

**GB Gas oil burners**

Two-stage operation

**PRESS GBW B10**

CODE	MODEL	TYPE
20032930	PRESS GBW	604T50



<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
2.2	Guarantee and responsibility	5
2.3	Guidance for the use of bio fuel blends up to 10%	5
<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	Technical data	9
4.3	Packaging - Weight	9
4.4	Overall dimensions	10
4.5	Firing rates	10
4.6	Test boiler	12
4.7	Burner description	13
4.8	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/Servicer 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	17
5.10	Hydraulic connections	19
5.11	Gas oil supply	19
5.12	Pump	22
<b>6</b>	<b>Electrical system</b>	<b>24</b>
6.1	Notes on safety for the electrical wiring	24
6.2	Electrical connection	25
<b>7</b>	<b>Start-up, calibration and operation of the burner</b>	<b>27</b>
7.1	Notes on safety for the first start-up	27
7.2	Calibrations before firing	27
7.3	Burner calibration	28
7.4	Combustion characteristics	29
7.5	Emissions into the atmosphere	29
7.6	Flue gas temperature	30
7.7	Combustion chamber pressure	30
7.8	Loss of heat from the flue	30
7.9	Burner operation	31
<b>8</b>	<b>Maintenance</b>	<b>33</b>
8.1	Notes on safety for the maintenance	33
8.2	Maintenance programme	33

<b>9</b>	<b>Faults - Possible causes - Solutions.....</b>	<b>35</b>
9.1	Burner start-up cycle diagnostics.....	36
9.2	Operating fault diagnostics .....	36
9.3	Control card .....	37
<b>A</b>	<b>Appendix - Accessories (optional).....</b>	<b>38</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: Gas oil burners

Model: PRESS GBW

These products are in compliance with the following Technical Standards:

EN 267

EN 292

and according to the European Directives:

MD	2006/42/EC	Machine Directive
LVD	73/23/EEC - 2006/95/EC	Low Voltage Directive
EMC	89/336/EEC - 2004/108/EC	Electromagnetic Compatibility

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

Legnago, 30.07.2010

Mr. G. Conticini  
Burners Division Department  
RIELLO S.p.A.



## 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

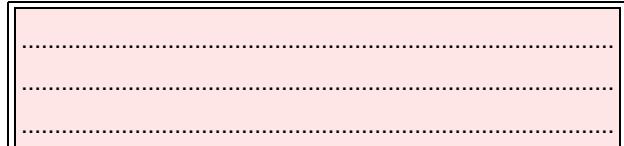
#### Delivery of the system and the instruction manual

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 value and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used.
  3. Riello warranty does not cover defects arising from incorrect commissioning or servicing by non Riello employed service engineers, and any issues impacting the burner arising from external site related issues.

## 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, hydroscopic and less stable.

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

It is a minimum requirement that the fuel blend (up to 10% Bio) is obtained with gasoil in accordance with the relevant EN standards, regional regulations and FAME in accordance with EN 14214. It is also important that the fuel blends meet the 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 dual fuel applications where oil may be stored for long periods of time.
- The burner must be set according to the appliance application and commissioned checking that all combustion parameters are as recommended in the appliance technical manual.
- 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

**Series :** PRESS

<b>Operation :</b>	GV or G24	One stage
	GW or 1-2-3-4G	Two stage

**Emission :** ... Class 1 EN267

<b>Head :</b>	TC Standard head
	TL Extended head

<b>Flame control system :</b>	FS1 Standard (1 stop every 24 h)
	FS2 Continuous working (1 stop every 72 h)

<b>Electrical supply of the system :</b>	1/230/50	1/230V/50Hz
	1/210/60	1/210V/60Hz
	1/220/60	1/220V/60Hz
	1/200/50-60	1/200V/50-60Hz
	3/230-400/50	3/230V/50Hz-3N/400V/50Hz
	3/210/60	3/210V/60Hz
	3/220-380/60	3/220V/60Hz-3N/380V/60Hz
	3/200/50-60	3/200V/50-60Hz

<b>Auxiliary voltage :</b>	230/50	230V/50Hz
	120/60	120V/60Hz
	220/60	220V/60Hz
	200/50-60	200V/50-60Hz

PRESS	GBW		TC	FS1	1/230/50	230/50
-------	-----	--	----	-----	----------	--------

## 4.2 Technical data

MODEL		PRESS GBW	
Type		605T50	
Power (1) Output (1)	2nd stage	kW Mcal/h kg/h	178 - 356 153 - 306 15 - 30
	1st stage	kW Mcal/h kg/h	107 - 178 92 - 153 9 - 15
Fuel	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 Mcal/kg	11.86
	density	kg/dm <sup>3</sup>	10.2 (10.200 kcal/kg)
	viscosity at 20 °C	mm <sup>2</sup> /s max	0.82 - 0.85 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 Hz	230 ~ +/-10% 50 - single-phase	
Electric motor	rpm	2800	
	kW	0.25	
	V	230	
	A	2.3	
Motor capacitor	µF/V	6.3/450	
Ignition transformer	V1 - V2 I1 - I2	230 V - 8 kV 1.8 A - 30 mA	
Pump	output (at 12 bar) pressure range fuel temperature	kg/h bar °C max	65 10 - 18 60
Electrical power consumption	kW max	0.50	
Protection level		IP40	

Tab. A

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

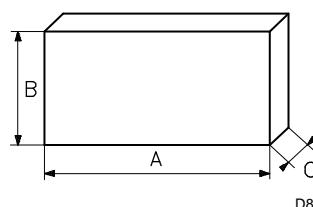
(2) Pressure at test point 18)(Fig. 7 at page 13) with zero pressure in the combustion chamber and maximum burner output.

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

## 4.3 Packaging - Weight

Approximate measurements.

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



D88

Fig. 1

	A	B	C	kg
mm	695	468	542	37

Tab. B

## 4.4 Overall dimensions

Approximate measurements.

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 when open is give by measurement I.

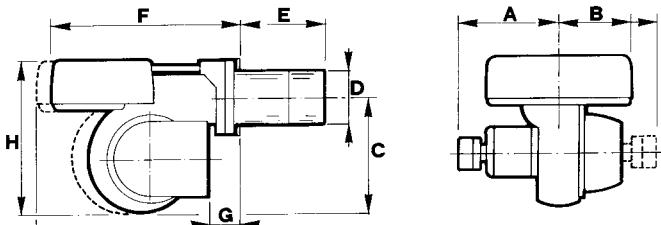


Fig. 2

	A	B	C	D	E	F	G	H	I
mm	234	205	292	140	185	473	59	397	688

Tab. C

## 4.5 Firing rates

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

In **one-stage operation**, only one control device is provided: TL (See the wiring diagram on page 25).

The burner fires in the 1st stage, where it remains for 7 seconds before passing to the 2nd stage when commanded by the control box 8) (Fig. 7 on page 13).

When the boiler temperature or pressure exceeds the values set on the control device TL, the burner shuts down.

In **two-stage operation**, two control devices are provided: TL and TR.

The burner fires in the 1st stage but passes to the 2nd stage only if control device TR is closed. Once the temperature or pressure value set on control device TR has been reached, the burner returns to the 1st stage.

The burner shuts down only when the boiler temperature or pressure exceeds the value set on control device TL, even if the burner is still operating in the 1st stage.

Two-stage operation ensures reduced boiler temperature or pressure fluctuation and consequently lower operating costs.

**MINIMUM 1ST STAGE DELIVERY (MIN)** must be selected within the range of the values listed above the adjacent diagram.

It is not necessary to know the pressure in the combustion chamber in the 1st stage.

**MAXIMUM 2ND STAGE DELIVERY (MAX)** must be selected within the range of the adjacent diagram. This area is known as the FIRING RATE and provides the maximum delivery of the burner according to the combustion chamber pressure.

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 the FIRING RATE area.

### Example:

if the PRESS GBW Model has a delivery of 21 kg/h at a combustion chamber pressure of 4 mbar, the work point will be found on the maximum pressure curve.



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 27.

Consult page 11, for operation at different surrounding temperatures and/or altitudes.

The delivery of the burner to be coupled to the boiler must be selected in the MAX. area - in other words, within the FIRING RATE.

The burner can also operate in depression combustion chambers.

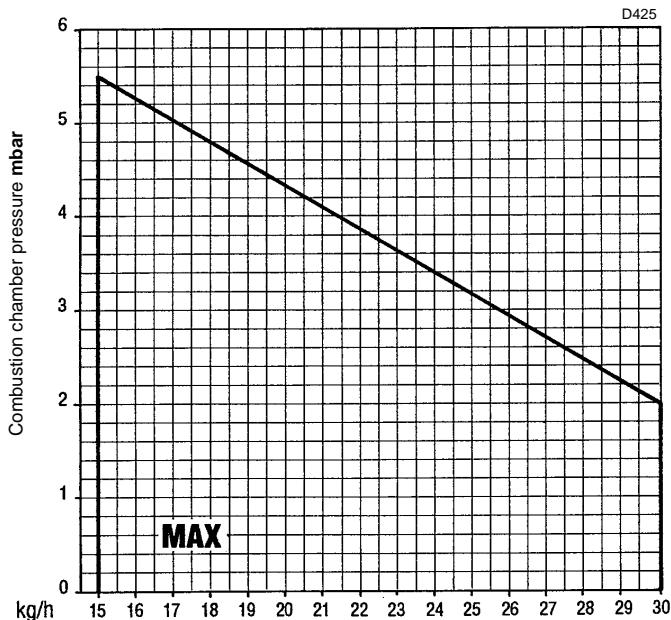


Fig. 3

PRESS GBW - MIN (1st stage) = 9 - 15 kg/h

## 4.5.1 Burner firing rates according to air density

The burner firing rate range provided in this Manual applies to operation at a surrounding temperature of 20°C at an altitude of 100 meters above sea level (atmospheric pressure approx. 1000 mbar).

The burner may be required to operate with comburent air at a higher temperature and/or at higher altitudes.

Heating of air and increase in altitude produce the same effect: the expansion of the air volume, i.e. the reduction of air density.

The burner fan's delivery remains substantially the same, but the oxygen content per cubic meter and the fan's head are reduced. It is therefore important to know if the maximum output required of the burner at a given combustion chamber pressure remains within the burner's firing rate range even at different temperature and altitude conditions. Proceed as follows to check the above:

- 1 - Find the correction factor F in the Tab. D for the plant's air temperature and altitude.

Altitude a.s.l.	(1)	Correction factor F									
		Air temperature °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		

(1) AVERAGE BAROM. PRESS.

2 - Divide the burner's delivery Q by F in order to obtain the equivalent delivery  $Q_e$ :

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

3 - In the firing rate range of the burner (Fig. 4), indicate the work point defined by:

$Q_e$  = equivalent delivery

$H_1$  = combustion chamber pressure

The resulting point A must remain within the firing rate range.

4 - Plot a vertical line from Point A as shown in (Fig. 4) and find the maximum pressure  $H_2$  of the firing rate.

5 - Multiply  $H_2$  by F to obtain the maximum reduced pressure  $H_3$  of the firing rate.

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

If  $H_3$  is greater than " $H_1$ ", as shown in (Fig. 4), the burner deliver the output required.

If  $H_3$  is lower than  $H_1$ , the burner's delivery must be reduced.

Tab. D

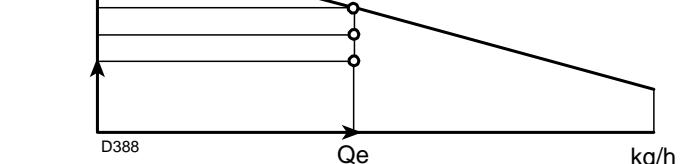


Fig. 4

A reduction in delivery is accompanied by a reduction of the pressure in the combustion chamber:

$Q_r$  = reduced delivery

$H_{1r}$  = reduced pressure

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

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

$$Q_r = Q \times 0,95$$

$$H_{1r} = H_1 \times (0,95)^2$$

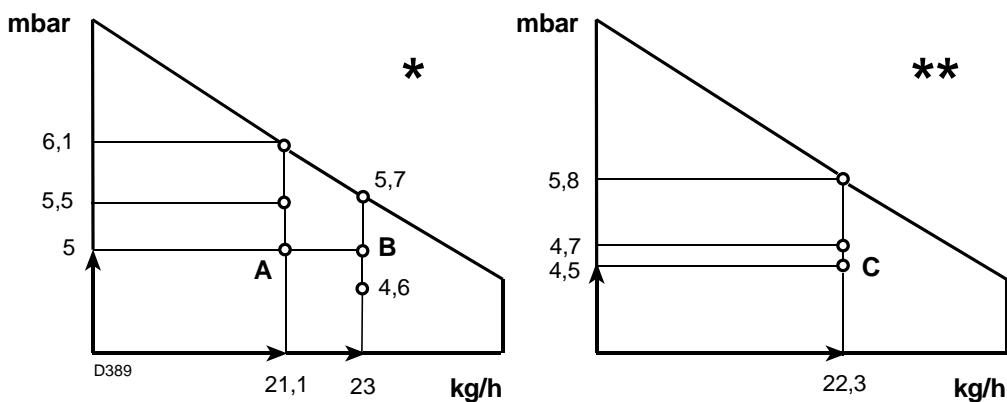
Steps 2-5 must now be repeated using the new  $Q_r$  and  $H_{1r}$  values.

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



CAUTION

Example



**Fig. 5**

**Delivery  $Q = 19 \text{ kg/h}$  - Comb. chamber press.  $H1 = 5 \text{ mbar}$**

air $20^\circ\text{C}$ - altitude 1000 m a.s.l. - $F = 0.898$		*
$Qe = Q : F = 19 : 0.898 = 21.1 \text{ kg/h}$	5 mbar A	
$H2 = 6.1 \text{ mbar}$		
$H3 = H2 \times F = 6.1 \times 0.898 = 5.5 \text{ mbar}$		
$H3 > H1 (5.5 > 5) \text{ OK}$		
air $30^\circ\text{C}$ - altitude 1600 m a.s.l. - $F = 0.808$		*
$Qe = Q : F = 19 : 0.808 = 23 \text{ kg/h}$	5 mbar B	
$H2 = 5.7 \text{ mbar}$		
$H3 = H2 \times F = 5.7 \times 0.808 = 4.6 \text{ mbar}$		
$H3 < H1 (4.6 < 5) \text{ IMPOSSIBLE}$		

Delivery reduction 5%

$$Qr = 19 \times 0.95 = 18 \text{ kg/h} - H1r = 5 \times (0.95)^2 = 4.5 \text{ mbar}$$

$Qe = Q : F = 18 : 0.808 = 22.3 \text{ kg/h}$	4.5 mbar	C	**
$H2 = 5.8 \text{ mbar}$			
$H3 = H2 \times F = 5.8 \times 0.808 = 4.7 \text{ mbar}$			
$H3 > H1 (4.7 > 4.5) \text{ OK}$			

### 4.6 Test boiler

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

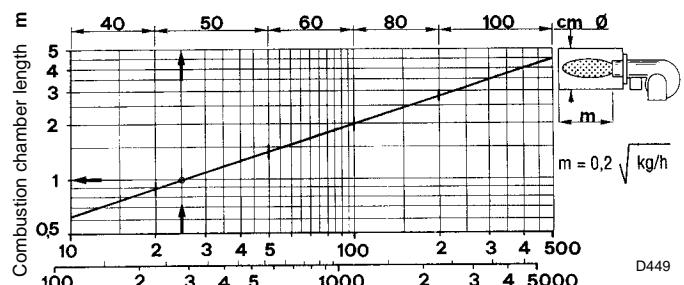
Fig. 6 indicates the diameter and length of the test combustion chamber.

#### Example:

delivery 25 kg/hour:

diameter = 50 cm; length = 1 m.

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



**Fig. 6**

#### 4.7 Burner description

- 1 Slide bars for opening the burner and inspecting the combustion head
- 2 Combustion head
- 3 Air inlet to fan
- 4 Motor capacitor
- 5 Ignition transformer
- 6 Terminal strip
- 7 Fairleads for wiring carried out by the installer
- 8 Control box with lock-out pilot light and lock-out reset button
- 9 Fan pressure test point
- 10 Pump (See page 22)
- 11 Fan
- 12 Electrical motor
- 13 Screw for combustion head adjustment
- 14 Photocell for flame presence control
- 15 Fan rotation direction
- 16 Variable stroke hydraulic cylinder.  
Opens the fan gate valve to the value necessary at the 2nd stage of operation.
- 17 Indexed selector.  
This selector adjusts the opening of the fan gate to the value necessary at the 1st stage of functioning.

**NOTE:**

If the control box 22)(Fig. 7) push-button lights up, it indicates that the burner is in lock-out.

To reset, hold the push-button down for between 1 and 3 seconds.

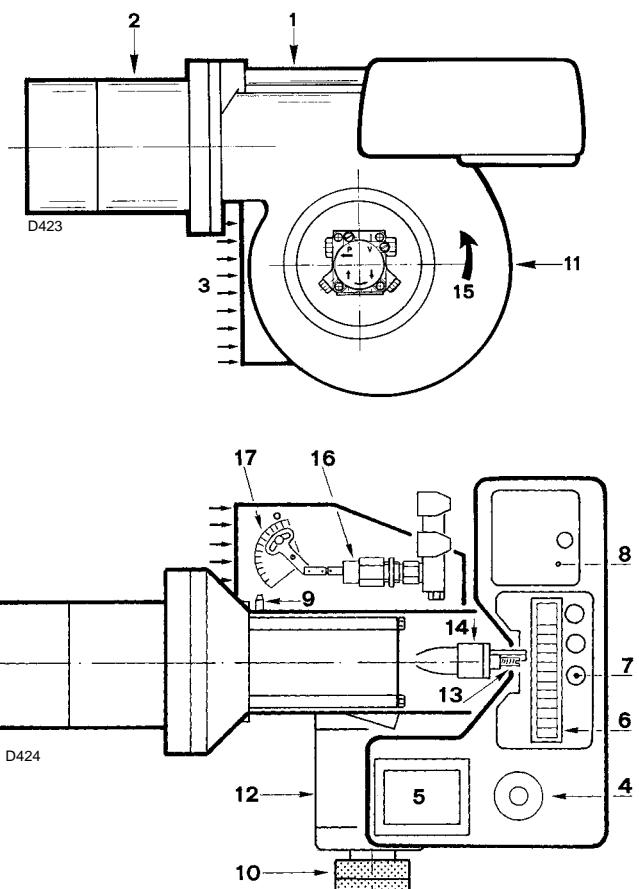


Fig. 7

#### 4.8 Standard equipment

- 2 - Hoses
- 2 - Gaskets for hoses
- 2 - Nipples for hoses
- 2 - Reducers with gasket for connection of hoses
- 1 - Thermal insulation screen
- 4 - Screws to secure the burner flange to the boiler: M10 x 25
- 1 - Instruction booklet



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 suitableness of the available means of handling.

Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).

When handling, keep the load at not more than 20-25 cm from the ground.



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. 8) 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).

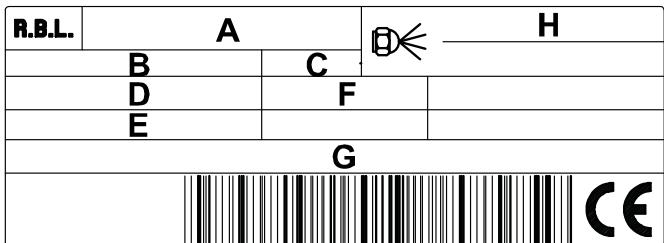


Fig. 8



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

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

- During the burner installation, check that the gasoil and bio fuel blends are in accordance with Riello specifications (please refer to the chapters "Technical Data" and "Guidance for the use of bio fuel blends up to 10%" within the burner technical manual).
- If a Bio blend is in use the installer must seek information from the end user that their fuel supplier can evidence that the blends of fuel conform to the relevant standards.
- Check that the materials used in the construction of the oil tank and ancillary equipment are suitable for bio fuels, If not these must be upgraded or replaced with Bio compatible parts.
- Particular attention should be given to the oil storage tank and supply to the burner. Riello recommends that existing oil storage tanks are cleaned, inspected and any traces of water are removed BEFORE bio fuel is introduced (Contact the tank manufacturer or oil supplier for further advice). If these recommendations are not respected this will increase the risk of contamination and possible equipment failure.
- In line oil filters should be replaced making sure that they are Bio compatible. Riello recommends a good quality bio compatible oil filter at the tank and a secondary 100 micron filter are used to protect the burner pump and nozzle from contamination.
- The burner hydraulic components and flexible oil lines must be suitable for bio fuel use (check with Riello if in doubt). Riello have carefully chosen the specification of the bio compatible components including the flexible oil lines to protect the pump, safety 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 33.



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

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

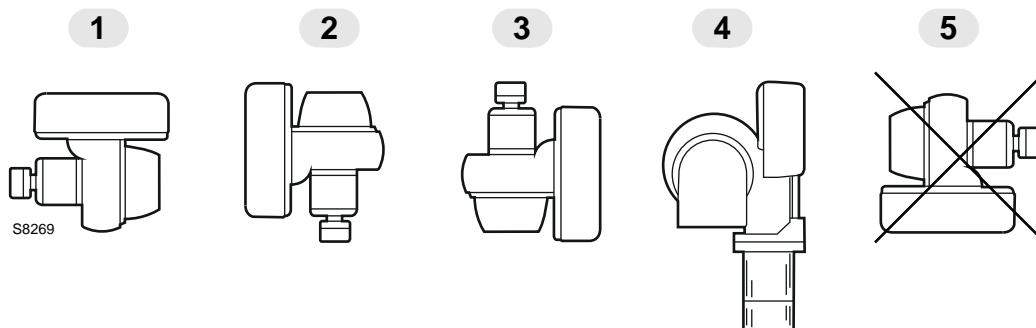


Fig. 9

#### 5.6 Boiler plate

Drill the combustion chamber locking plate as shown in Fig. 10. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

	A	B	C	D
mm	155	160	160	M10

Tab. E

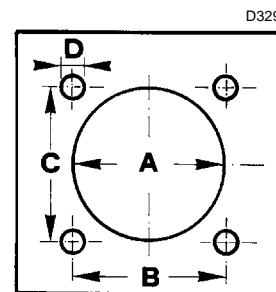


Fig. 10

## 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 (mm), is as follows:

### Blast tube

shortened	43 mm
standard	185 mm
lengthened	320 mm

## 5.8 Securing the burner to the boiler

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

- Remove the screws 2) from the two slide bars 3).
- Remove the screws 1) that secure the blast tube 6) to the burner 4).
- Now disassemble the blast tube complete with the slide bars.

Fasten the blast tube 6) to the boiler plate (Fig. 10 on page 15), inserting the gasket provided 5). Use the 4 screws provided after having protected the thread with antiscruffing products (high-temperature grease, compounds, graphite). The burner-boiler seal must be airtight.

For boilers with front flue passes 9) or flame inversion chambers, protective fettling in refractory material 7) must be inserted between the boiler's fettling 8) and the blast tube 6).

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

Reassemble the burner 4) on the slide bars 3) and re-insert the screws 2).

Leave the burner open as shown in (Fig. 11).

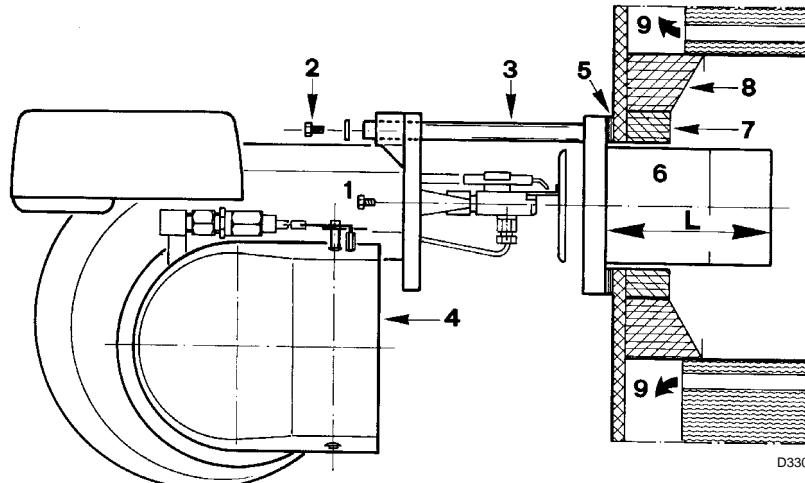


Fig. 11

## 5.9 Nozzle installation

### 5.9.1 Choice of nozzles for 1<sup>st</sup> and 2<sup>nd</sup> 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.

The nozzle must be chosen from among those listed in (Tab. F).

Use nozzle with atomization angle of 60° and, if possible, at a pressure of 12 bar.

Nozzles 60° - GPH	Delivery kg/h (1)			kW 12 bar
	10 bar	12 bar	14 bar	
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
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

(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

### 5.9.2 Nozzle

The spray patterns in relation to the leading brands of nozzle on sale are shown in (Tab. G).

The nozzle deliveries indicated in the Tab. F are the rated values. In reality, the delivery may differ by +/- 10% due to the reasons below:

- tolerance values indicated by the manufacturer;
- temperature variation: delivery decreases with a rise in temperature and vice-versa;
- variations in fuel viscosity: delivery decreases with a decrease of viscosity and vice-versa.

A burner's exact delivery can only be determined by weighing. Suck the fuel from a recipient mounted on a weighing machine, or attach hoses to the nozzles and weigh the fuel that flows out.

A liter counter can be applied to the pump's suction line if a single-pipe supply system has been provided.

#### NOTE:

Nozzle manufacturers discourage opening of the nozzle to clean its internal parts and especially its calibrated hole. The filter, on the other hand, may be cleaned or replaced as required. Grip the nozzle on its hexagonal part when handling.

Spray	Delevan	Monarch	Danfoss	Steinen
	hollow	A	PL	H
	solid	B	AR	S
	universal	W	NS - PLP	B
	semi-solid	E	R	-
				S

Tab. F

Tab. G

#### Example:

Boiler output = 270 kW - efficiency 90 %

Output required by the burner =

270 : 0.9 = 300 kW;

300 : 2 = 150 kW per nozzle;

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

1° = 3.00 GPH - 2° = 3.00 GPH,

or the following two different nozzles:

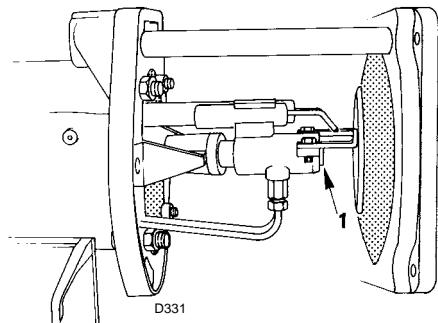
1° = 2.50 GPH - 2° = 3.50 GPH, or

1° = 3.50 GPH - 2° = 2.50 GPH.

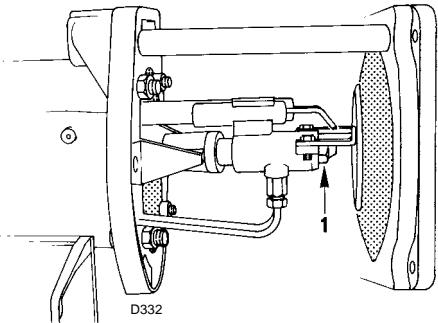
### 5.9.3 Nozzle assembly

The nozzle for the 1st stage of operation is the one lying beneath the firing electrodes (Fig. 14).

With the burner open on the slide bars as shown in (Fig. 11 on page 16), unscrew and remove the plastic plug 1) (Fig. 12) and screw the nozzle 1) (Fig. 13) into the same place using a 16 mm wrench. Do not use any sealing products such as gaskets, sealing compound, or tape. The nozzle must be screwed into place tightly but not to the maximum torque value provided by the wrench.



**Fig. 12**



**Fig. 13**



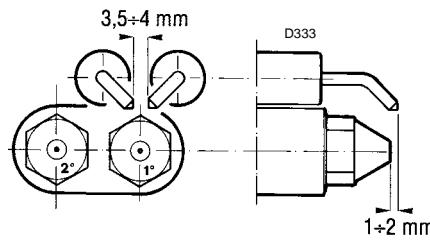
Do not use any sealing products such as gaskets, sealing compound, or tape.

Be careful to avoid damaging the nozzle sealing seat. The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

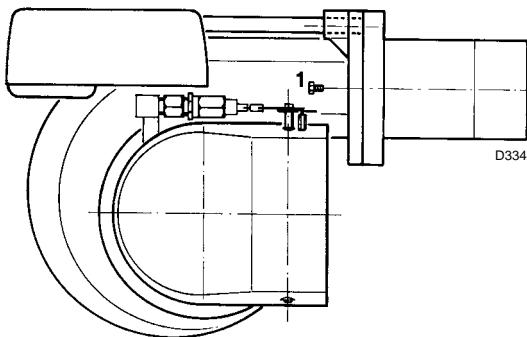


Make sure that the electrodes are positioned as shown in (Fig. 13 on page 18).

Lastly, close the burner by screwing in the two screws 1)(Fig. 15).



**Fig. 14**



**Fig. 15**

## 5.10 Hydraulic connections

### NOTE:

The hydraulic circuit feeding system must be designed to the indications provided in "Gas oil supply".

Remove the plugs from the suction and return pump connectors and screw in the hoses, the connectors, and the gaskets provided in their place as shown in (Fig. 16).

Do not twist the hoses during installation.



- The opening of the burner or the boiler door must not twist or strain the hoses.
- Arrange the hoses in such way that they will never be stepped on or contact hot boiler surfaces.
- Use two wrenches to screw in the hoses/nipples: one to grip the hose connector and the other to grip the nipple in order to apply the opposite force.

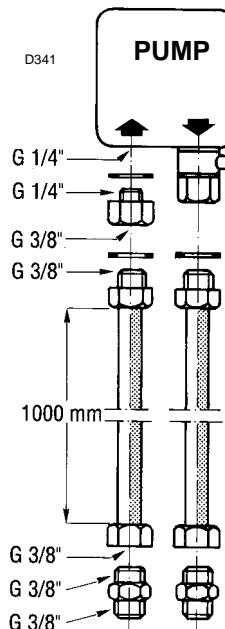


Fig. 16

## 5.11 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) are used to protect the burner pump and nozzle from contamination.

In case of Biodiesel use, pay attention to install Biocompatible filters.

### 5.11.1 Double-pipe circuit

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

There are three types of fuel hydraulic circuits:

- double-pipe circuits (the most common)
- single-pipe circuits
- loop circuits.

According to the burner/tank layout, either of two fuel supply systems can be used:

- siphon-type (with the tank higher than the burner);
- suction-type (with the tank lower than the burner).

### 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.

### Useful suggestions for both systems (A) and (B):

- Use copper pipes whenever possible.
- Any curves used in the system should be made with the widest possible radius.
- Use biconic connectors at both ends of the pipe.
- Whenever the burner is installed in areas with extremely cold winter climates (temperatures lower than -10°C), we recommend insulating both the tank and the piping. Avoid the smallest of the three pipe diameters provided in the Table and lay the piping along the most sheltered route possible. The paraffin in the fuel begins to solidify below 0°C, and the filters and nozzle begin to clog accordingly.
- Install a filter on the suction lines with a transparent plastic bowl if possible in order to permit the regular flow of fuel and quick checking of the state of the filter.
- The return pipe does not require an on/off valve, but if the user desires to insert one, a lever-type valve should be selected which clearly indicates when the valve is open or closed (if the burner starts with the return pipe closed, the sealing organ located on the pump shaft will break).
- The opening of the burner or the boiler door must not twist the hoses that connect the copper pipes to the pump.
- If more than one burner is operating in the same room, each one must be equipped with its own suction pipe; the return pipe may be shared by all, providing it is sufficiently sized.
- The suction line must be perfectly airtight. In order to check the seal, close the pump's return line. Install a union T on the vacuum meter attachment. On one branch of this T install a pressure gauge and on the other branch inject air at a pressure of 1 bar. After the air injection, the gauge must remain at a constant pressure.

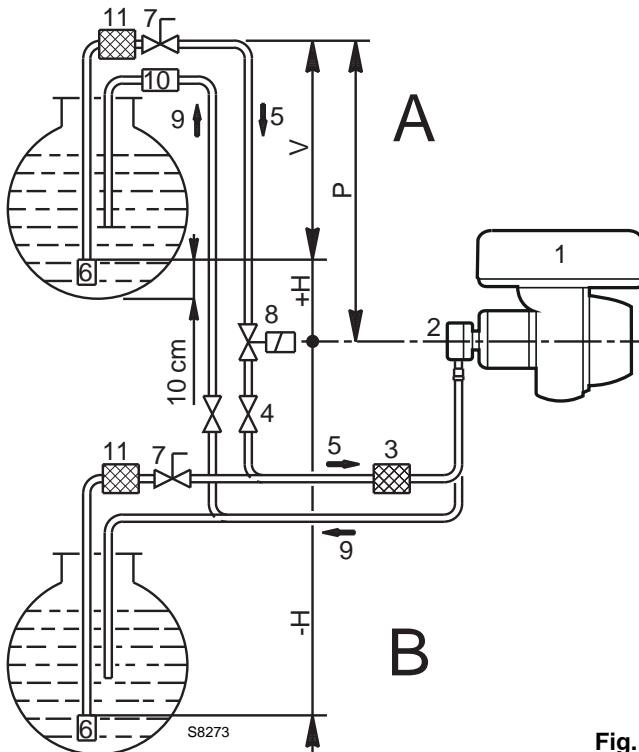


Fig. 17

### Key (Fig. 17)

H	Pump/Foot valve height difference
L	Piping length
	• values calculated for gas oil:
	• viscosity = 6 cSt/20°C
	• density = 0.84 kg/dm <sup>3</sup>
	• temperature = 0°C
	• max altitude = 200 m (a.s.l.)
ø	Inside pipe diameter
1	Burner
2	Pump
3	Filter
4	Manual on/off valve
5	Suction line
6	Foot valve
7	Rapid closing manual valve remote controlled (only Italy)
8	On/off solenoid valve (only Italy)
9	Return line
10	Check valve (only Italy)
11	Tank filter

+ H (m)	L (m)		
	8	10	12
+ 4,0	35	90	152
+ 3,0	30	80	152
+ 2,0	26	69	152
+ 1,0	21	59	130
+ 0,5	19	53	119
0	17	48	108
- 0,5	15	43	97
- 1,0	13	37	86
- 2,0	9	27	64
- 3,0	4	16	42
- 4,0	-	6	20

Tab. H

### 5.11.2 Single-pipe circuit

There are two solutions possible:

- Pump external bypass (A, Fig. 19) (recommended)

The two hoses are connected to an automatic degassing unit, (See "Degassing unit" on page 38.).

The pump bypass screw must not be removed.

- Pump internal bypass (B, Fig. 19)

The pumps are equipped with a screw 6), Layout on Fig. 32, which is accessible through the return line connector, which when removed opens the return pipe to the suction line. The pump return line connector must be plugged.

This solution is possible only with low pump depression values (max. 0.2 bar) and perfectly-sealed piping.

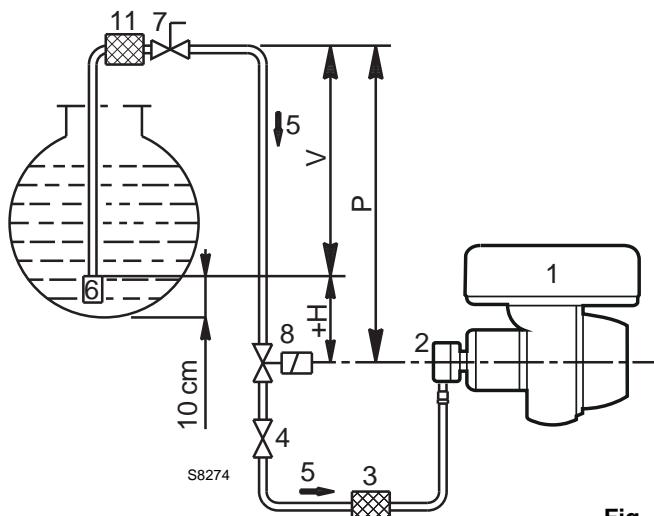


Fig. 18

### Key (Fig. 18)

H	Pump/Foot valve height difference
L	Piping length
	• values calculated for gas oil:
	• viscosity = 6 cSt/20°C
	• density = 0.84 kg/dm <sup>3</sup>
	• temperature = 0°C
	• max altitude = 200 m (a.s.l.)
Ø	Inside pipe diameter
1	Burner
2	Pump
3	Filter
4	Manual on/off valve
5	Suction line
6	Foot valve
7	Rapid closing manual valve remote controlled (only Italy)
8	On/off solenoid valve (only Italy)
11	Tank filter

+ H - H (m)	L (m)		
	8	10	12
+ 4,0	35	90	152
+ 3,0	30	80	152
+ 2,0	26	69	152
+ 1,0	21	59	130
+ 0,5	19	53	119

Tab. I

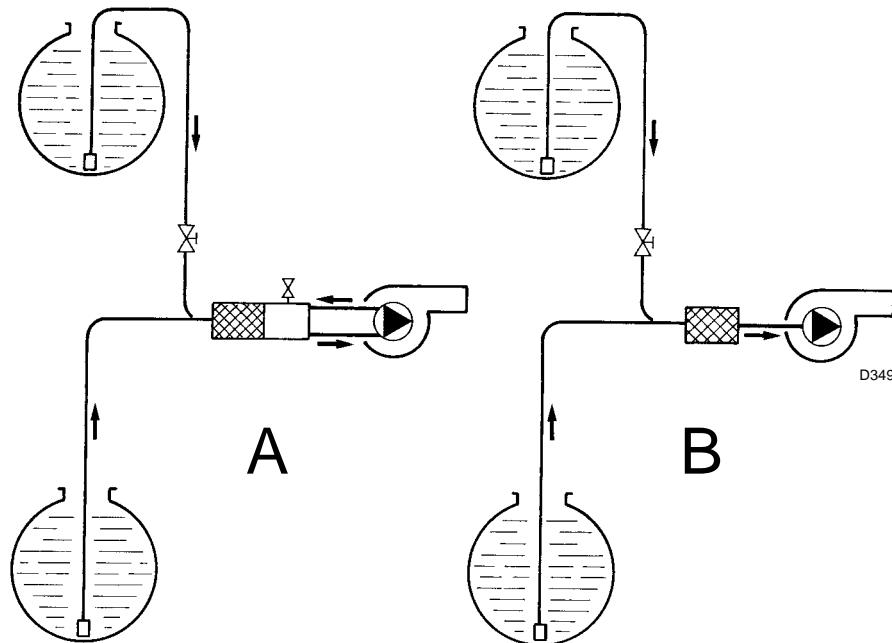


Fig. 19

### 5.11.3 The loop circuit

This is composed by piping that leaves from the tank and returns to the same with an auxiliary pump that circulates the fuel under pressure. A branch connection from the loop goes to feed the burner. This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the Table.

Contact our Engineering Department for further information regarding single-pipe systems and the loop circuit.

**Altitude:** Altitude has a determined effect on pipe suction power. At altitudes of more than 200 meters above sea level, the level difference, in metres, between the pump and the foot valve must be corrected by the factor "F", see (Tab. J), in order to obtain the equivalent height difference with which to determine the maximum piping length, i.e.:

if a suction-type system is involved:  
(equivalent)  $H_e = (\text{real}) H + F$

if a siphon-type system is involved:  
(equivalent)  $H_e = (\text{real}) H - F$

where:

$$F = (\text{real altitude}) (m - 200) / 1000$$

m	200	300	600	900	1200	1500	1800	2100
F	0	0,1	0,4	0,7	1	1,3	1,6	1,9

m = Altitude in m a.s.l.

F = Compensation factor

**Tab. J**

#### Example:

Suction type system ..... - H = 2 m

Piping diameter ..... Ø = 10 mm

Altitude	m	200	1200
F		0	1
- H	m	2	2 + 1 = 3
Piping lenght	m	27	16

## 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.

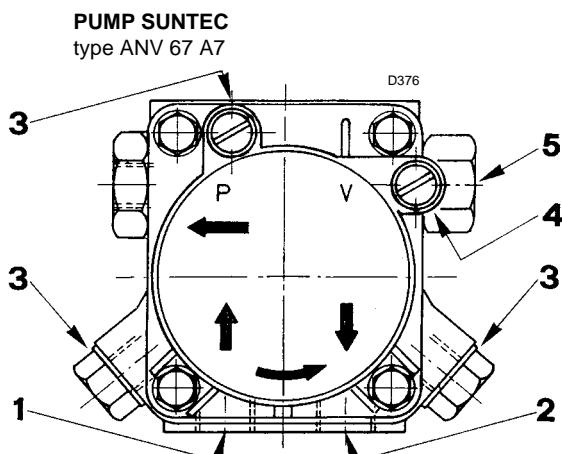


Fig. 20

#### Pump

	ANV 67 A7
1 - Suction	G 1/4"
2 - Return	G 1/4"
3 - Pressure gauge attach.	G 1/8"
4 - Vacuummeter attachment	G 1/8"
5 - Pressure adjustment screw: Right rotation = pressure increases Left rotation = pressure decreases	

### 5.12.1 Technical data

#### Pump SUNTEC ANV 67 A7

Delivery pressure range	bar	10 - 20
Max. suction depression	bar	0.45
Viscosity range	mm <sup>2</sup> /s (cSt)	2 - 75
Max. gas oil temperature	°C	60
Max. suction and return pressure	bar	2
Pressure calibration in the factory	bar	14
Filter mesh width	mm	0.150

**Tab. K**

G = cylindrical thread

The connector to be screwed into the cylindrical thread G must be equipped with a sealing washer.

Do not screw a connector with a conical thread (NPTF) into the cylindrical thread G.

#### NOTE

- The pump is equipped with a bypass that connects return line and the suction line.  
The pump is installed on the burner with the bypass closed by screw 6) (Fig. 32 on page 31).  
When single-pipe fuel supply systems without degaussing units (Fig. 19 on page 21) are used, this screw, accessible from the connector 2), must be removed. In this way, the excess in the delivery discharged by the pressure regulator into the return line passes into the suction line.  
The pump will break immediately if it is run with the return line closed and the bypass screw inserted.
- The vacuum meter attachment is located upstream from the pump filter and consequently it is not able to detect a clogged filter.
- The pump is delivered from the factory already full of fuel and with its return and suction connections plugged. This stops the gear unit rusting and permits the pump to prime upon first starting.
- Water must be prevented from accumulating on the bottom of the tank, due to infiltration or condensation, and subsequently reaching the pump. Water in the pump will lead to rusting and eventually the pump will have to be renewed.

### 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).

- Also check to make sure that the valves located on the suction line are open and that there is sufficient fuel in the tank.
- In order for self-priming to take place, the pressure gauge attachment plug located on the pump (or the gauge itself, if applied) (See "Pump" on page 22.) must be loosened in order to bleed off the air contained in the suction line and bring the pump delivery pressure to zero.
- Do not illuminate the photocell; otherwise, the burner will fail to start.
- Start the burner by closing the control device and the electrical line main switch. The pump must rotate in the direction indicated by the arrow marked on the cover or the pump body.
- When the gas oil begins to flow out of the gauge attachment, the pump is primed. At this point, stop the burner immediately.

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. 40 seconds, reset the burner, and then repeat the starting operation as often as required.



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 by hand using a separate pump.

Once the pump has been primed, screw in the plug or the gauge on the pump's delivery line tightly and close the control devices.

## 6 Electrical system

### 6.1 Notes on safety for the electrical wiring



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Do not invert the neutral with the phase in the electrical supply line. 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:



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



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 connection



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.

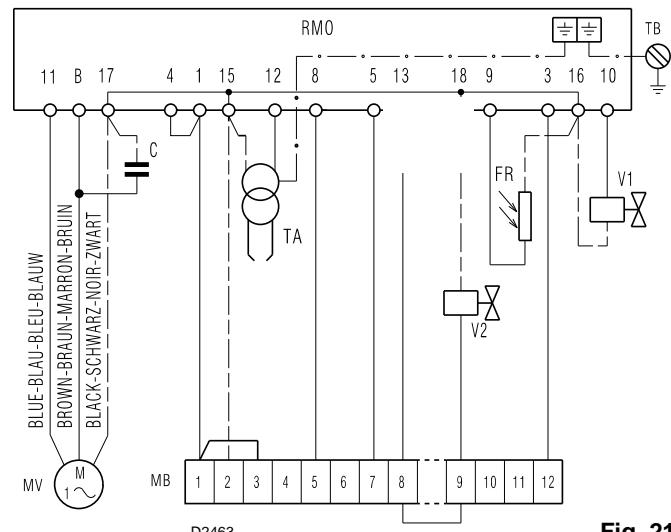
### 6.2.1 Electrical equipment factory-set

as set up by the manufacturer

- **LAYOUT (Fig. 21)**
- PRESS GV (single-phase)**

#### Key to Layout (Fig. 21)

C	- Capacitor
RMO	- Control box
FR	- Photocell
MB	- Burner terminal strip
MV	- Fan motor
TA	- Ignition transformer
TB	- Burner ground (earth) connection
V1	- 1st stage solenoid valve
V2	- 2nd stage solenoid valve



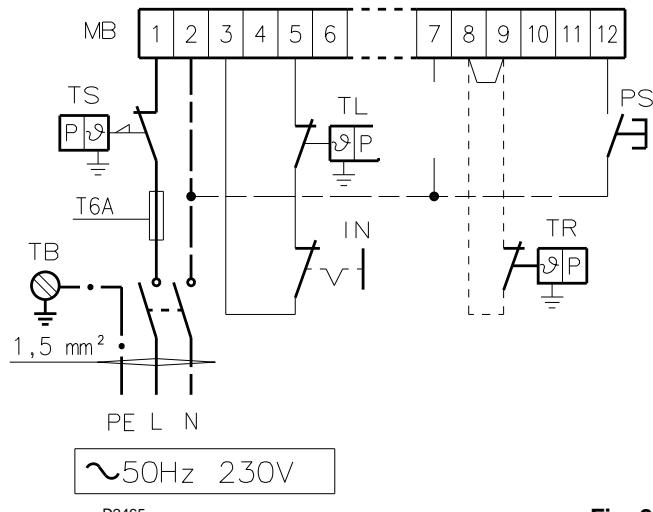
**Fig. 21**

### 6.2.2 Electrical connection of burner by installer

- **LAYOUT (Fig. 22)**
- PRESS GBW Model electrical connection:  
single-phase 230V power supply**

#### Key to wiring layout (Fig. 22):

IN	- Manual burner stop switch
MB	- Burner terminal strip
PS	- Lock-out reset button
S	- Remote lock-out signal
TB	- Burner ground (earth) connection
TL	- Limit control device system: This shuts down the burner when the boiler temperature or pressure exceeds the setpoint value.
TR	- High-low mode control device system: This controls operating stages 1 and 2 and is necessary only for two-stage operation.
TS	- Safety control device system: This operates when TL is faulty.



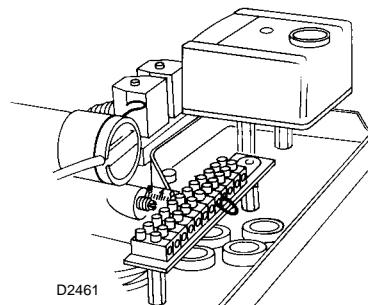
**Fig. 22**

#### NOTE:

The burner is delivered preset for single-stage operation with a jumper inserted in the terminal strip, see (Fig. 23). If two-stage operation is required, remove the jumper between terminals 8-9 and insert the control device TR in its place to command the 2nd gas oil solenoid valve.



- 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.



Fuse and cable sections: (cable section not indicated: 1,5 mm<sup>2</sup>)

**Fig. 23**

### 6.2.3 Electrical cable fastening

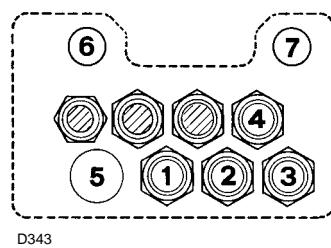
Use flexible cables according to EN 60 335-1. Regulations:

- if in PVC sheath, use at least H05 VV-F;
- if in rubber sheath, use at least H05 RR-F.

All cables to be connected to the burner terminal strip 6) (Fig. 7 on page 13) should pass through fairleads 7) (Fig. 7 on page 13). The fairleads and precut holes can be used in various ways. One example is given below:

1 - Single-phase power supply.....	Pg 13.5
2 - Control device TL.....	Pg 13.5
3 - Control device TR .....	Pg 13.5
4 - Spare fairlead.....	Pg 13.5
5 - Fitting hole for fairlead, if required .....	Pg 21
6 - Fitting hole for fairlead, if required .....	Pg 11
7 - Fitting hole for fairlead, if required .....	Pg 11

To ensure that the IP 40 protection classification is maintained, close all unused fairlead fitting holes.



D343

Fig. 24

## 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.



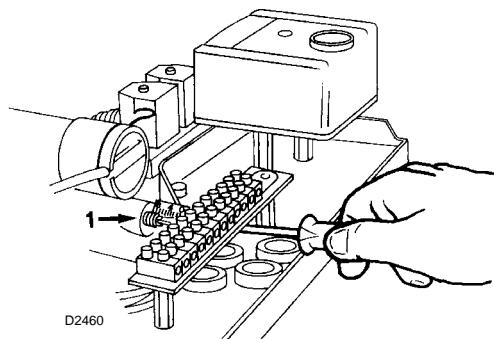
Check the correct working of the adjustment, command and safety devices.

### 7.2 Calibrations before firing

#### 7.2.1 Combustion head setting

The setting of the combustion head depends exclusively on the delivery of the burner - in other words, the delivery of the nozzle selected on Tab. F at page 17.

Set the screw 1)(Fig. 25) in such way that its rear surface corresponds to the notch number shown in diagram (Fig. 26).

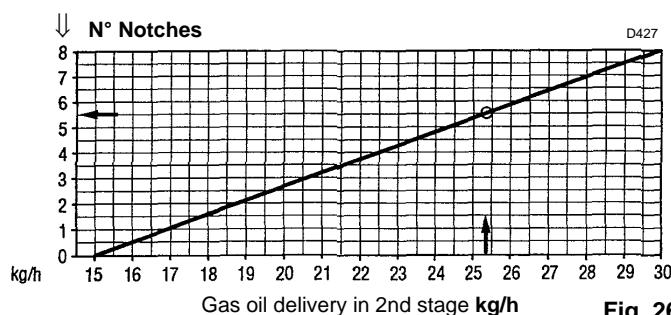


**Fig. 25**

#### 7.2.2 Pump adjustment

No presetting are required for the pump, which is set to 12 bar by the manufacturer. This pressure must be checked and adjusted (if required) after the burner has been ignited.

The only operation required in this phase is the application of a pressure gauge on the apposite pump attachment indicated in Tab. F at page 17.



**Fig. 26**

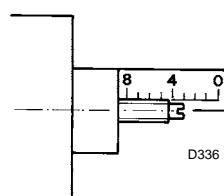
#### Example:

The PRESS GBW Model with 3.00 GPH nozzle and 12 bar pump pressure.

Find the delivery of the two 3.00 GPH nozzles in (Tab. F on page 17):

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

Diagram (Fig. 26) indicates that for a delivery of 25.4 kg/h the burner requires the combustion head to be set to approx. three notches, as shown in (Fig. 27).



**Fig. 27**

## 7.2.3 Fan gate adjustment

### 1st stage:

The air gate valve 1) (Fig. 28) is set using the indexed selector 4) (Fig. 28).

Loosen the screw 3) (Fig. 28) and the nut 2) (Fig. 28) and shift the indexed selector 4) so that the index finger 7) (Fig. 28) corresponds to the required notch setting indicated in (Tab. L) according to the 1st stage nozzle's delivery.

### Example

3.00 GPH nozzle.

The indexed selector must be set to notch 2.5.

### 2nd stage:

The air gate valve 1) (Fig. 28) must be set using the cylinder 6) (Fig. 28). This setting must be adapted case by case to the burner's delivery and combustion chamber pressure.

The first time the burner is fired, the hydraulic cylinder setting should be left as originally set by the manufacturer: at approximately half of its full stroke.

In summary, the operations and settings that must be performed prior to firing the burner for the first time are as follows:

- choice of the two nozzles;
- setting of the combustion head;
- setting of the fan's air gate valve for the 1st stage.

The following require no adjustment operations and may remain as they are provided:

- pump pressure;
- setting of the fan's air gate valve for the 2nd stage.

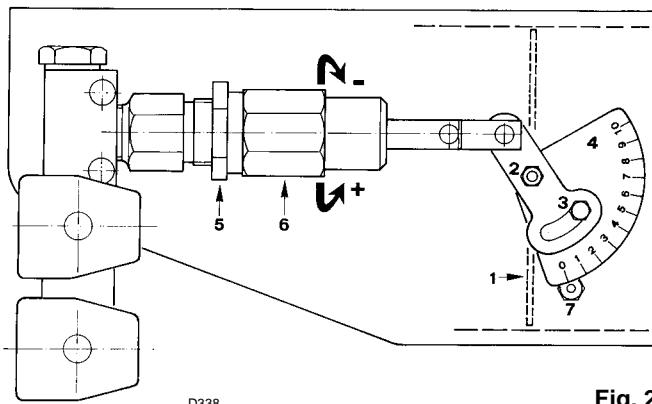


Fig. 28

### PRESS GBW

GPH	N°
2,00	1,5
2,25	1,5
2,50	2
3,00	2,5
3,50	3
4,00	3

Tab. L

GPH = / Nozzle 1st stage  
N° = / N° Notch

## 7.3 Burner calibration



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

Execute the fuel exchange when the burner is off.

### 7.3.1 Firing

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 gas oil solenoid valve occur, see the suggestions provided in page 35.

### 7.3.2 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 stage nozzles

See the information listed on page 22.

#### • Pump pressure

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

**10 bar** in order to reduce fuel delivery. This adjustment is possible only if the surrounding temperature remains above 0°C. Never calibrate to pressures below 10 bar, at which pressures the cylinder 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 relevant screw indicated in page 22.

#### • 1st stage fan air gate valve

Sometimes it might be necessary to adjust the calibration performed previously, especially in the case of two-stage operation burners. Keep the burner operating in the 1st stage by opening the control device TR or by removing the jumper on the terminal block. Adjust the air gate valve 1) (Fig. 29) by using the indexed selector 4) after having loosened the screw 3) and the nut 2).

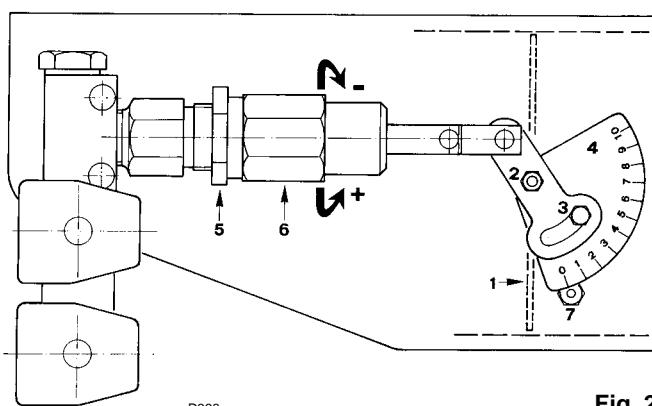


Fig. 29

#### NOTE:

**Burner starting and operation phases are indicated in page 31.**

## 7.4 Combustion characteristics

The burner delivery in the 2nd stage must not exceed the rated delivery for the boiler, and should be adjusted in relation to the user's effective heating requirements and selected within the MAX firing rates (See page 10). A lower setting of the boiler provides for a lower flue gas fume temperature, thus increasing combustion efficiency and saving fuel.

The burner's delivery in the 1st stage is usually 50% of the delivery in the 2nd stage and must be contained in the MIN. values range listed above the firing rates on page 10. The burner's 1st stage delivery can even be lower than 50% of the 2nd stage delivery whenever it does not cause the formation of too much condensate in the stack. It may also be higher than 50% when required by the reasons listed on page 17 in the "Choice of nozzles for 1st and 2nd stage" paragraph.

## 7.5 Emissions into the atmosphere

**Test boilers UNI-DIN** (Fig. 6 on page 12): emissions of Bacharach-CO<sub>2</sub>-CO-CxHy-NOx obtained in laboratory tests with our burners proved to be lower than the limits defined by EC Norms EN 267 under the operating conditions established by these standards, see (Tab. M).

**EN 267 (5-91)**

Stage		1°	2°
Bacharach	n°	< 2	< 1
CO <sub>2</sub>	%	> 11.3	> 12.3÷12.7 (15÷100 kg/h) > 12.7 (> 100 kg/h)
CO	ppm	< 100	< 100
CxHy	ppm	< 10	< 10
NOx (3% O <sub>2</sub> )	mg/Nm <sup>3</sup>	< 150	< 150

**Tab. M**

**N.B.** Excess air % = CO<sub>2</sub> max : CO<sub>2</sub> measured

CO<sub>2</sub> max = 15,2%

**Example** CO<sub>2</sub> measured = 13,5%

Excess air = 15,2 : 13,5 = 1,13 = 13%

**Commercial boilers:** emissions of Bacharach-CO<sub>2</sub>-CO-CxHy-NOx must not exceed the limits imposed by locally-applicable regulations for burner installations. In particular, the CO<sub>2</sub> level should not be higher than 13.5% in order to prevent variations in the draught and air temperature or dirty burner conditions from causing polluting combustion.

An insufficient CO<sub>2</sub> level must also be avoided, since, in addition to raising costs and falling short of the established range, this can also be the cause for the generation of a dangerous quantity of uncombusted hydrocarbons in the flue gas (yellow Bacharach) and the detachment of the flame upon ignition.

The combustion values measured may be considered reliable only if there are no entries of air between the burner and the stack flue gas sampling point. Check for penetration of outside air by placing a column of smoke near the suspected leak in the seal: if the smoke column is drawn towards the seal there must be an entry of air.

## 7.6 Flue gas temperature

This temperature varies in relation to the delivery generated: the lower the delivery, the lower the temperature and the higher the fuel saving.

Bear in mind that excessive temperature reduction, however, gives rise to the formation of condensate.

## 7.7 Combustion chamber pressure

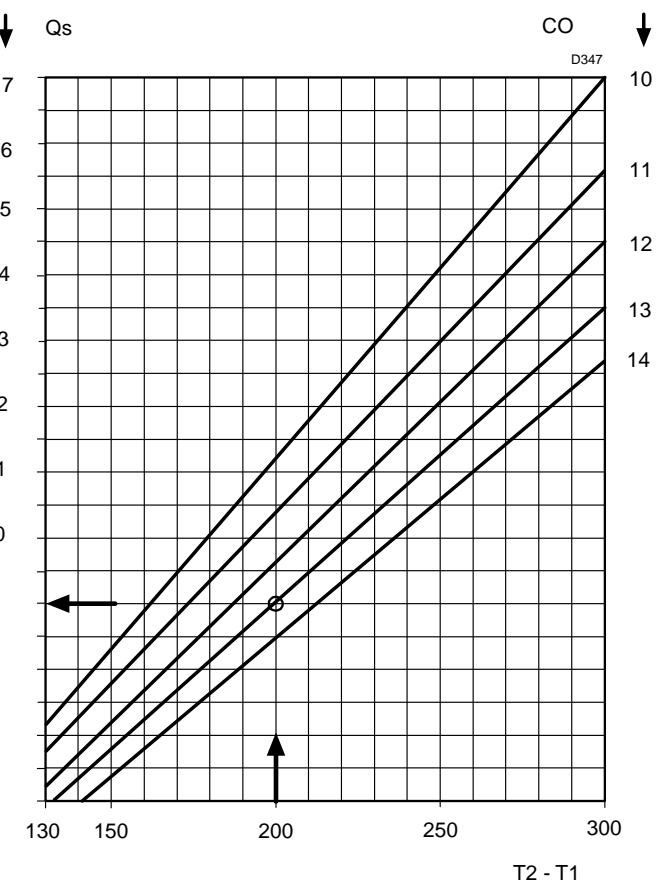
This must correspond to the setting indicated by the boiler manufacturer.

Chamber pressure is lowered with reduced burner delivery and higher CO<sub>2</sub> levels.

If the combustion chamber pressure is significantly higher than expected and the burner's delivery is correct, make sure that the boiler is not dirty, that the flue gas duct is not obstructed, and that the flue gas stack has been correctly sized.

## 7.8 Loss of heat from the flue

Heat losses from the flue gas stack Q<sub>s</sub> are determined by the formula given on page 36 or Diagram (Fig. 30).



T<sub>2</sub> - T<sub>1</sub> = 200 CC → = 13% → Q<sub>s</sub> = 9% **Fig. 30**

T<sub>2</sub> - T<sub>1</sub> = Flue gas temperature - Ambient temperature

## 7.9 Burner operation

### 7.9.1 Burner starting

- When the control device TL closes, the control box programmes the starting phase.

The indications for the start-up cycle are given on page 36.

- 0 sec. time:**

The control device TL closes.

- After 2 sec.:**

The motor starts.

- After 3 sec.:**

The ignition transformer is connected. Pre-purging begins with the 1st stage air delivery.

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) and 11), de-energized, close the passage to the nozzles.

- After 25 sec.:**

Solenoid valve 8) opens 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.

- After 30 sec.:**

The ignition transformer switches off.

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) that opens the fan air gate valve in the 2nd stage.

- After 39 sec.:**

The starting cycle comes to an end.

### 7.9.2 Steady State Operation

System equipped with one control device TR.

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

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

#### Systems not equipped with control device TR (which has been replaced by a jumper)

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) is discharged into the return piping 7).

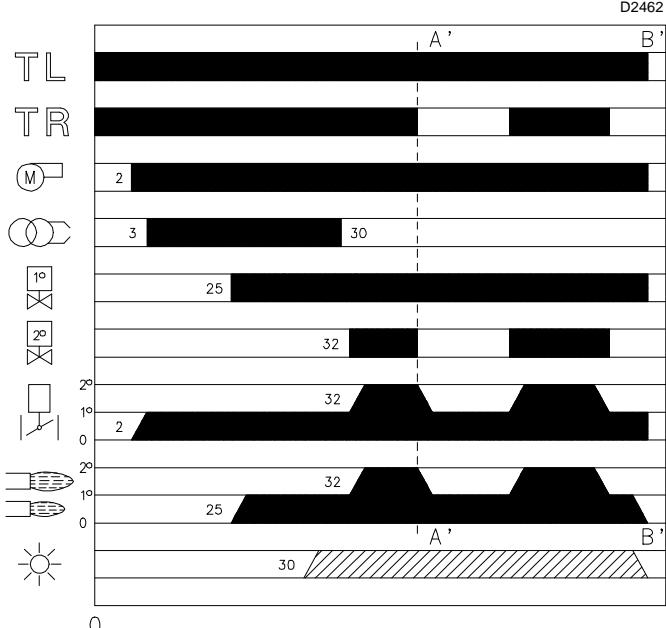


Fig. 31

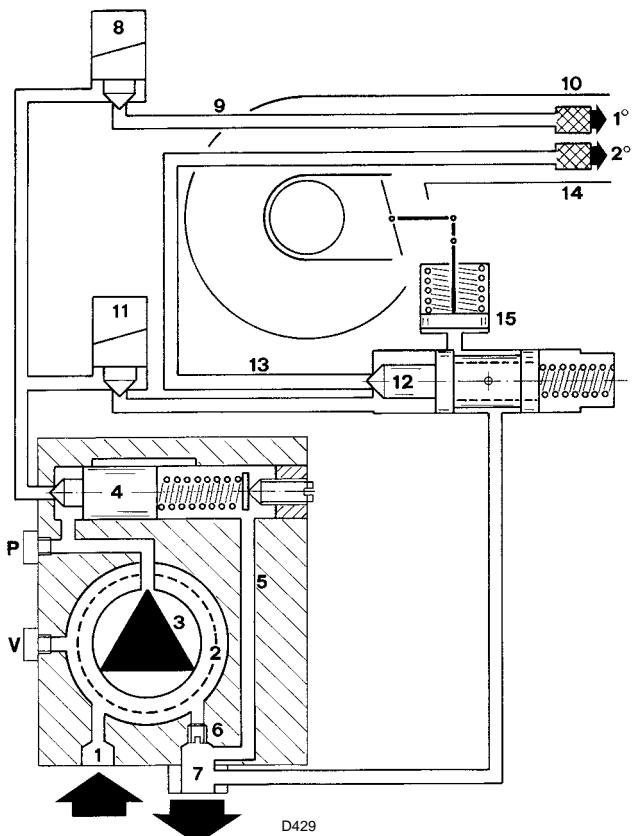


Fig. 32

### 7.9.3 Firing failure

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

The control box pilot light will light up.

### 7.9.4 Undesired shutdown during operation

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

### 7.9.5 Final checks

- Shine a light on the photocell and close the control devices: the burner should not start.
- Obscure the photocell while the burner is working: the burner should stop and automatically repeat the starting operation.
- Switch off control device TL while the burner is operating: the burner should stop.
- Switch off control device TS while the burner is operating: the burner should stop.

Fill out the information sheet on page 36 before leaving the plant.

## 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.

##### Pump

**The pressure** must be stable and at the same level as measured during the previous check (between 10 and 14 bar).

**The depression** must be less than 0.45 bar. Values different from those measured previously may be due to a different level of fuel in the tank.

**Unusual noise** must not be evident during pump operation.

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

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

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

##### Filters (Fig. 33)

Check the following filter boxes:

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

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

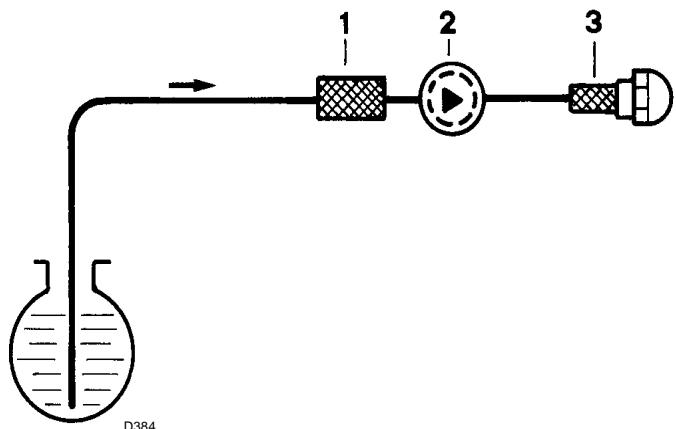


Fig. 33

##### Fan

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

##### Combustion Head

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

- The electrode tips, see (Fig. 14 on page 18)
- The electrode insulators
- The high-voltage cable
- The nozzles and the flame stability disk
- The blast tube, especially at its end
- The boiler plate/burner gasket
- The boiler door fettling

**Nozzles**

Do not clean the nozzle opening; do not even open it. The nozzle filter however may be cleaned or replaced as required. Replace the nozzle every 2-3 years or whenever necessary. After changing the nozzle, the combustion must be checked.

**Photocell (Fig. 34)**

Clean the glass cover from any dust that may have accumulated. In order to extract the photocell 2) from its seat, raise the spring 1).

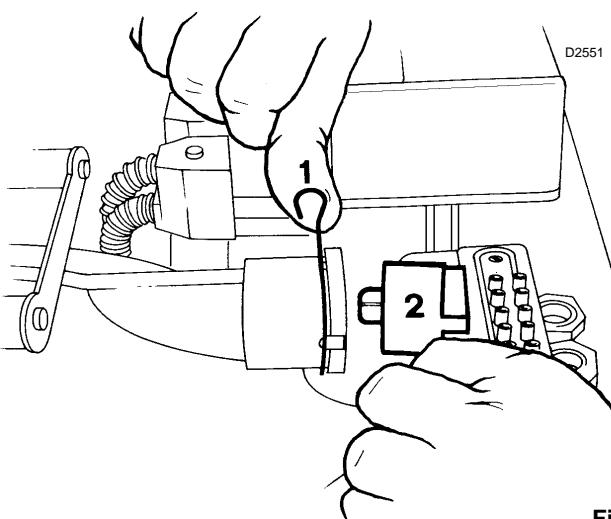


Fig. 34

**Hoses**

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

**Gas oil fuel supply line (Fig. 35)**

If the previous checks have suggested that air may be entering the circuit somewhere, pressurize the circuit piping. Plug the pump's return line connector 1) (Fig. 35) after removing the hose. Install a union T 2) (Fig. 35) on the vacuum meter attachment. On one branch of the T install the pressure gauge 3) and on the other branch 4) inject air at a pressure of 1 bar. After the injection of air has stopped, the gauge reading should remain stable. The suction piping must be equipped with a foot valve 5).

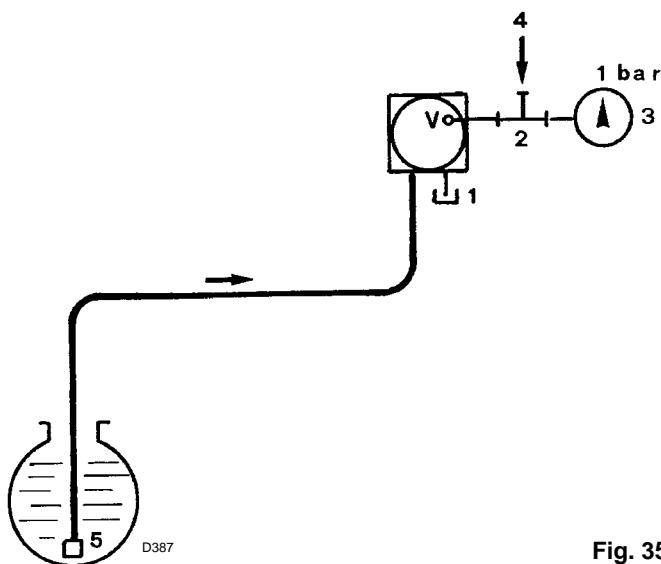


Fig. 35

**Fuel tank**

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

**Boiler**

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

Close the burner and apply power.

If the combustion characteristics measured at the beginning of the control operation do not match the values listed in the previous inspection's technical report sheet or fail to provide satisfactory combustion, the burner must be re-calibrated. Write the new values down on the data sheet illustrated on page 36 or a similar document. These values will be useful for comparison during future checks. Lastly, check to make sure that the fan air gate valve is in good condition and that the screws are tightly locked. The tightness of the screws that fasten the cables to the burner terminal block must also be checked. Clean the outside surfaces of the burner and spray all parts that show signs of rusting with silicon rust-preventer.

**8.2.3 Opening the burner**

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

- Unscrew the screws 1)
- Pull back part A while keeping it slightly lifted.

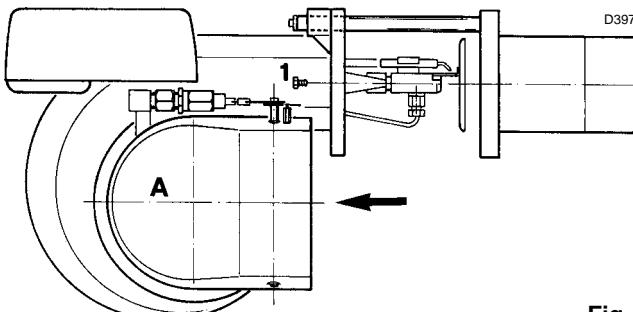


Fig. 36

**Other control measurements**

Check the parameters listed in the data sheet on page 36.

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

Once these controls and measurements have been performed, stop the burner, disconnect the power supply, and close the manual valves on the fuel lines and open the burner.

## 9 Faults - Possible causes - Solutions

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
The burner does not start	<ul style="list-style-type: none"> <li>- No electrical power supply .....</li> <li>- A limit or safety control device is open.....</li> <li>- Control box lockout .....</li> <li>- Pump is jammed .....</li> <li>- Erroneous electrical connections .....</li> <li>- Defective control box.....</li> <li>- Defective electrical motor .....</li> <li>- Defective capacitor .....</li> <li>- Photocell short-circuit.....</li> <li>- Light is entering or flame is simulated.....</li> </ul>	<ul style="list-style-type: none"> <li>Close all switches - Check fuses</li> <li>Adjust or replace</li> <li>Reset control box</li> <li>Replace</li> <li>Check connections</li> <li>Replace</li> <li>Replace</li> <li>Replace</li> <li>Replace photocell</li> <li>Eliminate light or replace control box</li> </ul>
After pre-purge the burner goes to lock out and the flame does not appear	<ul style="list-style-type: none"> <li>- No fuel in tank; water on tank bottom.....</li> <li>- Inappropriate head and gate valve adjustments .....</li> <li>- Gas oil solenoid valve fails to open.....</li> <li>- Nozzle clogged, dirty, or deformed .....</li> <li>- Dirty or poorly adjusted firing electrodes.....</li> <li>- Grounded electrode due to broken insulation .....</li> <li>- High voltage cable defective or grounded.....</li> <li>- High voltage cable deformed by high temperature .....</li> <li>- Firing transformer defective .....</li> <li>- Erroneous valve or transformer electrical connections .....</li> <li>- Control box defective .....</li> <li>- Pump unprimed.....</li> <li>- Pump/motor coupling broken .....</li> <li>- Pump suction line connected to return line .....</li> <li>- Valves up-line from pump closed.....</li> <li>- Filters dirty: line - pump - nozzle .....</li> <li>- Incorrect motor rotation direction .....</li> <li>- 1st stage sol. valve coil defective.....</li> </ul>	<ul style="list-style-type: none"> <li>Top up fuel level or suck up water</li> <li>Consult Manual</li> <li>Check connections; replace coil</li> <li>Replace</li> <li>Adjust or clean</li> <li>Replace</li> <li>Replace</li> <li>Replace or protect</li> <li>Replace</li> <li>Check</li> <li>Replace</li> <li>Prime pump and see "Pump unprimed"</li> <li>Replace</li> <li>Correct connection</li> <li>Open</li> <li>Clean</li> <li>Change motor electrical connections</li> <li>Replace</li> </ul>
The burner goes to lock out right after flame appearance	<ul style="list-style-type: none"> <li>- Delayed firing by electrodes or poorly adjusted head .....</li> <li>- Defective photocell or control box .....</li> <li>- Dirty photocell .....</li> <li>- Presence of electromagnetic disturbance .....</li> </ul>	<ul style="list-style-type: none"> <li>Adjust</li> <li>Replace</li> <li>Clean</li> <li>Use the radio disturbance protection kit</li> </ul>
Firing with pulsations or flame detachment	<ul style="list-style-type: none"> <li>- Poorly adjusted head .....</li> <li>- Poorly adjusted firing electrodes .....</li> <li>- Poorly adjusted fan air gate: too much air.....</li> <li>- Nozzle unsuited to burner or boiler .....</li> <li>- Defective nozzle.....</li> <li>- Inappropriate pump pressure .....</li> </ul>	<ul style="list-style-type: none"> <li>Adjust according to Manual</li> <li>Adjust according to Manual</li> <li>Adjust</li> <li>See Nozzle Table; reduce 1st stage</li> <li>Replace</li> <li>Adjust according to Manual</li> </ul>
The burner does not pass to 2nd stage	<ul style="list-style-type: none"> <li>- Control device TR does not close .....</li> <li>- Defective control box .....</li> <li>- 2nd stage sol. valve coil defective.....</li> <li>- Piston jammed in valve unit .....</li> </ul>	<ul style="list-style-type: none"> <li>Adjust or replace</li> <li>Replace</li> <li>Replace</li> <li>Replace entire unit</li> </ul>
or fuel passes to 2nd stage but air remains in 1st	<ul style="list-style-type: none"> <li>- Low pump pressure.....</li> <li>- Defective cylinder.....</li> </ul>	<ul style="list-style-type: none"> <li>Increase</li> <li>Replace</li> </ul>
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.
Noisy pump, instable pressure	<ul style="list-style-type: none"> <li>- Air has entered the suction line.....</li> <li>- Depression value too high (higher than 35 cm Hg):</li> <li>- Tank/burner height difference too great .....</li> <li>- Piping diameter too small.....</li> <li>- Suction filters clogged .....</li> <li>- Suction valves closed.....</li> <li>- Paraffin solidified due to low temperature .....</li> </ul>	<ul style="list-style-type: none"> <li>Tighten connectors</li> <li></li> <li>Feed burner with loop circuit</li> <li>Increase</li> <li>Clean</li> <li>Open</li> <li>Add additive to gas oil</li> </ul>
Pump unprimed after prolonged pause	<ul style="list-style-type: none"> <li>- Return pipe not immersed in fuel .....</li> <li>- Air enters suction piping.....</li> </ul>	<ul style="list-style-type: none"> <li>Bring to same height as suction pipe</li> <li>Tighten connectors</li> </ul>
Pump leaks gas oil	- Leakage from sealing organ.....	Replace pump

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
Smoke in flame - dark Bacharach	- Not enough air .....	Adjust head and fan gate according to Manual
	- Nozzle worn or dirty.....	Replace
	- Nozzle filter clogged .....	Clean or replace
	- Erroneous pump pressure.....	Adjust to between 10 - 14 bar
	- Dirty fan .....	Clean
	- Flame stability spiral dirty, loose, or deformed .....	Clean, tighten in place, or replace
	- Boiler room air vents insufficient .....	Increase
- yellow Bacharach	- Too much air .....	Adjust head and fan gate according to Manual
Dirty combustion head	- Nozzle or filter dirty .....	Replace
	- Unsuitable nozzle delivery or angle.....	See Recommended nozzles
	- Loose nozzle .....	Tighten
	- Impurities on flame stability spiral .....	Clean
	- Erroneous head adjustment or not enough air .....	Adjust as per Manual instructions; open gate valve
	- Blast tube length unsuited to boiler .....	Contact boiler manufacturer

## 9.1 Burner start-up cycle diagnostics

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

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

Key: ○ Off    ● Yellow    □ Green    ▲ Red

Tab. N

## 9.2 Operating fault diagnostics

The control box has a self-diagnostic system, which easily allows identifying the operating faults (**RED LED** signal).

To use this function, wait at least ten seconds from the safety lock out, and then press the reset button for a minimum of 3 seconds.

After releasing the button, the RED LED starts flashing as shown in the diagram below.



The pulses of the LED constitute a signal spaced by approximately 3 seconds.

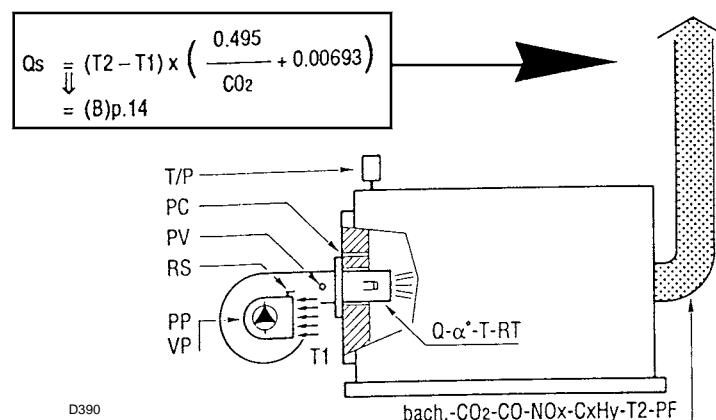
The number of pulses will provide the information on the possible faults, according to the table below:

SIGNAL	PROBABLE CAUSE
2 flashes ● ●	The flame does not stabilise at the end of the safety time: - faulty photocell; - faulty or soiled light-oil valves; - neutral/phase exchange; - faulty ignition transformer - poor burner regulation (insufficient gas oil).
3 flashes ● ● ●	Min. air pressure switch does not close: - air pressure switch faulty; - air pressure switch incorrectly regulated; - max. air pressure switch triggered (if installed).
4 flashes ● ● ● ●	Min. air pressure switch does not open or light in the chamber before firing: - air pressure switch faulty; - air pressure switch incorrectly regulated.

SIGNAL	PROBABLE CAUSE
7 flashes 	<p>Loss of flame during operations:</p> <ul style="list-style-type: none"> <li>– poor burner regulation (insufficient gas oil);</li> <li>– faulty or soiled gas oil valves;</li> <li>– short circuit between photocell and earth.</li> </ul>
10 flashes 	<ul style="list-style-type: none"> <li>– Wiring error or internal fault.</li> </ul>

### 9.3 Control card

BURNER	MODEL	TYPE	CODE
BOILER	COMPANY	MODEL	kW



**Fig. 37**

Q	= Delivery
$\alpha$ -T	= Angle and type of spray (Tab. G on page 17)
PP	= Pump delivery pressure
VP	= Pump suction pressure or depressurization
BACH	= Bacharach
CO <sub>2</sub>	= Carbon dioxide
CO	= Carbon monoxide
NOx	= Nitrogen oxide
CxHy	= Uncombusted hydrocarbons

T2	= Temperature
PF	= +/- pressure at stack
T1	= Temperature
PV	= Fan pressure
RT	= Combustion head adjustment
RS	= Fan gate valve adjustment
T/P	= Temperature or pressure
PC	= Comb. chamber pressure
Qs	= Heat loss at stack

## A

## Appendix - Accessories (optional)

### • 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.

Code	3010386
------	---------

### • Degassing unit

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

In double-pipe systems, the air returns to the tank from the return pipe; in single-pipe systems, the air remains in circulation causing pressure variations in the pump and burner malfunctions.

For this reason, we advise installing a degassing unit near the burner in single-pipe installations.

Degassing units are provided in two versions:

Code 20034277 without filter

Code 20034281 with filter

### Degassing unit characteristics

- Burner delivery	: max. 80 kg/h
- Fuel pressure	: max. 0.7 bar
- Ambient temperature	: max. 50 °C (without filter)
- Ambient temperature	: max. 40 °C (with filter)
- Fuel temperature	: max. 50 °C (without filter)
- Fuel temperature	: max. 40 °C (with filter)
- Attachment connectors	: 1/4 inch

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

### • Kit for lengthening the combustion head

L = Standard length

L1 = Length obtainable with the kit

Code 3000581	L = 185	L1 = 320 mm
--------------	---------	-------------

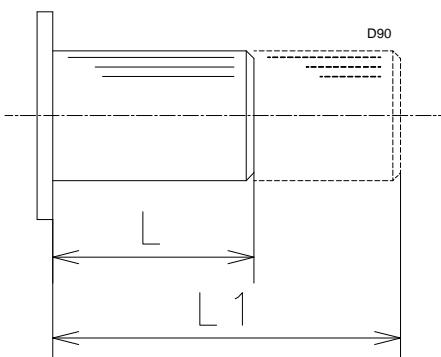


Fig. 38

### • Spacer for shortening the combustion head

L = Spacer thickness

L1 = Resulting length of combustion head

Code 3000755	L = 142	L1 = 43 mm
--------------	---------	------------

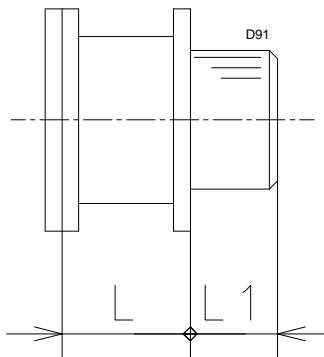


Fig. 39

### • Soundproofing

The sound attenuating shroud significantly reduces the noise generated by the burner (- 10 dBA).

The casing is in steel and sound-damping material and fully encloses the burner.

The casing is wheel-mounted so that it can be easily removed for burner inspection.

Code 3000776
--------------

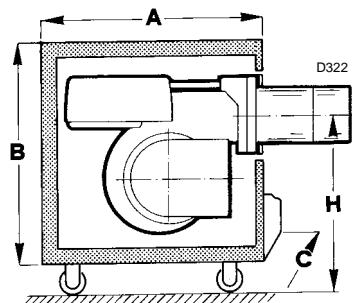


Fig. 40

	A	B	C	H	MIN.	MAX.	kg
mm	600	600	635	550	1170	52	

### • Complete closure of the air gate valve during pauses in burner operation

Serves to minimize thermal dispersion caused by the stack draught sucking air from the fan's suction opening.

This is achieved by hydraulic cylinder M, which closes the fan gate valve completely when the burner shuts down.

Code 3000853
--------------

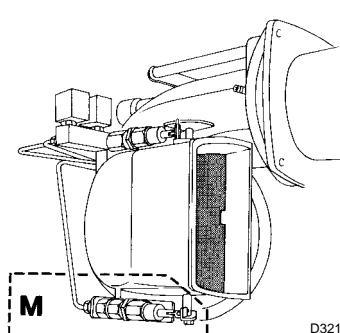


Fig. 41









RIELLO S.p.A.  
I-37045 Legnago (VR)  
Tel.: +39.0442.630111  
<http://www.rielloburners.com>

---