GB

Gas oil / Kerosene burners

Three-stage operation

CE

BIO

CODE	MODEL	TYPE
20034815	P 140 T/G	476 M1
20034817	P 140 T/G	476 M1
20034818	P 200 T/G	477 M1
20034819	P 200 T/G	477 M1
20034820	P 300 T/G	478 M1
20034823	P 300 T/G	478 M1
20034824	P 450 T/G	479 M1
20034825	P 450 T/G	479 M1

20035784 (2) - 03/2012

1 Declaration

Declaration of conformity in accordance with ISO / IEC 17050-1		
Manufacturer:	RIELLO S.p.A.	
Address:	Via Pilade Riello, 7 37045 Legnago (VR)	
Product:	Gas oil / Kerosene burner	
Model:	P 140 T/G P 200 T/G P 300 T/G P 450 T/G	
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	2006/95/EC	Low Voltage Directive
EMC	2004/108/EC	Electromagnetic Compatibility

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

Legnago, 01.03.2012

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 occured
- ➤ repairs and/or overhauls incorrectly carried out;
- ➤ modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- ➤ insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- ➤ the use of non-original components, including spare parts, kits, accessories and optional;
- ➤ force majeure.

The manufacturer furthermore declines any and every responsibility for the failure to observe the contents of this manual.

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

If any Riello burners are used with fuel with a bio content >10% then the components within the hydraulic circuit maybe affected and are not covered under warranty. The hydraulic circuit consists of;

- – Pump
- – Hydraulic ram (where applicable)
- – Valve block
- – Flexible oil lines (considered as a consumable component)

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

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 requirements related to operational environment conditions within the relevant EN standards.

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

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

2.3.1 Information and general instructions

To ensure consistency, the supplier of the fuel must be able to demonstrate compliance with a recognised Quality Control and management system to ensure high standards are maintained within the storage, blending and delivery processes. The installation oil storage tank and its ancillaries must also be prepared BEFORE liquid Bio fuel is introduced. Checks and preparation should include;

- For new installations, make sure that all materials and seals in the oil storage and supply line to the burner are compatible with Bio fuels. For all installations, there must be a good quality bio compatible oil filter at the tank and then a secondary filter of 100 Microns protecting the burner from contamination.
- If an existing oil storage tank is to be used then in addition to the materials checks as detailed above, it will be essential that the tank is first inspected for condition and checked for water or other contamination. Riello strongly recommends that the tank is cleaned and oil filters replaced prior to Bio fuel delivery. If this is not completed then due to the hydroscopic nature of Bio fuel, it will effectively clean the tank, absorb water present which in turn will result in equipment failure that is not covered by the manufacturer's warranty.
- Depending on the capacity of the oil storage tank and oil usage, fuels may remain static within the tank for some considerable time and so Riello recommends that the oil distributor is consulted regarding the use of additional Biocides within the fuel to prevent microbial growth from occurring within the tank. Riello suggests that fuel suppliers and or service companies are contacted for guidance on fuel filtration. Special attention should be applied to duel fuel applications where oil may be stored for long periods of time.
- The burner must be set according to the appliance application and commissioned checking that all combustion parameters are as recommended in the appliance technical manual.
- Riello recommends that the in line and burner oil pump filters are inspected and if required replaced at least every 4 months during burner use, before the burner start-up following a long period of discontinue operation and even more frequently where contamination has occurred. Particular attention is needed when inspecting and checking for fuel leakages from seals, gaskets and hoses.

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 imformation for a correct matching of this burner to the boiler.

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

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

3.3 Basic safety rules

➤ Children or inexpert persons must not use the appliance.

➤ Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.

➤ Unauthorised persons must not attempt to repair the appliance.

➤ It is dangerous to pull or twist the electric leads.

➤ Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.

➤ Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.

➤ Do not place anything on the burner.

➤ Do not block or reduce the size of the ventilation vents in the installation room.

➤ Do not leave containers and inflammable products or combustible materials in the installation room.

3.4 Personnel training

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

The user:

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

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

➤ undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;

➤ must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.

➤ Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

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

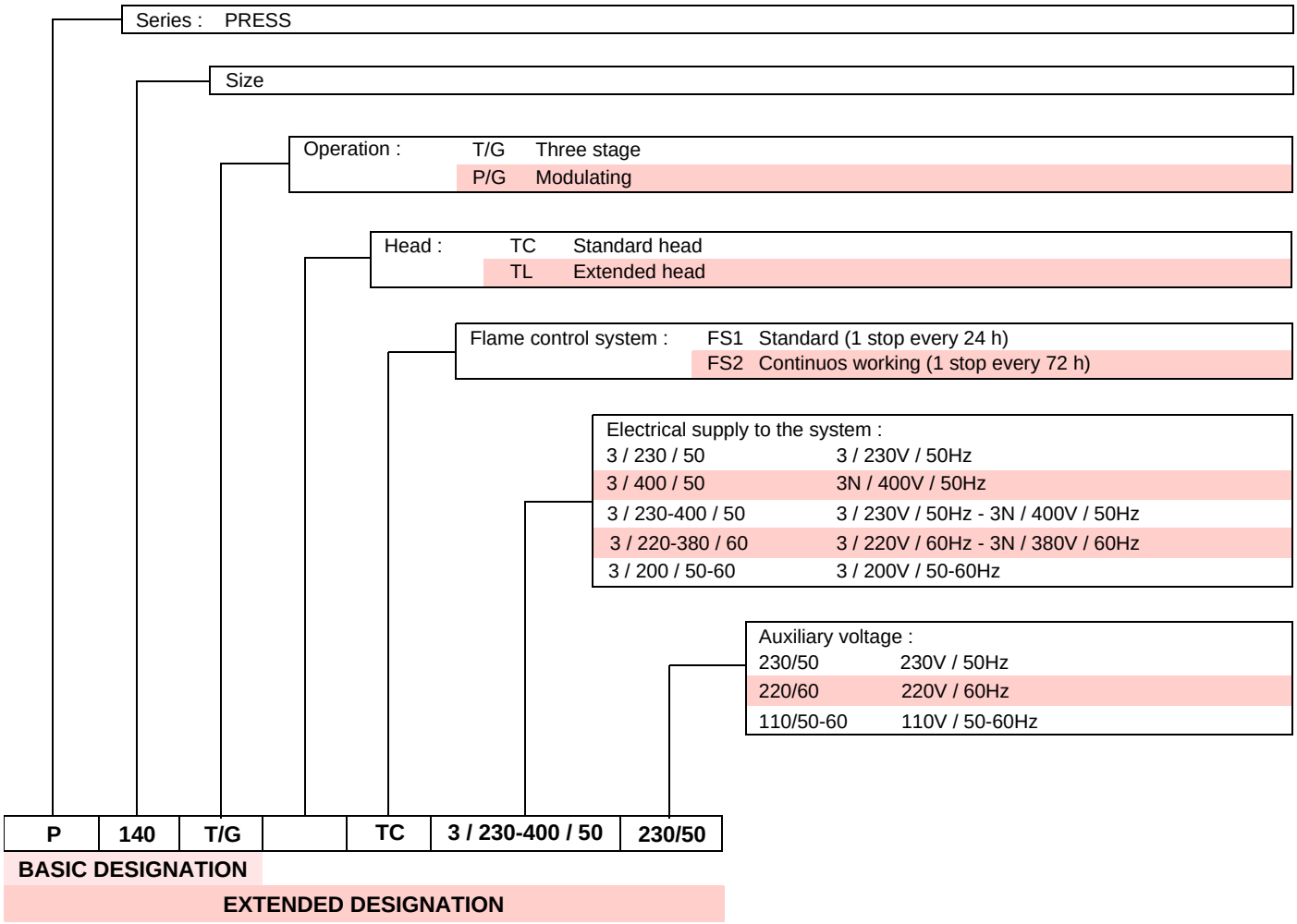
➤ Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.

➤ Personnel must inform their superiors of every problem or dangerous situation that may arise.

➤ The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

4 Technical description of the burner

4.1 Burner designation



4.2 Models available

Designation		Electrical supply	Code
P 140 T/G	TC	3/230-400/50	20034815
P 140 T/G	TL	3/230-400/50	20034817
P 200 T/G	TC	3/230-400/50	20034818
P 200 T/G	TL	3/230-400/50	20034819
P 300 T/G	TC	3/230-400/50	20034820
P 300 T/G	TL	3/230-400/50	20034823
P 450 T/G	TC	3/230/50	20034824
P 450 T/G	TL	3/230/50	20034825

4.3 Technical data

MODEL			P 140 T/G	P 200 T/G	P 300 T/G	P 450 T/G
Type			476 M1	477 M1	478 M1	479 M1
Output (1) Delivery		kW kg/h	380 - 1660 32 - 140	557 - 2370 47 - 200	710 - 3560 60 - 300	890 - 5340 75 - 450
Operation			1 stage - 2 stage - 3 stage			
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 density viscosity at 20 °C	kWh/kg Mcal/kg kg/dm^3 mm^2/s max	11.86 10.2 (10.200 kcal/kg) 0.82 - 0.85 6 (1.5 °E - 6 cSt)			
Kerosene	net calorific value density viscosity at 20 °C	kWh/kg Mcal/kg kg/dm^3 mm^2/s max	11.97 10.3 (10.300 kcal/kg) 0.77 - 0.83 6 (1.5 °E - 6 cSt)			

Tab. A

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

4.4 Electrical data

MOTOR IE1

MODEL		P 140 T/G	P 200 T/G	P 300 T/G	P 450 T/G
Electrical supply		3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V			
Electric motor*	rpm W V A	2860 3 230/400 13.5/8	2910 4 230 - 400 14 - 8.1	2910 9.2 220 - 380 31.5 - 18.2	2920 15 400 - 690 29 - 16.8
Ignition transformer		Prim.: 2 A - Sec.: 2 x 6.5 kV - 35 mA			
Absorbed electrical power	kW	5.3	5.4	11.1	17.3
Electrical protection		IP 40			

MOTOR IE2

MODEL		P 140 T/G	P 200 T/G	P 300 T/G	P 450 T/G
Electrical supply		3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V			
Electric motor *	rpm W V A	2920 3 230/400 13.5/7.8	2920 4 230 - 400 13.5 - 7.8	2920 9.2 230 - 400 29.1- 16.8	2920 15 400 - 690 26.6 - 15.4
Ignition transformer		Prim.: 2 A - Sec.: 2 x 6.5 kV - 35 mA			
Absorbed electrical power	kW	5.2	5.3	11.0	17.3
Electrical protection		IP 40			

Tab. B

(*) Only with star-delta starter for P 450 T/G burner model.

4.5 Packaging - Weight

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

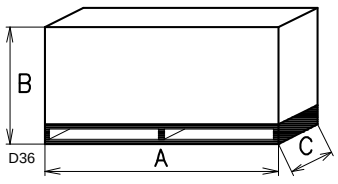


Fig. 1

mm	A	B	C	kg
P 140 T/G	1500	905	930	130
P 200 T/G	1500	905	930	220
P 300 T/G	1780	990	1085	238
P 450 T/G	1780	990	1085	300

Tab. C

4.6 Overall dimensions

The maximum dimensions of the burner are given in Fig. 2.

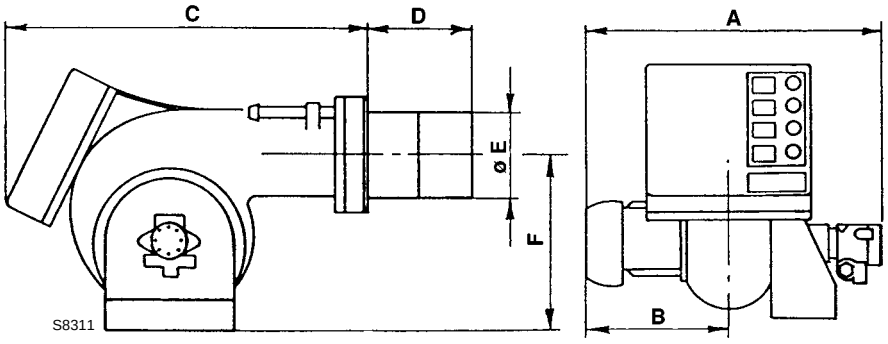


Fig. 2

mm	A	B	C	D	E	F
P 140 T/G	765	365	890	253*-363-473	222	467
P 200 T/G	795	396	890	281*-391-501	250	467
P 300 T/G	858	447	1000	314*-444-574	295	496
P 450 T/G	950	508	1070	346*-476-606	336	525

Tab. D

(*) It is possible with a spacer upon request

4.7 Firing rates

Firing rates optained with three nozzles in operation.

When the burner operates with only one, or two nozzles, the pressurizzation conditions are improved and no problems arise.

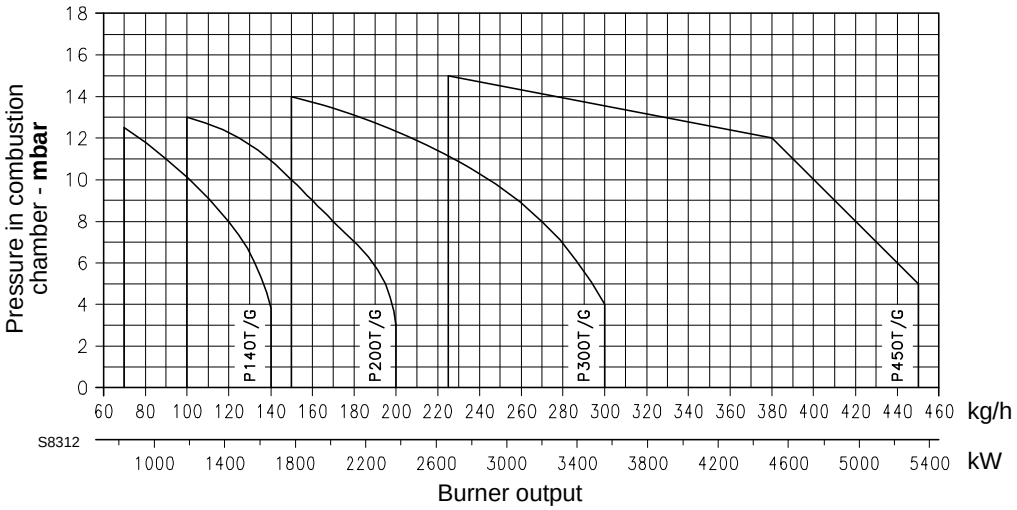


Fig. 3

4.7.1 Dimensions of the testing combustion chambre

For the combustion head projection carefully follow the boiler manufacturer indications. A proper protection with refractory material on the combustion chamber shall be made, when boilers with frontal smoke box are used.

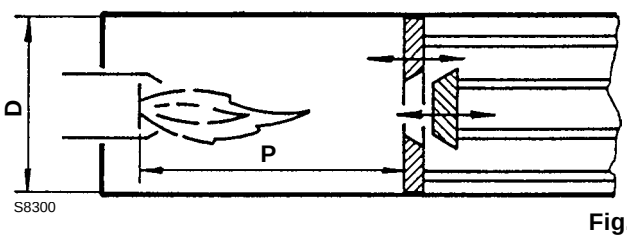


Fig. 4

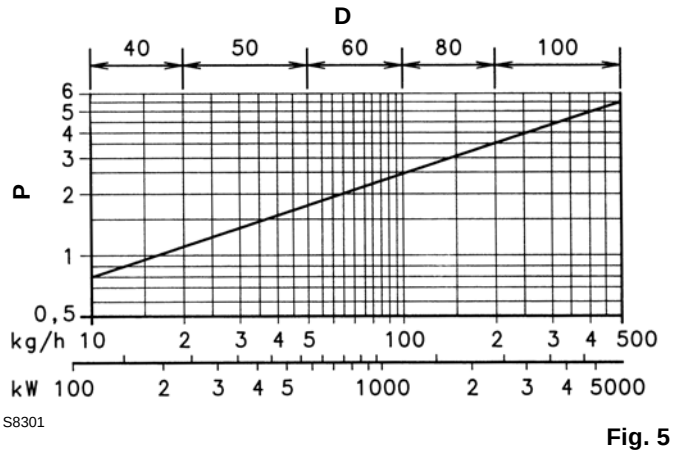
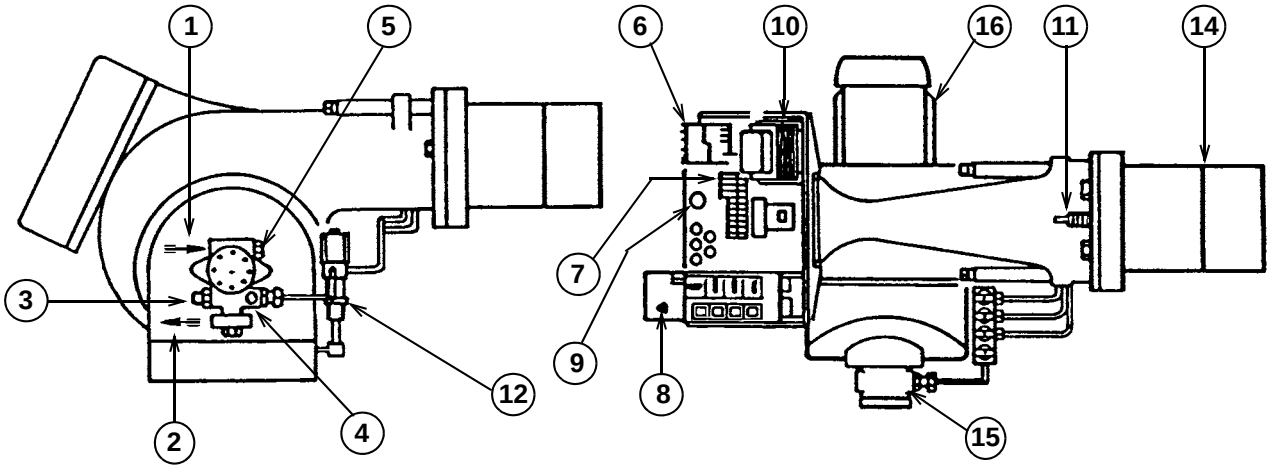


Fig. 5

D Boiler diameter (cm)
P Position of the boiler movable wall (m)

4.8 Burner description

P 140 - 200 T/G



P 300 - 450 T/G

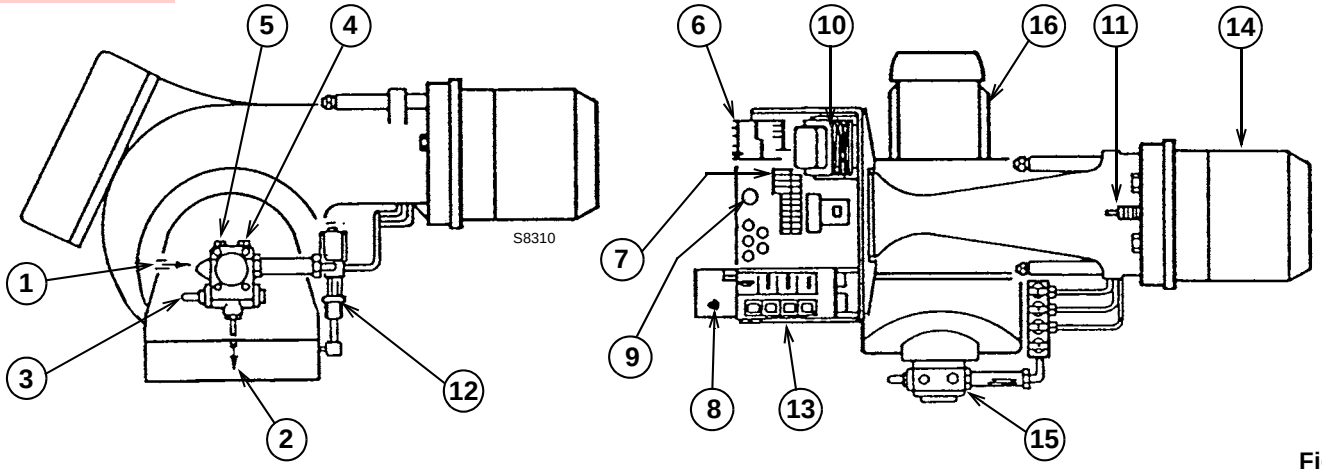


Fig. 6

1 Suction line
2 Return line
3 Pump pressure adjustment screw
4 Manometer plug
(G 1/8 for P 140 T/G and P 200 T/G;
G 1/4 for P 300 T/G and P 450 T/G)
5 Vacuometer plug
(G 1/2 for P 140 T/G and P 200 T/G;
G 1/4 for P 300 T/G and P 450 T/G)
6 Reset push button of the motor
(P 140 T/G, P 200 T/G, P 300 T/G)
7 Terminal strip
8 Control box reset push-button and lock-out lamp
9 Fairleads
10 Ignition transformer
11 Rugulating bush for combustion head
12 Valves group with hydraulic jacks
13 Electric board
14 Combustion head
15 Pump
16 Motor

4.9 Standard equipment

Flexible hoses . . . . . No. 2
Nipples . . . . . No. 2
Screws . . . . . No. 4
Gasket for flange . . . . . No. 1
Nozzles. . . . . No. 3
Fairleads (*) . . . . . No. 1
Starter. . . . . No. 4
Extensions (P 300-450 T/G: for long head only) . . . . . No. 2
Diffuser disc (P 450 T/G) . . . . . No. 1
Instruction booklet . . . . . No. 1
Spare parts list . . . . . No. 1
(*) For versions with star-delta starting.

WARNING

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

5 Installation

5.1 Notes on safety for the installation

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

DANGER

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

WARNING

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

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.

WARNING

The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitableness of the available means of handling.
Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).
When handling, keep the load at not more than 20-25 cm from the ground.

CAUTION

After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.
Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

5.3 Preliminary checks

Checking the consignment

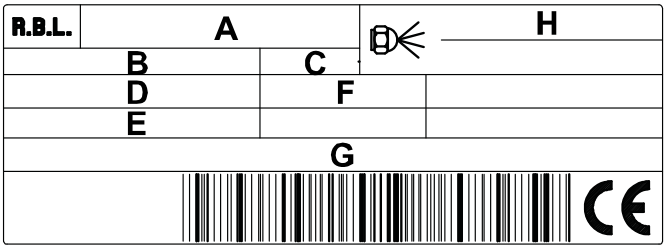
CAUTION

After removing all the packaging, check the integrity of the contents. In the event of doubt, do not use the burner; contact the supplier.

The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

Checking the characteristics of the burner

Check the identification label of the burner, showing:
- ➤ the model (**A**)(Fig. 7) 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).



S8268

Fig. 7

WARNING

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

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 value and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used. The burner must be commissioned and combustion parameters set to appliance manufacturer's recommendations.
- ➤ Regularly check visually for any signs of oil leakage from seals, gaskets and hoses.
- ➤ It is strongly recommended that with Bio fuel use, oil filters are inspected and replaced every 4 months. More regularly where contamination is experienced.
- ➤ During extended periods of non operation and/or where burners are using oil as a standby fuel, it is strongly recommended that the burner is put into operation for shorts periods at least every three months.

5.5 Operating position

The burner is designed to work only in the positions **1, 2, 3** and **4**.

Installation **1** is preferable, as it is the only one that allows performing maintenance operations as described in this manual.

Installations **2, 3** and **4** permit operation but make maintenance and inspection of the combustion head difficult, page 25.

WARNING

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

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

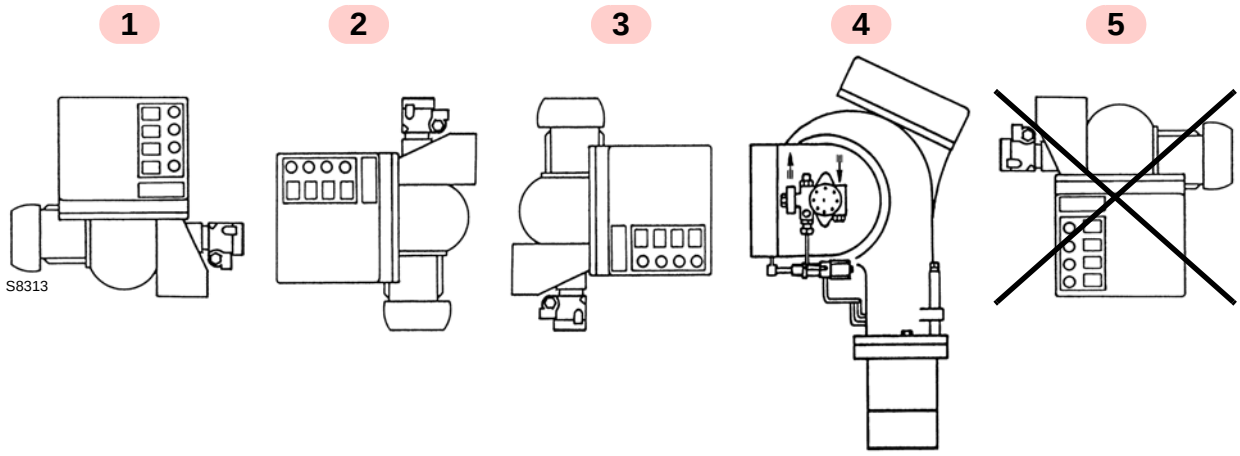


Fig. 8

5.6 Boiler front-plate drilling

Drill the combustion chamber locking plate as shown in Fig. 9.

The dimensions are indicated in Tab. E.

mm	A	B	C	D
P 140 T/G	260	230	225	M14
P 200 T/G	260	-	255	M16
P 300 T/G	260	-	300	M18
P 450 T/G	310	-	350	M20

Tab. E

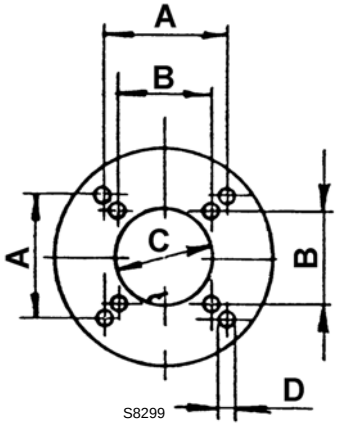


Fig. 9

5.7 Nozzle installation

The burner complies with the emission requirements of the EN 267 standard.

In order to guarantee that emissions do not vary, recommended and/or alternative nozzles specified by Riello in the Instruction and warning booklet should be used.

WARNING

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

CAUTION

The use of nozzles other than those specified by Riello S.p.A. and inadequate regular maintenance may result into emission limits non-conforming to the values set forth by the regulations in force, and in extremely serious cases, into potential hazards to people and objects.

The manufacturing company shall not be liable for any such damage arising from nonobservance of the requirements contained in this manual.

5.7.1 Nozzles reccomended

Type Delavan - 60° spray angle

5.7.2 Choice of nozzles

- ➤ State, first of all, the maximum output required with all three nozzles in operation.
- ➤ On the base of the maximum required output, choose, from Tab. F, three related nozzles.
- ➤ Use nozzles with a 60° spray angle at the recommended pressure of 12 bar.

WARNING

The pump pressure is referred to all three nozzles operating, the pressure increases automatically with two nozzles in operation and more with only one.

For three-stage operation, up to:
– 116 kg/h (P 140 T/G)
– 170 kg/h (P 200 T/G)
– 193 kg/h (P 300 T/G)

1st and 2nd nozzle are not equal to the 3rd one (Fig. 10).

Follow this procedure in order to obtain higher values of CO_2 (during 1st and 2nd stage of operation).

Rated nozzles delivery are shown in the Tab. F.

The real nozzle delivery may vary from the rated one up to ± 5%, its detection is made by weighing the oil sprayed out from the nozzle inserted in a tube.

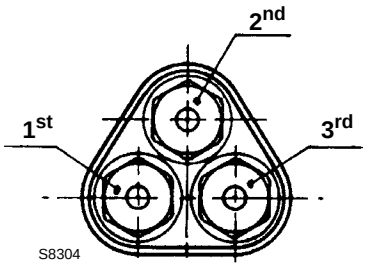


Fig. 10

	GPH 1st	GPH 2nd	GPH 3rd	kg/h 1st + 2nd + 3rd
P 140 T/G	6.5	6.5	3.5	71.1
	7	7	4	77.2
	7.5	7.5	4	81.6
	8	8	4	85.8
	8.3	8.3	4	88.4
	8.5	8.5	4.5	92.3
	9	9	5	98.7
	9.5	9.5	6	107.4
	9.5	9.5	8	115.9
	9.5	9.5	9.5	122.4
	10	10	10	128.7
	10.5	10.5	10.5	135.3
	11	11	11	141.6
P 200 T/G	10	10	5	107.3
	10.5	10.5	5	111.7
	10.5	10.5	6	115.9
	11	11	6.5	122.3
	12	12	6.5	130.9
	12	12	7.5	135.2
	13	13	7.5	143.8
	13.8	13.8	7.5	150.7
	13.8	13.8	10	161.3
	13.8	13.8	12	169.9
	13.8	13.8	13.8	177.6
	14	14	14	180.3
	15	15	15	193.2
	15.3	15.3	15.3	197.1
P 300 T/G	13.8	10.5	10.5	149.4
	13.8	11.0	11.0	153.6
	13.8	12.0	12.0	162.2
	14.0	13.0	13.0	171.7
	15.3	13.8	13.8	184.1
	15.0	14.0	14.0	184.6
	15.0	15.0	15.0	193.2
	15.3	15.3	15.3	197.1
	16.0	16.0	16.0	206.1
	17.0	17.0	17.0	219.0
	17.5	17.5	17.5	225.3
	18.0	18.0	18.0	231.9
	19.0	19.0	19.0	244.8
	19.5	19.5	19.5	251.1
	20.0	20.0	20.0	257.7
	21.5	21.5	21.5	276.9
	22.0	22.0	22.0	283.2
	24.0	24.0	24.0	309.0
P 450 T/G	17.5	17.5	17.5	225.3
	18	18	18	231.9
	19	19	19	244.8
	19.5	19.5	19.5	251.1
	20.0	20.0	20.0	257.7
	21.5	21.5	21.5	276.9
	22.0	22.0	22.0	283.2
	24.0	24.0	24.0	309.0
	26.0	26.0	26.0	334.7
	28.0	28.0	28.0	360.5
	30.0	30.0	30.0	386.3
	32.0	32.0	32.0	412.0
	35.0	35.0	35.0	450.6

Tab. F

5.7.3 Operation and efficiency of the burner

Model	THIRD STAGE		Power and output			
			Minimum		Maximum	
			kW	kg/h	kW	kg/h
P 140 T/G	1st nozzle	1st stage of operation	380	32	545	46
	1st + 2nd nozzle	2nd stage of operation	664	56	1103	93
	1st + 2nd + 3rd nozzle	3rd stage of operation	830	70	1660	140
P 200 T/G	1st nozzle	1st stage of operation	557	47	794	67
	1st + 2nd nozzle	2nd stage of operation	1067	90	1576	133
	1st + 2nd + 3rd nozzle	3rd stage of operation	1186	100	2372	200
P 300 T/G	1st nozzle	1st stage of operation	712	60	1186	100
	1st + 2nd nozzle	2nd stage of operation	1245	105	2372	200
	1st + 2nd + 3rd nozzle	3rd stage of operation	1779	150	3558	300
P 450 T/G	1st nozzle	1st stage of operation	890	75	1780	150
	1st + 2nd nozzle	2nd stage of operation	1780	150	3560	300
	1st + 2nd + 3rd nozzle	3rd stage of operation	2670	225	5340	450

Tab. G

5.8 Pump pressure

The pump leaves the factory rated at 12 bar.

WARNING

Pay attention to not overcome the pump pressure values of 10 and 14 bar.

5.9 Combustion head adjustment

At the end, on the base of the maximum output, you obtain the combustion head adjustment from the diagramm (Fig. 12).

The adjustment should be made by turning the screw A (Fig. 11) till the set-point (see Fig. 12) is on the line with the washer B .

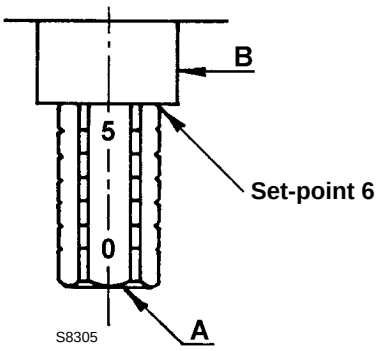


Fig. 11

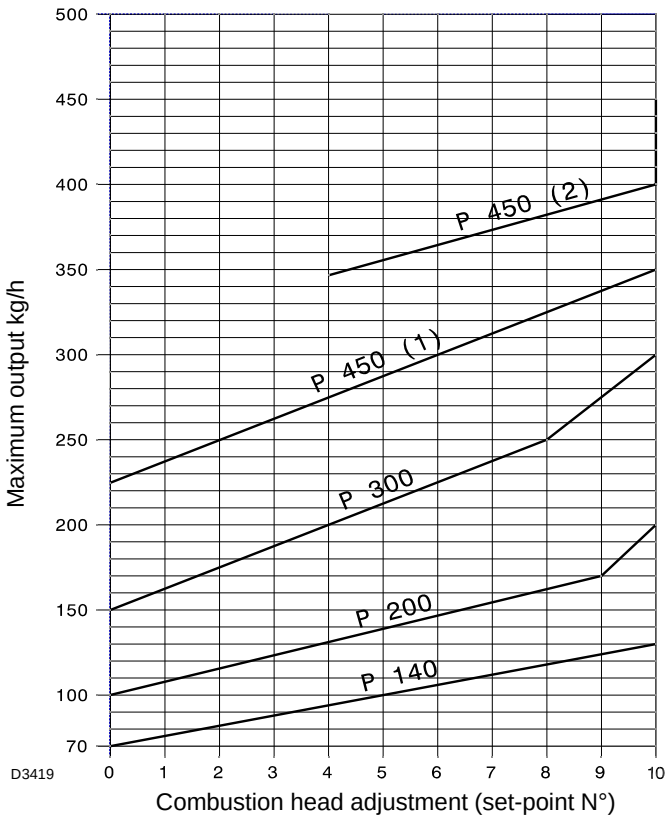


Fig. 12

5.9.1 Diffuser disc replacenet

Only for P 450 T/G

Depending on the desired output, you can use the ready-fitted standard-issue diffuser disc or the disc supplied (Fig. 12).

To replace the diffuser disc, proceed as follows:

- ➤ unscrew screws 1)(Fig. 13);
- ➤ slide the ventilating part back on pins 2);
- ➤ first unscrew screws 3), then replace diffuser disc.

Refit all parts following the above procedure in reverse order.

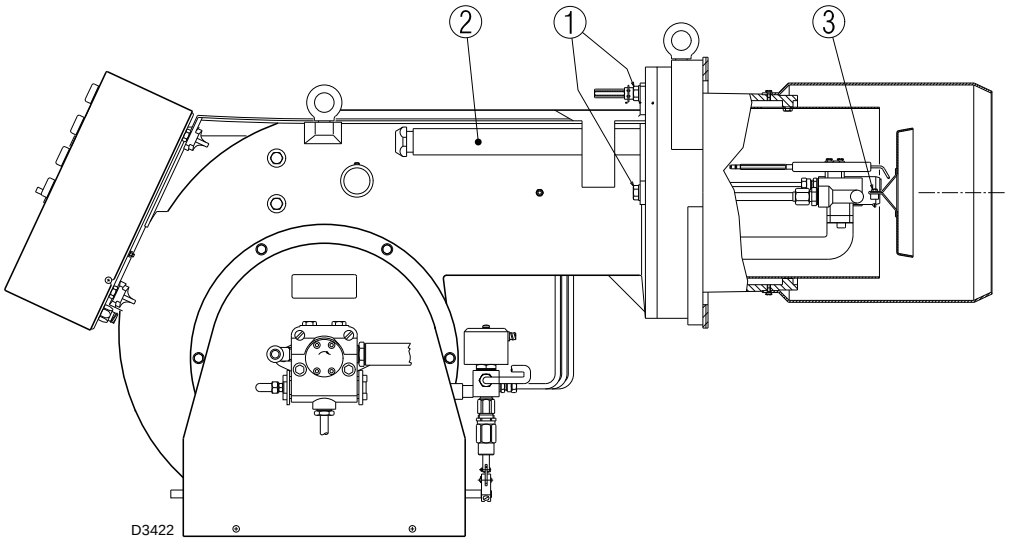


Fig. 13

5.10 Air damper adjustment

The air dampers adjustment shall be set each time in relation with the nozzles delivery and the combustion chamber pressurization.

Fig. 14 shows the placement of the air dampers, as Fig. 15 their correspondent hydraulic jacks.

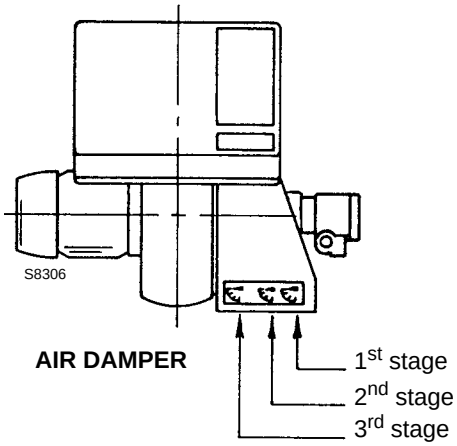


Fig. 14

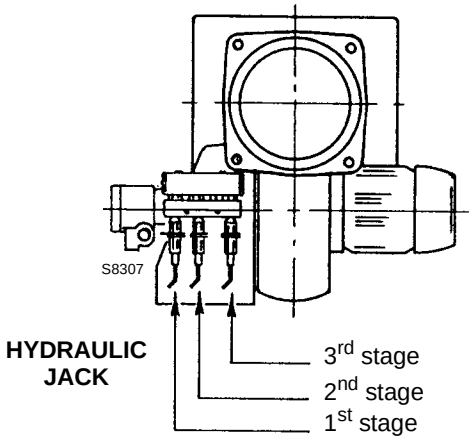


Fig. 15

To open or close the air dampers proceed as follows:

- ➤ loose the ring nut 1)(Fig. 16),
- ➤ turn clockwise the exagonal body 2) in order to decrease the air flow, and counterclockwise to increase it.

The right adjustment of the air dampers may be detect by checking the combustion results in the three stages of burner operation.

To check the combustion during the different stages, the commutator should be set to the position corresponding to the burner stage to be controlled.

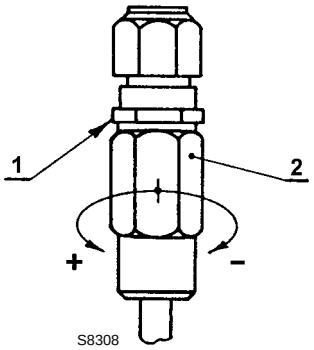


Fig. 16

5.11 Gas oil supply

WARNING

Where gas oil containing bio diesel is in use, it is recommended to avoid over oxygenation of the blended fuels.
Where at all possible avoid the use of two pipe systems where the circulated fuel is returned to the tank.
If this cannot be avoided make sure that the return pipe is normally below the surface of the fuel level within the storage tank.

WARNING

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

Please contact Riello for further information.

DANGER

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

CAUTION

You are advised to use additional filters on the fuel supply line.
Riello recommends a good quality fuel filter at the tank (Fig. 17 - Fig. 18) and a secondary filter (100 µ for gas oil and 15 µ for kerosene) are used to protect the burner pump and nozzle from contamination.
In case of Biodiesel use, pay attention to install Biocompatible filters.

5.11.1 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.

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.

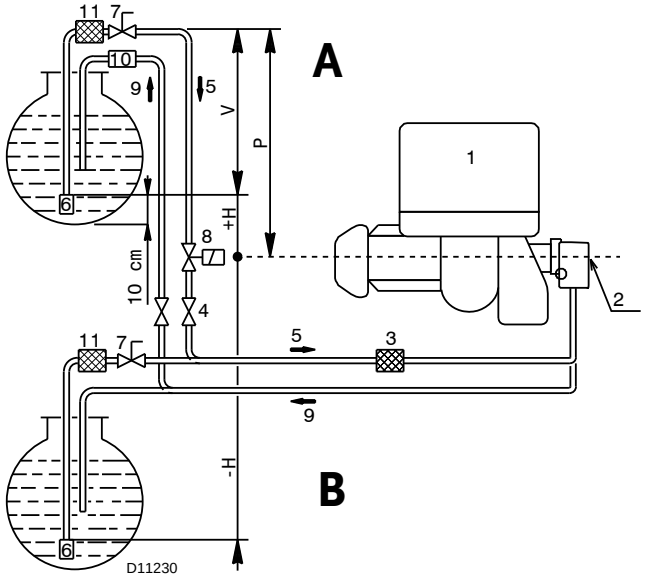


Fig. 17

Key (Fig. 17)
H Pump/Foot valve height difference
L Piping length
ø Inside pipe diameter
1 Burner
2 Pump
3 Filter
4 Manual on/off valve
5 Suction line
6 Foot valve
7 Rapid closing manual valve remote controlled (only Italy)
8 On/off solenoid valve (only Italy)
9 Return line
10 Check valve (only Italy)
11 Tank filter

H meters	P 140-200-300 T/G		P 450 T/G	
	L meters		L meters	
	Ø 14 mm	Ø 16 mm	Ø 16 mm	Ø 18 mm
0	50	60	20	40
0,5	40	50	18	35
1	30	40	15	30
1,5	20	30	13	25
2	10	20	10	20
3	5	10	5	10

Tab. H

5.11.2 Single-pipe circuit

In order to obtain single-pipe working it is necessary to unscrew the return hose, remove the by-pass screw 6)(Fig. 19) and then screw the plug 2).

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

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

Key (Fig. 18)

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

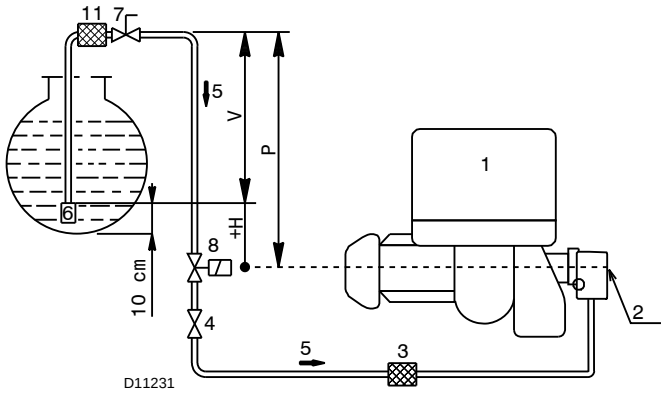


Fig. 18

H meters	P 140-200-300 T/G L meters		P 450 T/G L meters	
	Ø 14 mm	Ø 16 mm	Ø 16 mm	Ø 18 mm
0	20	40	20	40
0,5	25	45	25	45
1	30	50	30	50
1,5	35	55	35	55
2	40	60	40	60

Tab. I

5.12 Hydraulic connections

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

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

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

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

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

WARNING

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

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

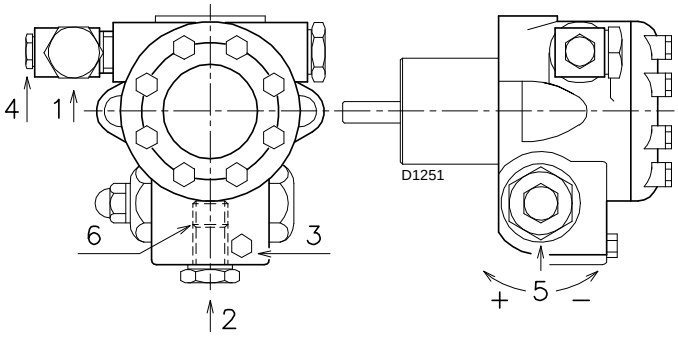
Now connect the other end of the hoses to the suction and return lines by using the supplied nipples.

5.13 Pump

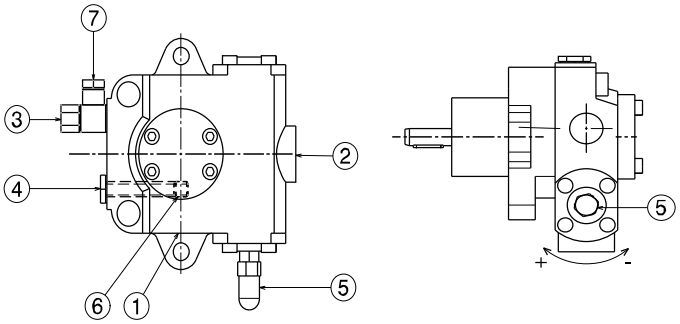
WARNING

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

P 140-200 T/G - Suntec E7



P 300 T/G - Suntec TA2



P 450 T/G - Suntec TA3

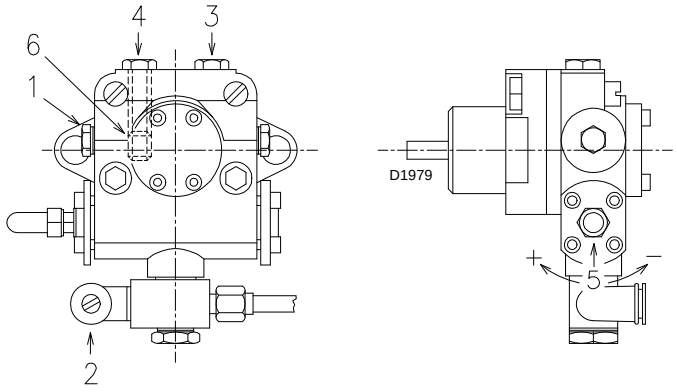


Fig. 19

Key (Fig. 19)

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

5.13.1 Technical data

Suntec E7

Min. delivery rate at 12 bar pressure	kg/h	230
Delivery pressure range	bar	10 - 21
Max. suction depression	bar	0.45
Viscosity range	mm^2/s (cSt)	2.8 - 200
Max. gas oil temperature	°C	90
Max. suction and return pressure	bar	1.5
Pressure calibration in the factory	bar	12
Filter mesh width	mm	0.17

Tab. J

Suntec TA2

Min. delivery rate at 12 bar pressure	kg/h	380
Delivery pressure range	bar	7 - 40
Max. suction depression	bar	0.45
Viscosity range	mm^2/s (cSt)	4 - 800
Max. gas oil temperature	°C	140
Max. suction and return pressure	bar	5
Pressure calibration in the factory	bar	30

Tab. K

Suntec TA3

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

Tab. L

5.13.2 Pump priming

WARNING

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

Obstructions in the line could cause the sealing organ located on the pump shaft to break.
(The pump leaves the factory with the by-pass closed).

– For self-priming to take place, the screw 3)(Fig. 19) of the pump must be loosened in order to bleed off the air contained in the suction line.
– The pump can be considered to be primed when the gas oil starts coming out of the screw 3).

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

WARNING

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

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6 Electrical system

6.1 Notes on safety for the electrical wiring

DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to firing failure.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burners have been set for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally the boiler's thermostat/pressure switch ensures the stopping of the burner.
  If this is not the case, it is necessary to apply in series with IN a timer switch that turns off the burner at least once every twenty-four hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use an omnipolar switch, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:

DANGER

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

DANGER

isolate the fuel supply.

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

6.2 Electrical panel

WARNING

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

HOURCOUNTER

Deducting the number of hours of 2nd nozzle hourcounter from those indicated in the 1st nozzle hourcounter you could know how many hours the burner has been performing only at 1st stage. The same procedure to detect the performance hours of the 2nd stage alone, deduct from the 2nd stage hourcounter the hours indicated in the 3rd nozzle hourcounter. The hours of 3rd stage operation are shown rightly on the 3rd nozzle hourcounter.

COMMUTATOR

Pos. 0: burner stop
Pos. 1: burner operation only at 1st stage
Pos. 2: burner operation at 1st and 2nd stage
Pos. 3: burner operation at 1st, 2nd, 3rd stage

MOTOR LOCK-OUT

It is caused by the overload relay in case of overload or no electic supply. Release by pressing the pushbutton on thermal relay.

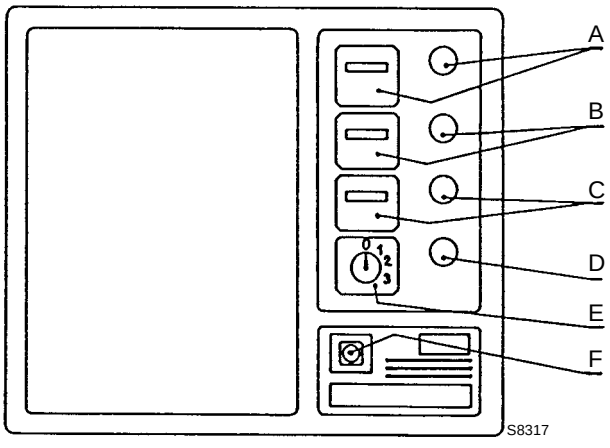


Fig. 20

Key (Fig. 20)
A 1st nozzle hourcounter with operation signal
B 2nd nozzle hourcounter with operation signal
C 3rd nozzle hourcounter with operation signal
D Motor lock-out signal
E 4 positions commutator
F Control box lock-out signal with re-set push-button

6.3 Electrical wiring factory-set

P 140-200-300 T/G
Direct motor starting

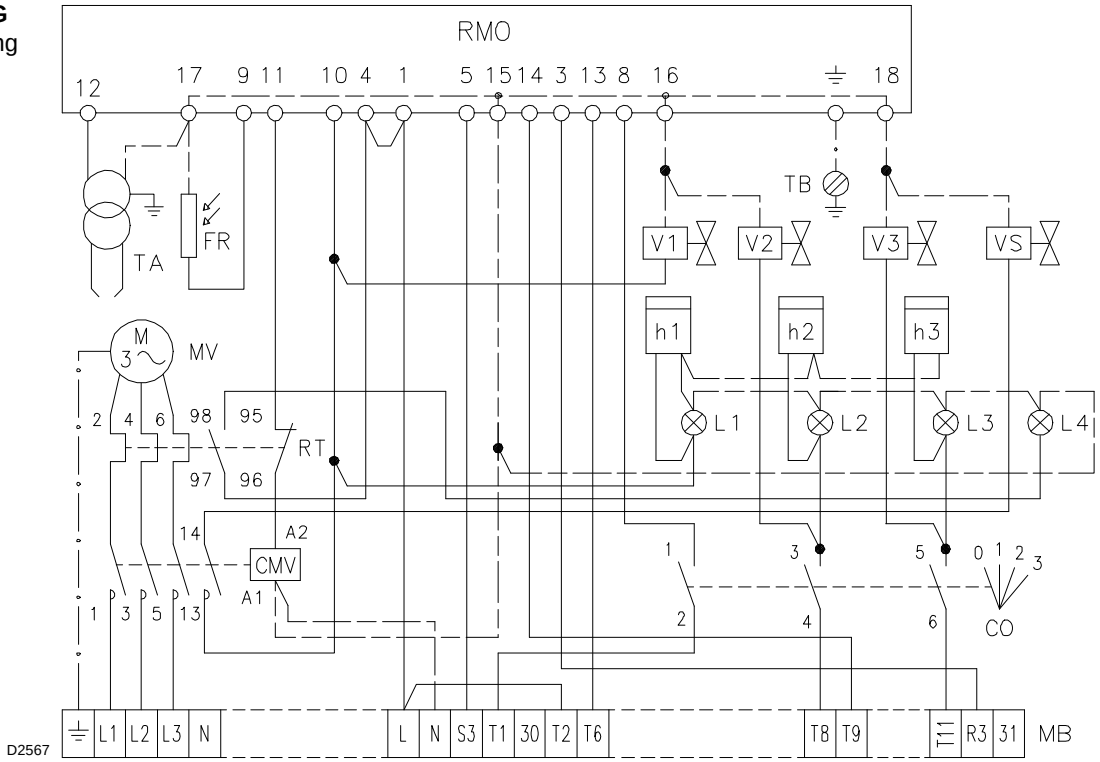


Fig. 21

P 300-450 T/G
Star-delta motor starting

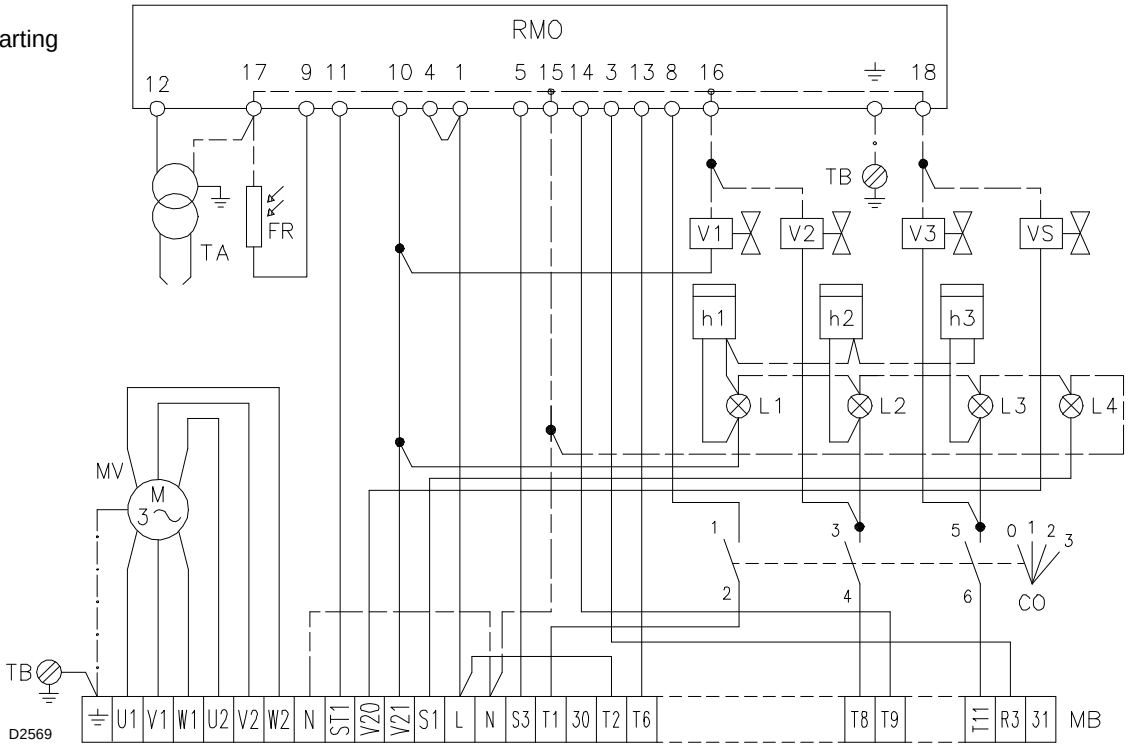


Fig. 22

Key (Fig. 21 - Fig. 22)

CMV	-	Motor contactor
CO	-	Commutator
FR	-	Photocell
h1,2,3	-	1., 2., 3. stage hourconters
L1,2,3	-	1., 2., 3. stage lamps
L4	-	Lock-out motor lamp
MB	-	Burner terminal strip
MV	-	Fan motor
RT	-	Thermal relay
TA	-	Ignition transformer
TB	-	Burner ground (earth) connection
VS	-	Safety solenoid valve
V1,2,3	-	1., 2., 3. stage solenoid valves

Star-delta starter

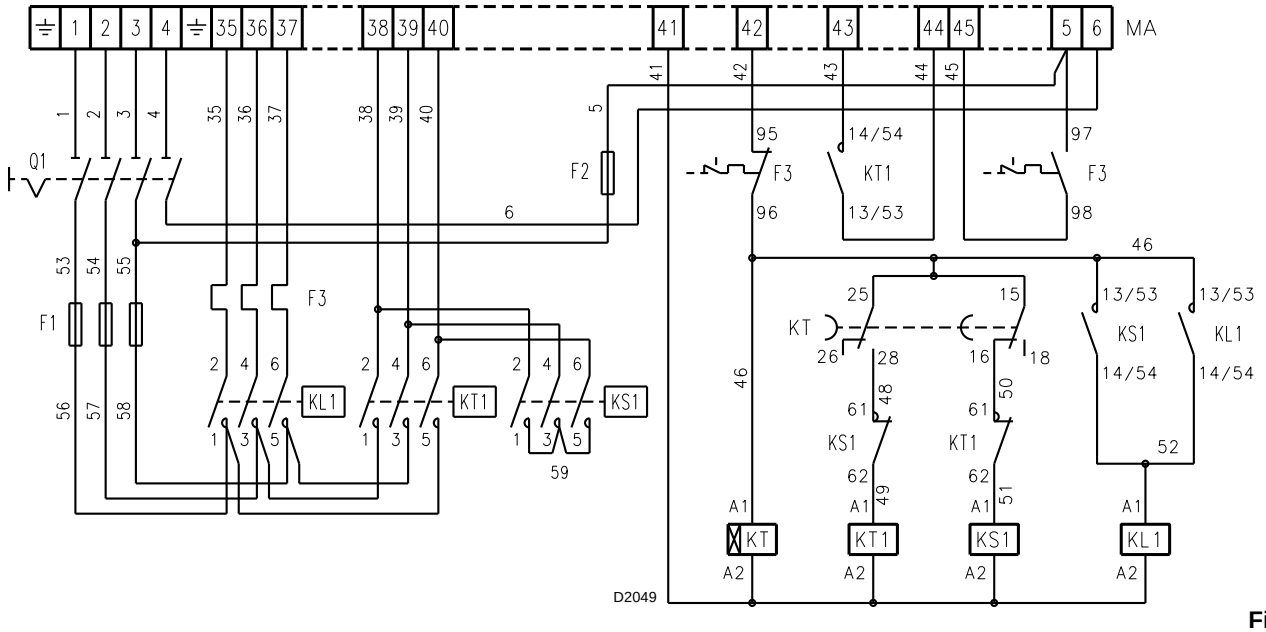


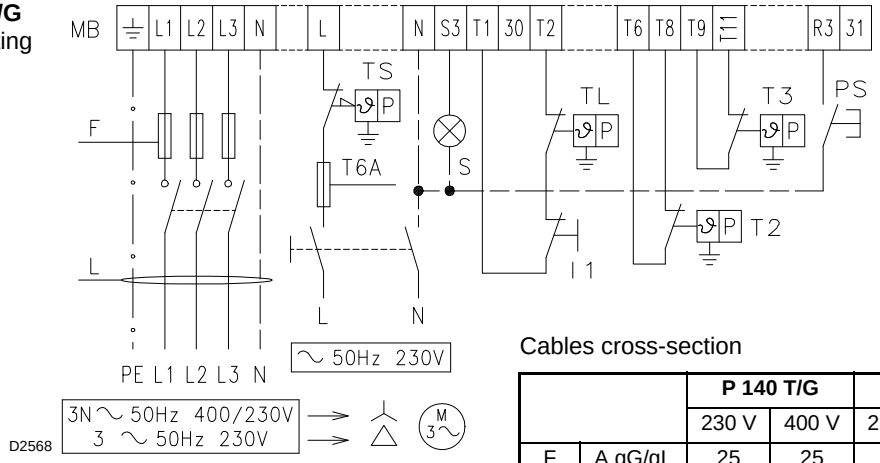
Fig. 23

Key (Fig. 23)

F1 - Power line fuses
F2 - Control devices fuse
F3 - Thermal relay - factory calibration at:
P 300 T/G: 10.2 A for 400 V - 17.6 A for 230 V
P 450 T/G: 16.7 A for 400 V - 29 A for 230 V
KL1 - Line contact-maker
KS1 - Star contact-maker
KT - Timer relay for switching from star to delta (factory calibration at 10 s.)
KT1 - Delta contact-maker
MA - Starter terminal strip
Q1 - Disconnecting switch with interlock

6.4 Electrical connection to the terminal strip - installer-set

P 140-200-300 T/G
Direct motor starting

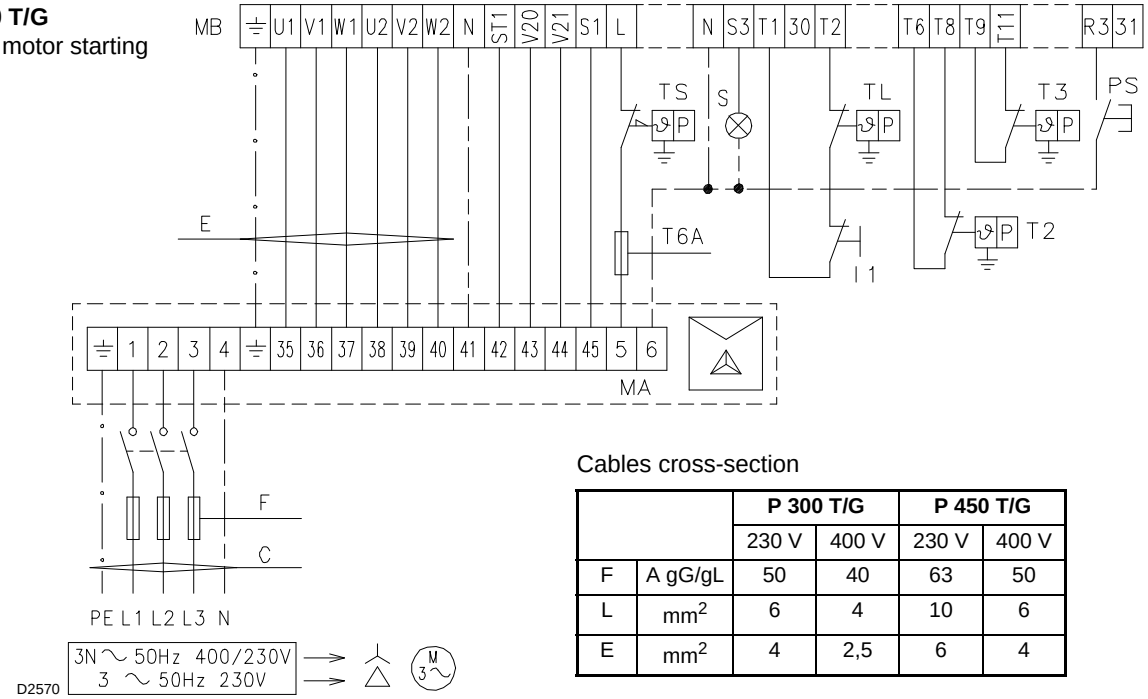


Cables cross-section

		P 140 T/G		P 200 T/G		P 300 T/G	
		230 V	400 V	230 V	400 V	230 V	400 V
F	A gG/gL	25	25	40	25	63	50
L	mm^2	2.5	2.5	4	2.5	6	4

Fig. 24

P 300-450 T/G
Star-delta motor starting



Cables cross-section

		P 300 T/G		P 450 T/G	
		230 V	400 V	230 V	400 V
F	A gG/gL	50	40	63	50
L	mm^2	6	4	10	6
E	mm^2	4	2,5	6	4

Fig. 25

Key (Fig. 24 - Fig. 25)
I1 - Burner manual stop switch
MA - Star-delta starter terminal strip
MB - Burner terminal strip
PS - Reset push-button
S - Remote lock-out signal
TL - Load limit remote control system: shut down the burner when the boiler temperature or pressure reaches the maximum preset value
TS - Safety load control system: operateds when TL is faulty
T2 - 2nd stage load control system
T3 - 3rd stage load control system

6.5 Calibration of thermal relay

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

If the motor is star-powered, **400 V**, the cursor should be positioned to “MIN”.

If it is delta-powered, **230 V**, the cursor should be positioned to “MAX”.

If the scale of the thermal relay does not include rated motor absorption at 400 V, protection is still ensured.

NOTE

In systems where the run of wiring connecting the thermostat exceeds 20 metres in length, or in places where the burner is subject to particularly disturbing electromagnetic interference (over 10 v/m), you must insert the relay-interface kit item number 3010386.

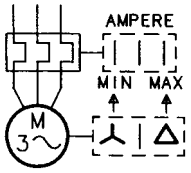


Fig. 26

WARNING

Check the lock-out by darkening the photo-cell after removal of the cover.

ATTENTION: HIGH VOLTAGE

7 Burner operation

7.1 Notes on safety for the first start-up

WARNING

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

WARNING

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

7.2 Burner start-up cycle

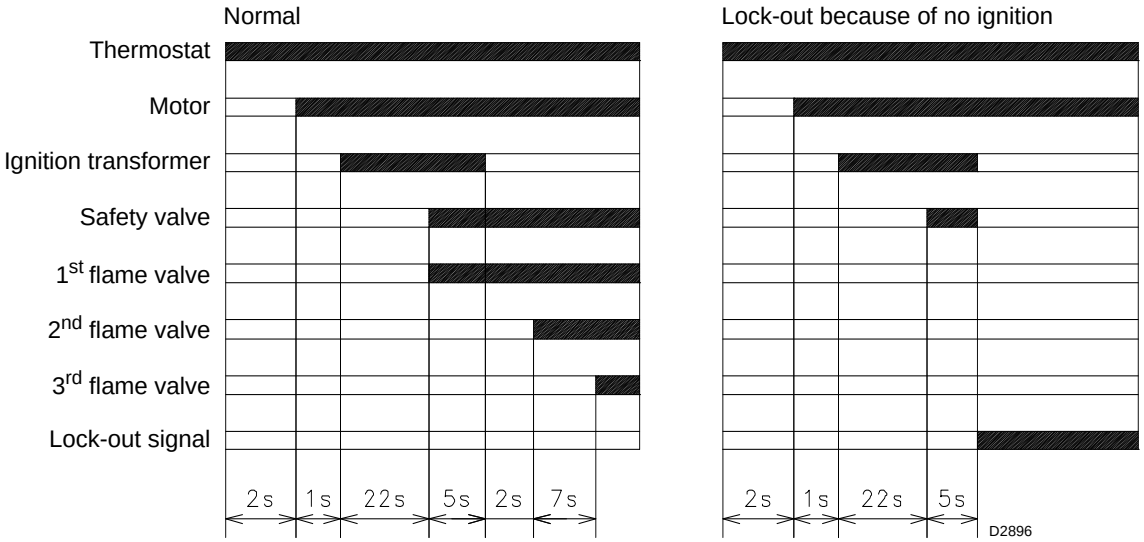


Fig. 27

7.2.1 Alternative start-up cycles

1 If you desire the pre-ignition being present during the complete pre-purge phase (37 s):
remove the bridge from the terminals 11 - 3 and put it on the terminals 11 - 7 of the control box.

2 If you desire to reduce the pre-purge period from 37 to 20 s (with contemporaneus presence of the pre-ignition) remove the wire from the terminal no. 7 to the no. 3 of the control box (maintaining the bridge to the terminals 11 - 3).

Three stage operation

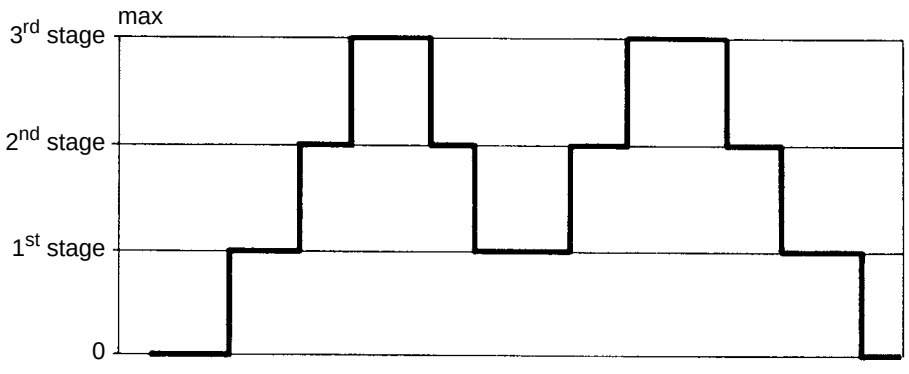


Fig. 28

8 Maintenance

8.1 Notes on safety for the maintenance

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

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

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

Before carrying out any maintenance, cleaning or checking operations:

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

Close the fuel interception tap.

8.2 Maintenance programme

8.2.1 Maintenance frequency

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

8.2.2 Checking and cleaning

Combustion

The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

Combustion head

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

Boiler

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

Burner

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

Filters

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

Pump

The delivery pressure must be stable. The depression must be less than 0.4 bar. Unusual noise must not be evident during pump operation. If the pressure is found to be unstable or if the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner. This measure permits the cause of the anomaly to be traced to either the suction piping or the pump.

If the pump is found to be responsible, check to make sure that the filter is not dirty. The vacuometer is installed upstream from the filter and consequently will not indicate whether the filter is clogged or not. Contrarily, if the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping. Please check that the supply line and filters are clear. The use of a pump vacuum gauge will assist in this. This measure permits the cause of the anomaly to be traced to either the suction line or the pump. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

Hoses

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

Nozzles

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

Fuel tank

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

Combustion

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

EN 267	Excess air		
	Max output $\lambda \leq$ **1.2**		Min output $\lambda \leq$ **1.3**
Theoretical max. CO_2 0 % O_2	**Calibration CO_2 %**		**CO mg/kWh**
	λ **= 1,2**	λ **= 1,3**	
15.2	12.6	11.5	$\leq$ 100

8.3 Burner start-up cycle diagnostics

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

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. M

8.4 Resetting the control box and using diagnostics

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

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

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

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

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

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

8.4.1 Resetting the control box

To reset the control box, proceed as follows:

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

8.4.2 Visual diagnostics

Indicates the type of burner malfunction causing lockout.

To view diagnostics, proceed as follows:

– Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, according to the coding system indicated in the table on page 27.

8.4.3 Software diagnostics

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

To view diagnostics, proceed as follows:

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

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

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

The sequence of pulses issued by the control box identifies the possible types of malfunction, which are listed in the table on page 27.

9 Faults - Possible causes - Solutions

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

If a burner malfunction is detected, first of all:
- check that the electrical wiring is adequately connected;
- check whether fuel is delivered;
- check that every adjustment parameter is adequately set.

SIGNAL	FAULT	POSSIBLE CAUSE	SOLUTION
No blink	The burner does not start	No electrical power supply	Close all switches - Check fuses
		A limit or safety control device is open	Adjust or replace
		Control box lock-out	Reset control box (no sooner than 10 s after the lockout)
		Pump is jammed	Replace
		Erroneous electrical connections	Check connections
		Defective control box	Replace
		Defective electrical motor	Replace
2 pulses ●●	After pre-purge and the safety time, the burner goes to lockout at the end of the safety time	No fuel in tank; water on tank bottom	Top up fuel level or suck up water
		Inappropriate head and air damper adjustments	Adjust
		Fuel solenoid valves fail to open (1st stage or safety)	Check connections; replace coil
		1st nozzle clogged, dirty, or deformed	Replace
		Dirty or poorly adjusted firing electrodes	Adjust or clean
		Grounded electrode due to broken insulation	Replace
		High voltage cable defective or grounded	Replace
		High voltage cable deformed by high temperature	Replace and protect
		Ignition transformer defective	Replace
		Erroneous valves or transformer electrical connections	Check
		Defective control box	Replace
		Pump unprimed	Prime pump
		Pump/motor coupling broken	Replace
		Pump suction line connected to return line	Correct connection
		Valves up-line from pump closed	Open
		Filters dirty: line - pump - nozzle	Clean
		Defective photocell or control box	Replace photocell or control box
		Photocell dirty	Clean
		1st stage operation of cylinder is faulty	Change the cylinder
		Motor lockout	Reset thermal relay
		Defective motor command remote control device	Substitute it
		2-phase powe supply thermal relay trips	Reset thermal relay
		Incorrect motor rotation direction	Change motor electrical connections
4 pulses ●●●●	The burner starts and then goes into lockout	Photocell short-circuit	Replace photocell
		Light is entering or flame is simulated	Eliminate light or replace control box
7 pulses ●●●●●●●	Flame detachment	Poorly adjusted head	Adjust
		Poorly adjusted or dirty firing electrodes	Adjust
		Poorly adjusted fan air gate: too much air	Adjust
		1st nozzle is too big (pulsation)	Reduce 1st nozzle delivery
		1st nozzle is too small (flame detachment)	Increase 1st nozzle delivery
		1st nozzle dirty, or deformed	Replace
		Pump pressure not suitable	Adjust it: between 10 - 14 bar
		1st stage nozzle unsuited to burner or boiler	See Nozzle Table; reduce 1st stage nozzle
		Defective 1st stage nozzle	Replace

Faults - Possible causes - Solutions

SIGNAL	FAULT	POSSIBLE CAUSE	SOLUTION
	The burner does not pass to 2nd stage	Control device TR does not close	Adjust or replace
		Defective control box	Replace
		2nd stage solenoid valve coil defective	Replace
		Piston jammed in valve unit	Replace entire unit
	Fuel passes to 2nd stage but air remains in 1st	Low pump pressure	Increase
		2nd stage operation of cylinder is faulty	Change cylinder
	Burner stops at transition between 1st and 2nd stage. Burner repeats starting cycle.	Nozzle dirty	Renew nozzle
		Photocell dirty	Clean
		Excess air	Reduce
	Uneven fuel supply	Check if cause is in pump from tank or fuel supply system	Feed burner located near burner
	Internally rusted pump	Water in tank	Suck water from tank bottom with separate pump
	Noisy pump, unstable pressure	Air has entered the suction line	Tighten connectors
		- Depression value too high (higher than 35 cm Hg):	
		Tank/burner height difference too great	Feed burner with loop circuit
		Piping diameter too small	Increase
		Suction filters clogged	Clean
		Suction valves closed	Open
		Paraffin solidified due to low temperature	Add additive to fuel
	Pump unprimes after prolonged pause	Return pipe not immersed in fuel	Bring to same height as suction pipe
		Air enters suction piping	Tighten connectors
	Pump leaks fuel	Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach	Not enough air	Adjust head and fan air damper
		Nozzle worn or dirty	Replace
		Nozzle filter clogged	Clean or replace
		Erroneous pump pressure	Adjust to between 10 - 14 bar
		Flame stability disc 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 air damper
	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; open gate valve
		Blast tube length unsuited to boiler	Contact boiler manufacturer
10 pulses ●●●●● ●●●●●		Connection or internal fault	
		Presence of electromagnetic disturbance	Use the radio disturbance protection kit

A Appendix - Accessories (optional)

SPACER KIT

If burner head penetration into the combustion chamber needs reducing, varying thickness spacers are available, as given in the following table.

Burner	Code
P 140-200 T/G	3000722
P 300 T/G	3000723
P 450 T/G	3000751

SOUND PROOFING BOX

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

Burner	Box type	Average noise reduction [dB(A)]	Code
P 140-200 T/G	C4/5	10	3010404
P 300-450 T/G	C7	10	3010376

DEGASSING UNIT

It may occur that a certain amount of air is contained in the fuel sucked up by the pump.
This air may originate from the fuel itself as a consequence of depressurisation or air leaking past imperfect seals.
In double-pipe systems, the air returns to the tank from the return pipe; in single-pipe systems, the air remains in circulation causing pressure variations in the pump and burner malfunctions.
For this reason, we advise installing a degassing unit near the burner in single-pipe installations.
Degassing units are provided in two versions:

Burner	Code
P 140-200-300-450 T/G (without filter)	20034277
P 140-200-300-450 T/G (with filter)	20034281

Degassing unit characteristics

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

PC INTERFACE KIT

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

Burner	Code
P 140-200-300-450 T/G	3002719

PROTECTION KIT (ELECTROMAGNETIC INTERFERENCES)

When the burner is installed in a room particularly subject to electromagnetic interference (signals emitted over 10 V/m) due for example to INVERTER presence or in systems where the lengths of the thermostat connections is over 20 meters, this specific protection kit is available as an interface between the thermostatic controls and the burner.

Burner	Code
P 140-200-300-450 T/G	3010386

BURNER SUPPORT

For easier maintenance, a mobile burner support has been designed, which means the burner can be dismantled without the need of forklift trucks.

Burner	Code
P 300-450 T/G	3000731

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