maintenance operations. Combustion must be checked after the nozzles have been changed.

**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.

**Combustion**

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

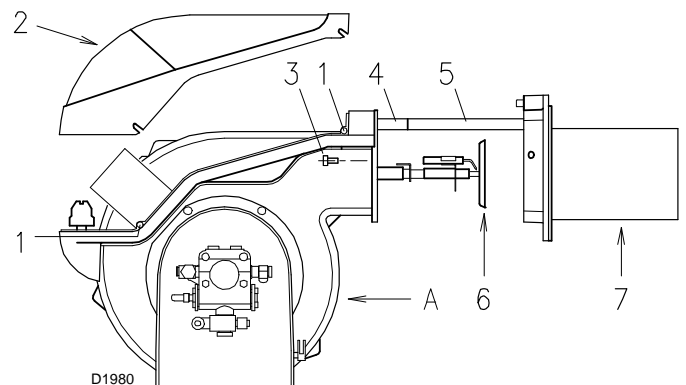
EN 267	Excess air		
	Max output $\lambda \leq 1.2$		Min output $\lambda \leq 1.3$
Theoretical max. CO <sub>2</sub> 0 % O <sub>2</sub>	Calibration CO <sub>2</sub> %		CO mg/kWh
15.2	$\lambda = 1,2$	$\lambda = 1,3$	$\leq 100$
	12.6	11.5	

**8.3 Opening the burner**



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

- Loosen screws 1)(Fig. 35) and withdraw the cover 2).
- Unscrew screws 3).
- Fit the two extensions 4) supplied with the burner onto the slide bars 5).
- Pull part A backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).



**Fig. 35**

**8.4 Closing the burner**

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



**9 Faults - Possible causes - Solutions**

Find a list of faults, causes and possible solutions for a set of failures that may occur and result in irregular burner operation or no functioning at all.

If a burner malfunction is detected, first of all:

- check that the electrical wiring is adequately connected;
- check whether fuel is delivered;
- check that every adjustment parameter is adequately set.

SYMBOL (1)	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
◀	The burner does not start	A limit or safety control device is open	Adjust or replace
		Control box lock-out	Reset control box
		Oil pressure switch intervenes	Adjust pressure switch or eliminate overpressure
		Motor protection tripped	Reset thermal cut-out
		No electrical power supply	Close all switches - Check connections
		Control box fuse blown	Replace (2)
		Contact II of servomotor does not operate	Adjust cam II or replace servomotor
		Pump is jammed	Replace
		Defective motor command control device	Replace
		Defective control box	Replace
	Defective electrical motor	Replace	
	The burner does not start and a function lock-out occurs	Flame simulation	Replace control box
Photocell short-circuit		Replace photocell	
2- phase power supply thermal cut-out trips		Reset thermal cut-out when third phase is re-connected	
▲	The burner starts but stops at maximum air damper setting	Contact I of servomotor does not operate	Adjust cam I or replace servomotor control box terminals 9-8
■	The burner starts and then goes into lock-out	Fault in flame detection circuit	Replace control box
▼	The burner remains in pre-purging phase	Contact III of servomotor does not operate	Adjust cam III or replace servomotor control box terminals 10-8
1	After pre-purge and the safety time, the burner goes to lock-out and the flame does not appear	No fuel in tank; water on tank bottom	Top up fuel level or suck up water
		Inappropriate head and air damper adjustments	Adjust
		Gas oil solenoid valves fail to open	Check connections; replace coil
		Nozzle clogged, dirty, or deformed	Replace
		Dirty or poorly adjusted firing electrodes	Adjust or clean
		Grounded electrode due to broken insulation	Replace
		High voltage cable defective or grounded	Replace
		High voltage cable deformed by high temperature	Replace and protect
		Ignition transformer defective	Replace
		Erroneous electrical connections of valves or transformer	Check
		Defective control box	Replace
		Pump unprimed	Prime pump and see "Pump unprimes"
		Pump/motor coupling broken	Replace
		Pump suction line connected to return line	Correct connection
	Valves up-line from pump closed	Open	
	Filters dirty: line - pump - nozzle	Clean	
	Incorrect motor rotation direction	Change motor electrical connections	
	The flame ignites normally but the burner locks out when the safety time has elapsed	Defective photocell or control box	Replace photocell or control box
Dirty photocell		Clean	
Firing with pulsations or flame detachment, delayed firing	Poorly adjusted head	Adjust	
	Poorly adjusted or dirty firing electrodes	Adjust	
	Poorly adjusted fan air gate: too much air	Adjust	
	Nozzle unsuited for burner or boiler	See Nozzle Table	
	Defective nozzle	Replace	
	Inappropriate pump pressure	Adjust	
The burner does not pass to 2nd stage	Control device TR does not close	Adjust or replace	
	Defective control box	Replace	
Uneven fuel supply	Check if cause is in pump or fuel supply system	Feed burner from tank located near burner	
Internally rusted pump	Water in tank	Suck water from tank bottom with separate pump	



SYMBOL (1)	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
	Noisy pump, unstable pressure	Air has entered the suction line - Depression value too high (higher than 35 cm Hg): Tank/burner height difference too great Piping diameter too small Suction filters clogged Suction valves closed Paraffin solidified due to low temperature	Tighten connectors  Feed burner with loop circuit Increase Clean Open Add additive to light oil
	Pump unprimes after prolonged pause	Return pipe not immersed in fuel Air enters suction piping	Bring to same height as suction pipe Tighten connectors
	Pump leaks gas oil	Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach  - yellow Bacharach	Not enough air Nozzle worn or dirty Nozzle filter clogged Erroneous pump pressure Flame stability disk dirty, loose, or deformed Boiler room air vents insufficient Too much air	Adjust head and fan gate Replace Clean or replace Adjust Clean, tighten in place, or replace Increase Adjust head and fan gate
	Dirty combustion head	Nozzle or filter dirty Unsuitable nozzle delivery or angle Loose nozzle Impurities on flame stability disk Erroneous head adjustment or not enough air Blast tube length unsuited to boiler	Replace See recommended nozzles Tighten Clean Adjust, open air damper Contact boiler manufacturer
I	During operation, the burner stops in lock out	Dirty or defective photocell	Clean or replace

- (1) When the burner does not fire or comes to a halt following a fault, the symbol which appears on control box 24)(Fig. 6 at page 13) indicates the type of problem.
- (2) The fuse is located in the rear part of the control box 24)(Fig. 6 at page 13). A pull-out fuse is also available as a spare part which can be fitted after breaking the tang on the panel which holds it in place.

## A Appendix - Accessories (optional)

### OUTPUT POWER REGULATOR KIT RWF 40

With the modulating operation, the burner continually adapts the power to the request for heat, ensuring great stability for the parameter controlled: temperature or pressure.

Two components should be ordered:

- the output regulator to install on the burner
- the probe to install on the heat generator

Parameter to control		Probe		Output power regulator	
	Range	Type	Code	Type	Code
Temperature	- 100...+ 500°C	PT 100	3010110	RWF40	3010212
Pressure	0...2.5 bar	Probe with output 4...20 µA	3010213		
	0...16 bar		3010214		

### POTENTIOMETER KIT

Depending on the servomotor fitted to the burner, a three-pole potentiometer (1000 Ω) can be installed to check the position of the servomotor.

Burner	Code
RL 190/M	3010021

### SOUND PROOFING BOX

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

Burner	Box type	Average noise reduction [dB(A)]	Code
RL 190/M	C4/5	10	3010404

### 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 units are provided in two versions:

Burner	Code
RL 190/M (without filter)	20034277
RL 190/M (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

### HEAD KIT FOR REVERSE FLAME CHAMBER

In certain cases, the use of the burner on reverse flame boilers can be improved by using an additional cylinder.

Burner	Standard head (mm)	Code
RL 190/M	493	3010241

**B Appendix - Electrical panel layout**

**ELECTRICAL EQUIPMENT FACTORY-SET**

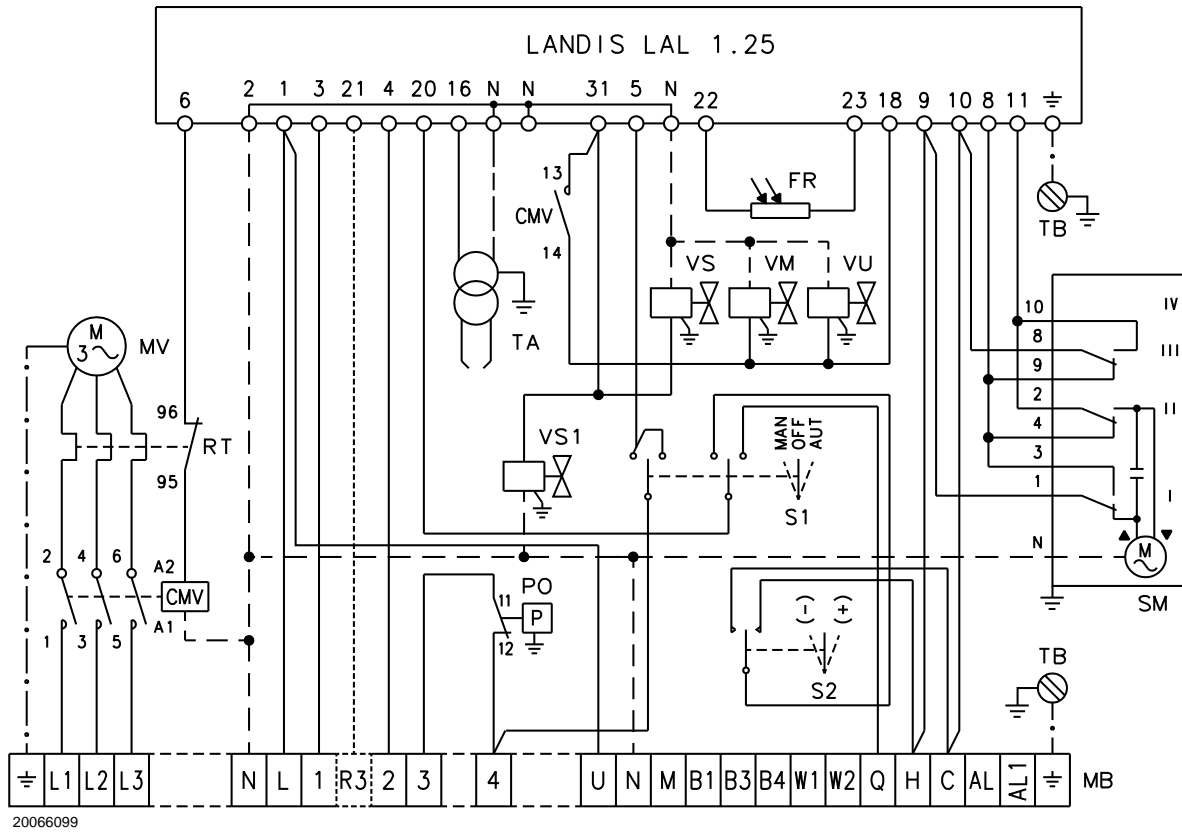


Fig. 36



The burner 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.

**TO BE COMPLETED BY THE INSTALLER**

**Electrical connection three-phase 230/400V power supply**

	230V	400V
F	A	T25
L	mm <sup>2</sup>	2.5

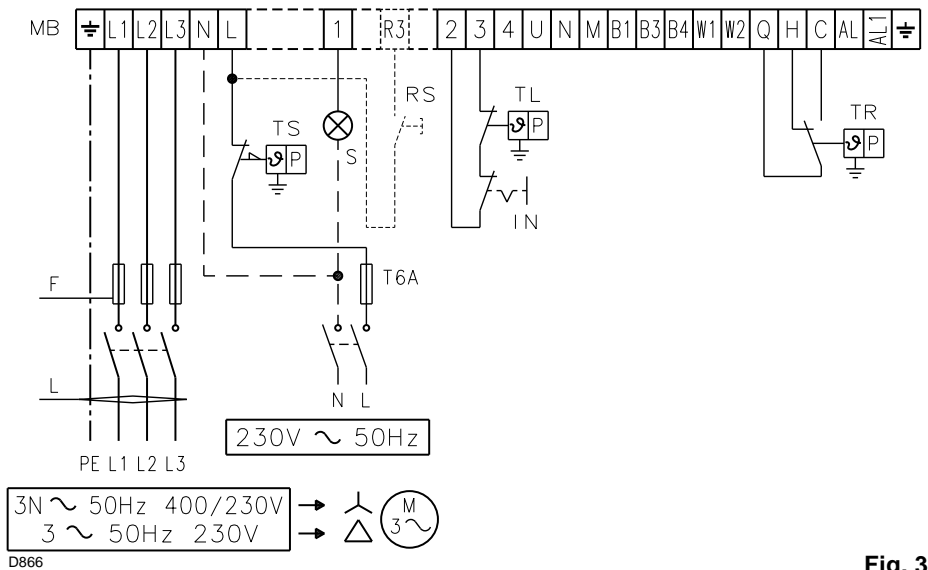
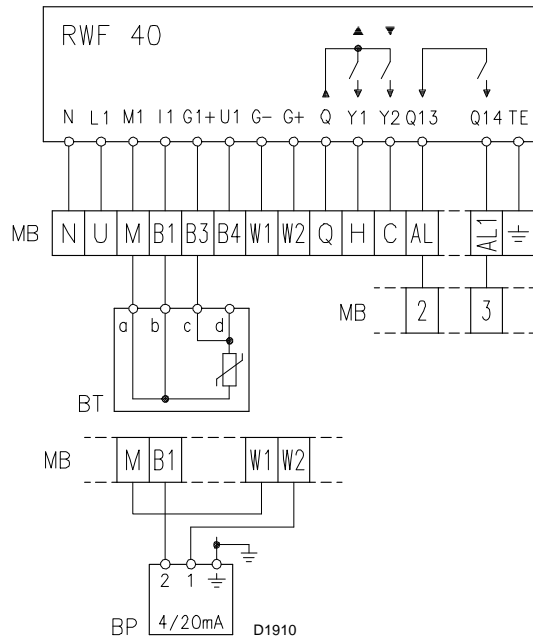


Fig. 37

**RWF40**

**Power regulator RWF40 electrical connection**



**Fig. 38**

**Key to layout**

- CMV Motor contactor
- LAL 1.25 Control box
- FR Photocell
- MB Terminal strip
- MV Fan motor
- PO Oil pressure switch
- RT Thermal cut-out
- S1 Power switch for different operations:  
MAN = manual  
AUT = automatic  
OFF = off
- S2 Button for:  
– power reduction  
+ power increase
- SM Servomotor
- TA Ignition transformer
- TB Burner ground (earth) connection
- VM Delivery pump valve
- VS Delivery pump valve (safety valve)
- VS1 Safety valve on return
- VU Valve on nozzle return
- BT Temperature probe
- BP Pressure probe
- IN Manual burner stop switch
- MB Terminal strip
- RS Remote lock-out reset button (if present)
- S Remote lock-out signal
- 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<sup>st</sup> and 2<sup>nd</sup>.  
The TR load control is not required when the regulator RWF40 is connected as its function is performed by the regulator RWF40 itself.
- TS Safety control device system: this operates when TL is faulty.







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