

GB Heavy oil burner

Three stage operation



CODE	MODEL	TYPE
3437785	P 200 T/N	467 T80



Original instructions

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

These products are in compliance with the following Technical Standards:

- EN 12100
- EN 267

According to the European Directives:

MD	2006/42/CE	Machine Directive
LVD	2014/35/UE	Low Voltage Directive
EMC	2014/30/UE	Electromagnetic Compatibility

The quality is guaranteed by a quality and management system certified in accordance with ISO 9001:2015.

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 Centre 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 Other symbols



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



DANGER: FLAMMABLE MATERIAL
This symbol indicates the presence of flammable materials.



DANGER: BURNING
This symbol indicates the risks of burns due to high temperatures.



DANGER: CRUSHING OF LIMBS
This symbol indicates the presence of moving parts: danger of crushing of limbs.



WARNING: MOVING PARTS

This symbol indicates that you must keep limbs away from moving mechanical parts; danger of crushing.



DANGER: EXPLOSION

This symbol signals places where an explosive atmosphere may be present. An explosive atmosphere is defined as a mixture - under atmospheric conditions - of air and flammable substances in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.



PERSONAL PROTECTION EQUIPMENT

These symbols indicate the equipment that must be worn and kept by the operator for protection against threats against safety and/or health while at work.



OBLIGATION TO ASSEMBLE THE COVER AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



ENVIRONMENTAL PROTECTION

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



IMPORTANT INFORMATION

This symbol indicates important information that you must bear in mind.



This symbol indicates a list.

Abbreviations used

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

2.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

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

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

2.2 Guarantee and responsibility

The manufacturer guarantees its new products from the date of installation, 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.



ATTENTION

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;
- 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.

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 safety rules 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.

Specifically:

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 ambient 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 envisaged by the manufacturer can be replaced.



ATTENTION

The manufacturer guarantees safety and proper operation only if all burner components are intact and correctly positioned.

3.2 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;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, the user undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- 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.

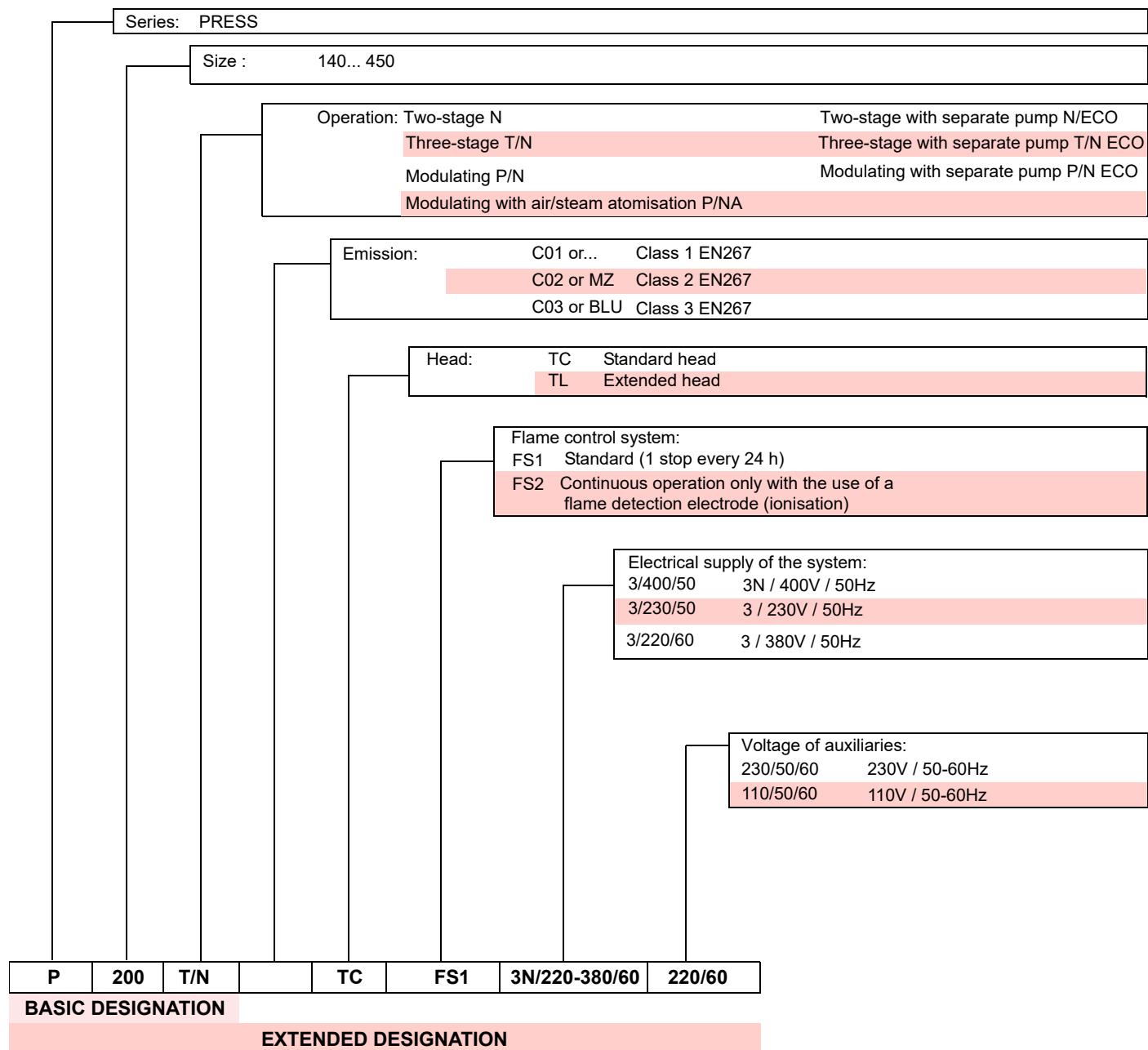
In addition:



- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- the user 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.

4 Technical description of the burner

4.1 Burner designation



4.2 Models available

Designation			Voltage	Start-up	Code
P 200 T/N	TC	FS1	3N/220-380/60	Diretto	3437785

5 Technical description of the burner
5.1 Technical data

MODEL		P 200 T/N
Output ⁽¹⁾	kW	515 - 2280
Delivery ⁽¹⁾	kg/h	45 - 200
Fuel		Heavy oil
- max viscosity at 50 °C	mm ² /s	50 (7°E) up at 50°C with kit 500 (65°E) at 50°C
Operation		• Intermittent (min. 1 stop every 24 hours)
Nozzle	number	1 (nozzle with return line)
Standard applications		Boilers: water, steam, diathermic oil
Ambient temperature	°C	0 - 40
Combustion air temperature	°C max	60
Pump	kg/h	350
	bar	25
Weight of the burner (complete with packaging)	kg	190

Tab. A

⁽¹⁾ Reference conditions: Room temperature 20°C - Barometric pressure 1000 mbar – Altitude 100 m above sea level.

5.2 Electrical data

MODEL		P 200 T/N
Electrical power supply	V	3N ~ 220/380 ± 10%
	Hz	60
Electrical motor (IE3)	rpm	3543
	kW	5.5
	V	220/380
	A	19-11
Ignition transformer	V1 - V2	230V - 2 x 6 kV
	I2 - I2	2A - 35 mA
Absorbed electrical power	kW max	20
Protection level	IP	40

Tab. B

5.3 Operation and efficiency of the burner

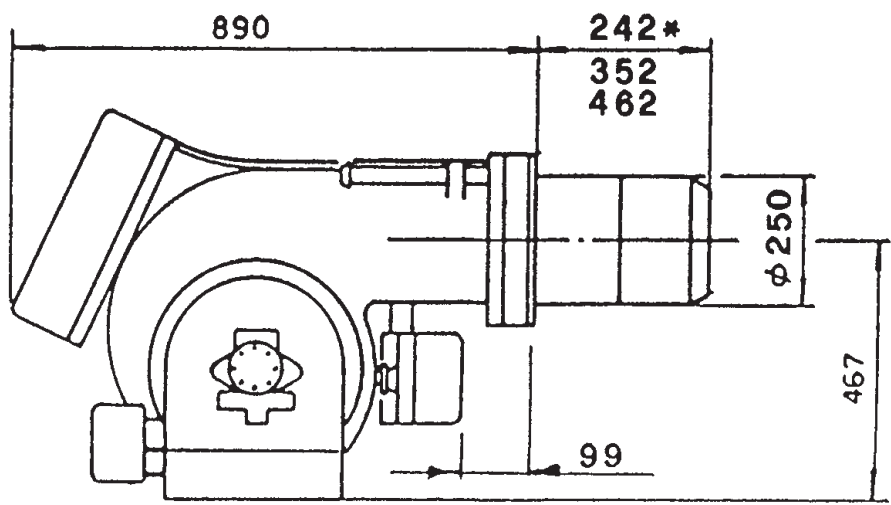
1st STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1 st nozzle:	ignition phase	376	33	763	67
1 st +2 nd nozzle:	intermediate phase	763	67	1516	133
1 st +2 nd +3 rd nozzle:	operation phase	1140	100	2279	200
2nd STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1 st nozzle:	ignition phase	376	33	763	67
1 st +2 nd nozzle:	1 st stage of operation	763	67	1516	133
1 st +2 nd +3 rd nozzle:	2 nd stage of operation	1140	100	2279	200
3rd STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1 st nozzle:	1 st stage of operation	513	45	763	67
1 st +2 nd nozzle:	2 nd stage of operation	1026	90	1516	133
1 st +2 nd +3 rd nozzle:	3 rd stage of operation	1140	100	2279	200

Tab. C

5.4 Overall dimensions

The dimensions of the burner are given in Fig. 1.
Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part drawn back on the slide bars.

* It is possible with a spacer, upon request.



S10344

Fig. 1

5.5 Standard equipment

Flexible hoses	No. 2
Cable clamps.....	No. 5
Screws.....	No. 4
Gasket for flange	No. 1
Nipples	No. 2
Manual.....	No. 1
Spare parts list	No. 1

5.6 Firing rates

During operation, burner output varies within a minimum and a maximum limit (Fig. 2).



The FIRING RATE was obtained with an ambient temperature of 20°C and a barometric pressure of 1000 mbar (approx. 100m above sea level), with the combustion head adjusted as shown on page 21.

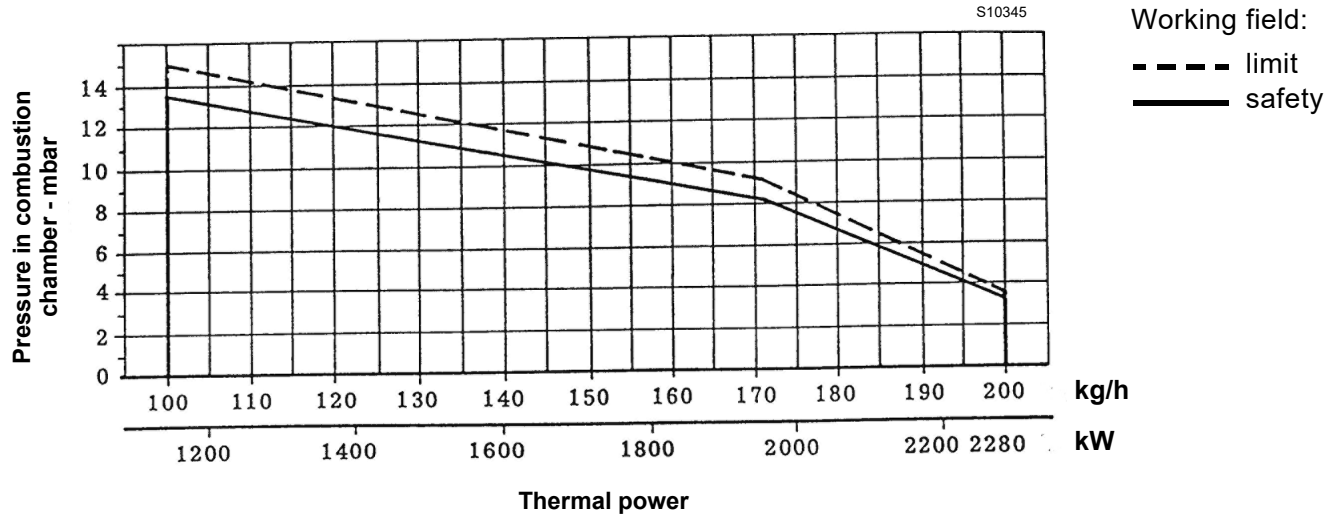


Fig. 2



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

5.7 Test boiler

The burner/boiler combination does not pose any problems if the boiler is EC approved and its combustion chamber dimensions are similar to those indicated in the diagram (Fig. 3).

If the burner must be combined with a boiler that has not been EC approved and/or its combustion chamber dimensions are clearly smaller than those indicated in the diagram, consult the manufacturer.

The firing rates were obtained in special test boilers, according to EN 267 standard.

In Fig. 3 you can see the diameter and length of the test combustion chamber.

Example:

Output 650 Mcal/h (407 kW): diameter 60 cm - length 2 m.

MODULATING RATIO

The modulating ratio, obtained in test boilers according to standard (EN 267) is 4:1.

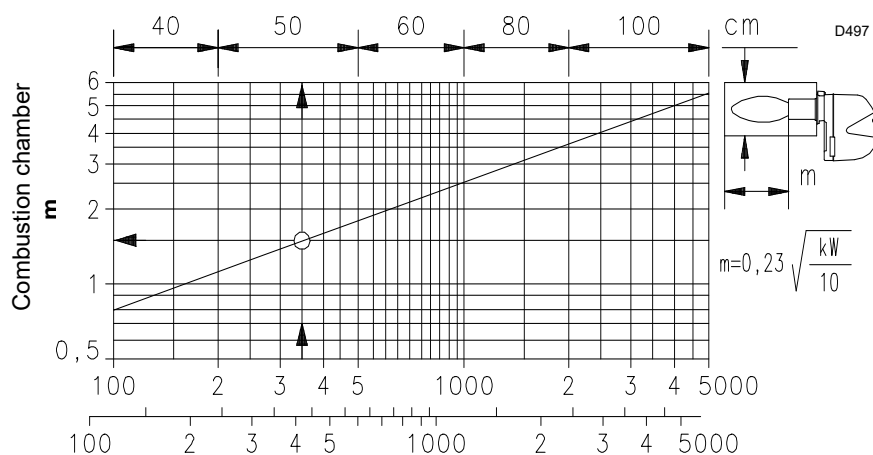


Fig. 3

5.8 Burner description

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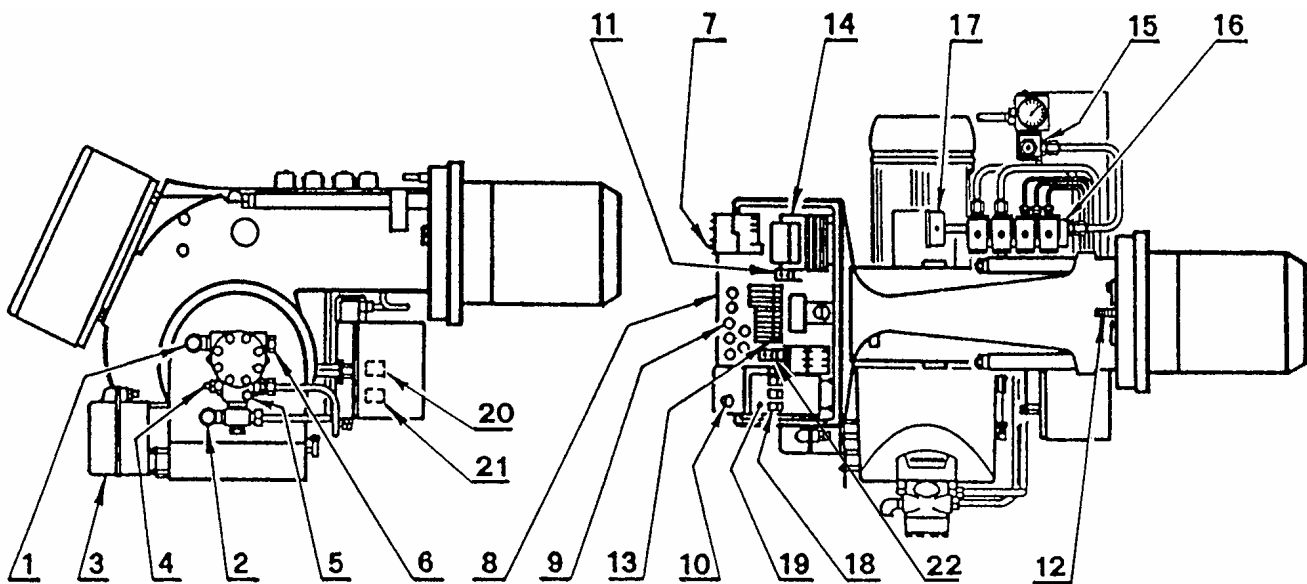


Fig. 4

- 1 Suction line
- 2 Return line
- 3 Air shutter opening motor
- 4 Pump pressure adjustment screw
- 5 Manometer plug (G 1/8)
- 6 Vacuum plug (G 1/2)
- 7 Reset push-button of the motor overload relay
- 8 Electric board
- 9 Cable clamps
- 10 Control box reset push-button and lock-out lamp
- 11 Adjustment thermostat
- 12 Regulating bush for combustion head
- 13 Wiring terminal board
- 14 Ignition transformer
- 15 Filter
- 16 Valves group
- 17 Manometer
- 18 Lamp
- 19 Commutator
- 20 Low limit thermostat
- 21 High limit thermostat
- 22 Timer

5.9 Control box RMO88...

Warning



ATTENTION

To avoid accidents, material or environmental damage, observe the following instructions!

The control box RMO88... is a safety device! Avoid opening or modifying it, or forcing its operation. Riello S.p.A. cannot assume any responsibility for damage resulting from unauthorised interventions!

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the control box connection area, fully disconnect the system from the power supply (omnipolar separation). Check the system is not powered and cannot be accidentally reconnected. Failure to do this will lead to the risk of electrocution.
- Protection against electrocution from the control box and all connected electric components is obtained with the correct assembly.
- Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- Falls and collisions can negatively affect the safety functions.
In this case, the control box must not be operated, even if it displays no evident damage.
- Press the reset button of the burner lockout command or the reset button (by applying a force of not more than 10 N), without the aid of tools or sharp objects.

For the safety and reliability of the control box, comply with the following instructions:

- avoid conditions that can favour the development of condensate and humidity. Otherwise, before switching on again, make sure that the entire control box is perfectly dry!
- Static charges must be avoided since they can damage the control box's electronic components when touched.



Fig. 5

S8906

Technical data

Mains voltage	AC 220...240 V +10 % / -15 %
Mains frequency	50 / 60 Hz ±6%
Power absorption	20 VA
Protection level	IP20
Safety class	I
Weight	approx. 260g
Cable length	
Thermostat cable	Max. 20 m at 100 pF/m
Air pressure switch	Max. 1 m at 100 pF/m
Gas pressure switch	Max. 20 m at 100 pF/m
Remote reset	Max. 20 m at 100 pF/m
CPI	Max. 1 m at 100 pF/m
Environmental conditions:	
Operation	DIN EN 60721-3-3
Climatic conditions	Class 3K3
Mechanical conditions	Class 3M3
Temperature range	-20...+60°C
Humidity	< 95 % r.h.

Mechanical structure

The control box is made of plastic to resist knocks, heat and flame propagation.

The control box contains the following components:

- a microprocessor that controls the program sequence, and a relay for controlling the load
- an electronic flame signal amplifier
- a built-in reset button with 3 signalling colours (LED) for status and error messages.

6 Installation

6.1 Notes on safety for the installation

After carefully cleaning all around the area where the burner is to be installed, and arranging for the environment to be illuminated correctly, 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.



The combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

6.2 Handling

The burner packaging includes a wooden platform, it is therefore possible to handle the burner (still packaged) with a pallet truck or fork lift truck.



Burner handling operations can be highly dangerous if not carried out with the greatest attention: distance unauthorised personnel, check integrity and suitability of the means available. 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). During handling, keep the load at no 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.

6.3 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.

Check the identification label of the burner, showing:

- the model (see **A** in Fig. 6) and the type of burner (**B**);
- the year of manufacture, in cryptographic form (**C**);
- the serial number (**D**);
- the absorbed electrical power (**E**);
- the types of fuel used and the relative supply pressures (**F**);
- the minimum and maximum possible output data of the burner (**G**) (see Firing rate).

D2582

N.	D	TIPO/TYP TYPE	A - B	C	V-50 Hz	E	kW
		kg/h				G	kW
Combust. Heizöl/Fuel		F	max. visc. @ °C	mm ² /s (E)			
						RBL	
REGOLAZIONE			X →	<input type="checkbox"/> DUE STADI PROGRESSIVI GLEITEND ZWEISTUFIG			
LEISTUNGSREGELUNG			X →	<input type="checkbox"/> MODULANTE MODULIEREND			

Fig. 6



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.

6.4 Operating position



- The burner is designed to work only in positions **1** and **4** (Fig. 7).
- Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual.
- The installation **4** permits the operation but makes the maintenance and inspection operations of the combustion head more difficult.



- Any other position could compromise the correct operation of the appliance.
- The installation **5** is prohibited for safety reasons.

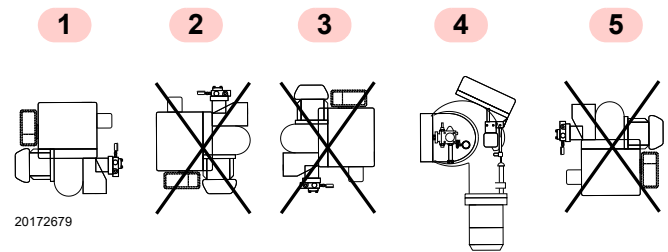
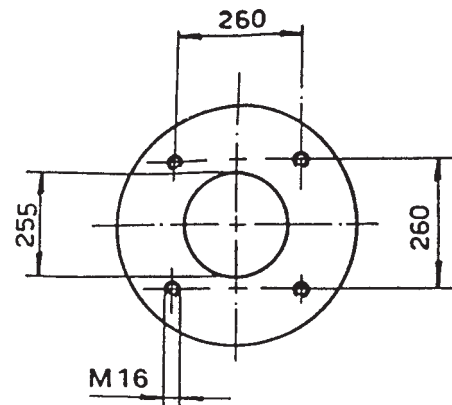


Fig. 7

6.5 Boiler plate

For the combustion head projection carefully follow the boiler manufacturer indications.

A proper protection with refractory material on the combustion head projecting into the combustion chamber shall be made, when boilers with frontal smoke box are used.



S10346

Fig. 8

6.6 Securing the burner to the boiler



Provide an adequate lifting system.



Be careful as some drops of fuel may leak out during this phase.

To separate the burner from the cast iron blast tube, proceed as follows:

- remove the cover 1)(Fig. 9), the split pin and pin 2), the nuts 3) and the screws 4).
- Pull out the blast tube from the burner by approx. 100÷120 mm and release the driving fork of the head 6) by removing the split pins 5).
- At this point, it is possible to fully pull out the blast tube from the pins 7).
- Fix the blast tube to the boiler by inserting the insulating seal 8) in-between.
- After fitting the selected nozzle, fit the burner on the pins 7) leaving it open by approx. 100 ÷ 120 mm.
- Refit the fork 6) fixing it with the split pins 5).
- Completely close the burner fastening it with screws 4), fit the nuts 3), the pin and split pin 2).

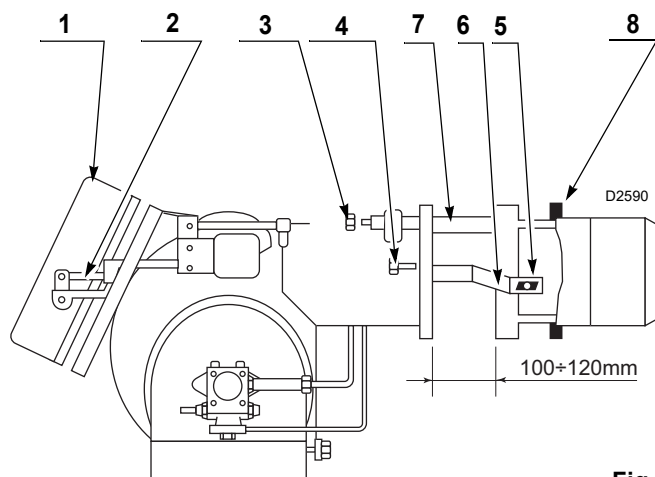


Fig. 9



ATTENTION

The seal between burner and boiler must be airtight.

6.7 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.



It is advisable to replace the nozzle once a year during periodical maintenance.



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 non-observance of the requirements contained in this manual.

6.7.1 Nozzle assembly

At this installation stage the burner is still separated from the blast tube; therefore it is possible to fit the nozzle with a 16 mm wrench. Do not use any sealing products such as: gaskets, tape or sealants. Be careful to avoid damaging the nozzle sealing seat.



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

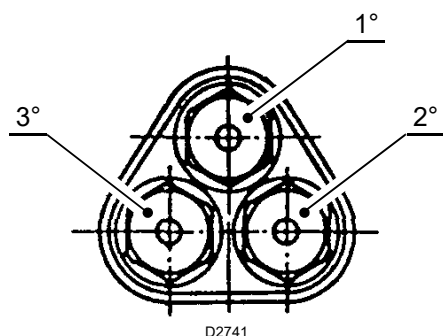


Fig. 10

6.7.2 Nozzle selection

First of all state the maximum output required with all three nozzles in operation.

On the base of the maximum output choose, from Tab. D, three related nozzles.

Nozzles: 60° - Pump pressure: 25 bar

The references of Tab. E should be followed in case of need of:

- modification of the pump pressure in order to vary the output,
- different composition of the 3 nozzles group,
- knowledge of the output in 1st and 2nd stage.

AVAILABLE NOZZLES

Nozzle GPH 60°			Total Output kg/h 1°+2°+3°	
1°	2°	3°	25 bar	28 bar
5.00	5.00	5.00	96	99
5.50	5.50	5.50	105	111
6.00	6.00	6.00	104	120
6.50	6.50	6.50	123	132
7.00	7.00	7.00	132	141
7.50	7.50	7.50	141	150
8.00	8.00	8.00	150	159
8.30	8.30	8.30	156	165
8.50	8.50	8.50	159	171
9.00	9.00	9.00	168	180
9.50	9.50	9.50	177	189
10.0	10.0	10.0	186	198
10.5	10.5	10.5	195	-
10.5	10.5	11.0	199	-

Tab. D

GPH	25 bar kg/h	28 bar kg/h
5.00	32	33
5.50	35	37
6.00	38	40
6.50	41	44
7.00	44	47
7.50	47	50
8.00	50	53
8.30	52	55
8.50	53	57
9.00	56	60
9.50	59	63
10.00	62	66
10.50	65	70
11.00	69	73

Tab. E

6.8 Fuel oil supply



Explosion danger due to fuel leaks in the presence of a flammable source.

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel shut-off valve is closed before performing any operation on the burner.



ATTENTION

The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.



ATTENTION

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

Any obstruction would cause the pump seals to break.

Oil pipes must be completely airtight.

6.8.1 Ring supply line

For heavy oil with viscosity up to 50°E/50°C.

- The oil could easily flow through the pipes if those are properly seized, protected and heated (by electricity, steam or hot water).
- The forwarding pump capacity should be all the least double of that of the burner pump. If several burners are supplied through the same ring supply line, the forwarding pump should have a capacity of approx. 30% more than the sum of the single burners outputs.
- For starting-up: after excluding the burner by the shutter valves 5) let the oil flow into the supply ring up to reach the required circulation; after than open the valves and supply normally the burner.

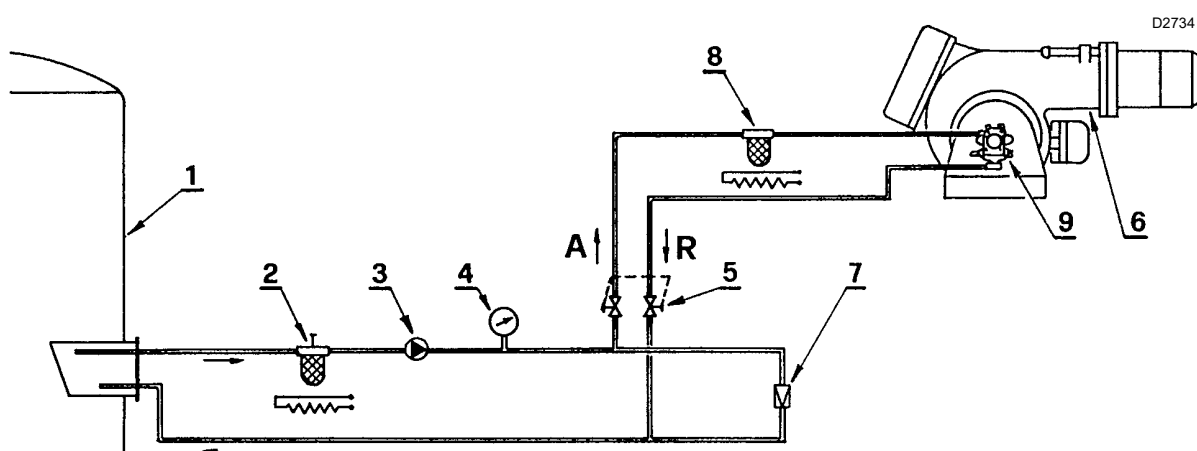


Fig. 11

Key

- 1 - Tank (heated for thick oil)
- 2 - Filter (oil resistance > 7°E / 50°C)
- 3 - Transfer pump
- 4 - Control pressure gauge
- 5 - Gate valves for burner disabling (coupled)
- 6 - Burner (with heavy oil kit code **3000721**)
- 7 - Pressure regulator
- 8 - Filter (oil resistance > 7°E / 50°C)
- 9 - Burner pump

6.8.2 Gravity supply line



- Make sure that the hoses to the pump supply and return line are installed correctly.

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



ATTENTION

During the installation, hoses must not be stressed with twisting.

Periodically clean the tank filter.

Make sure that the nozzle has no filter.

Only for oil with max. viscosity up to 7°E/50°C.

Pump priming:

loose the tap of the vacuumeter plug and wait for the oil flow.

H: Difference in the pipes height

L: Total length of the suction tube



ATTENTION

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.

H meters	L meters	
	ø 1 1/4"	ø 1 1/2"
0	5	10
0,5	8	15
1	11	20
1,5	14	25
2	17	30

Tab. F

D2735

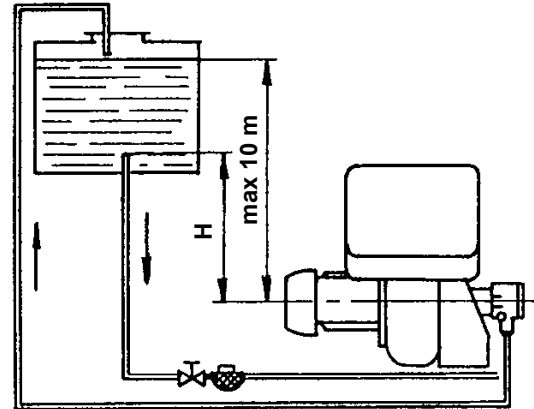


Fig. 12

6.9 Pump pressure

The pump pressure is referred to all three nozzles operating. The pump pressure increases automatically when two nozzles are operating and becomes higher with only one nozzle.

Suggested pressure:

- Light oil: 25 bar
- Heavy oil: 28 bar (transformation kit)

Rated nozzles deliveries are listed on the table.

A tolerance of ±5% concerns the real delivery against the rated one.

The pump leaves the factory set at 25 bar.

6.10 Electrical connections

Notes on safety for the electrical wiring



DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The FS1 burners have been set for intermittent operation. This means that the burner should compulsorily be stopped at least once every 24 hours to enable the electric control box to check its own safety and efficiency at start-up. Normally the boiler's thermostat/pressure switch ensures that the burner stops. If this is not the case, a time switch should be fitted in series to TL to stop the FS1 burner at least once every 24 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. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use a multiple pole switch with at least a 3 mm gap between the contacts (overvoltage category III), as envisaged by the present safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.
- Check the electric wiring inside the boiler complies with the national and local safety regulations.
- Live and neutral should not be mixed up (this could cause dangerous malfunctions, a loss of protection against electric shocks, etc.).
- Make sure the cable grommets of the connected cables comply with the relevant standards (e.g. EN60730 and EN60 335).
- When wiring the unit, make sure that AC 230V mains voltage cables are run strictly separate from extra low-voltage cables to avoid risks of electrical shock hazard.

Before carrying out any maintenance, cleaning or checking operations:



DANGER

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



DANGER

Close the fuel shut-off valve.



DANGER

Avoid condensate, ice and water leaks from forming.

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

Use flexible cables according to EN 60 335-1 standard.



ATTENTION

Check the lock-out by darkening the flame sensor after removal of the cover.

In case of supply 220V without neutral, connect the motor and the pre-heater tank through delta (the "star" connection is the original one, made for 380V).

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.

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 Adjustments prior to ignition

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

7.2.1 Nozzle

See information on page 17.

7.2.2 Pump pressure

See information on page 19.

7.3 Combustion head adjustment

On the base of the maximum delivery detect, from diagram (Fig. 13), the combustion head adjustment.

The adjustment should be made by turning the screw **A** till the set-point (Fig. 13) is on the line with the washer **B** (Fig. 14).

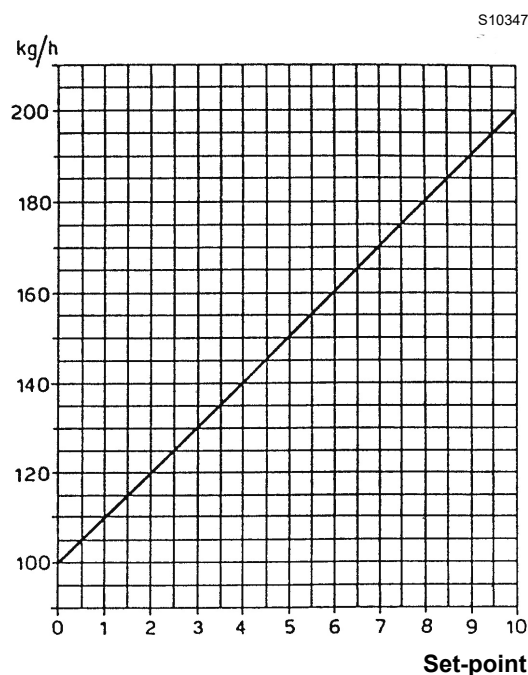


Fig. 13

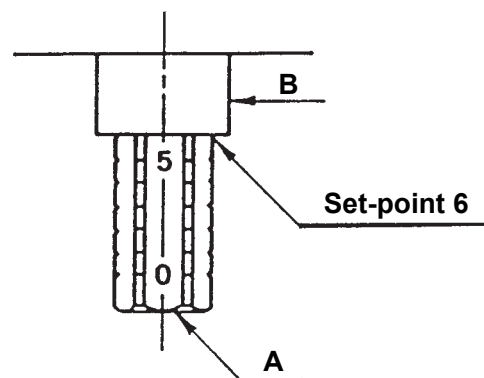


Fig. 14

7.4 Air shutters adjustments

The adjustment of the air shutters shall be set each time, with reference to the nozzles deliveries and the combustion chamber pressurization.

Fig. 15 shows the positioning of the air shutters.

Fig. 16 shows the positioning of the cams of the motor.

1st Stage adjustment:

manual regulation carried out by acting on the sector **A** (Fig. 15).

2nd - 3rd Stage adjustment:

carried out by acting on the coloured lever of the motor (Fig. 16).

Blue lever:

adjustment not necessary. Positioned by the factory on the vertical of the motor axis. It maintains the shutters of 2nd and 3rd stage closed during the 1st stage operation and in the stop periods.

Do not turn clockwise (-) the lever to avoid crawlings of the air shutters, turning the lever anticlockwise (+) the motor will be in different position during the passage from 2nd to 1st stage or during the stop.

Orange lever:

for 2nd stage air shutters adjustment, it is adjustable both in opening and in closing position.

Red lever:

for 3rd stage air shutters adjustment, it is adjustable both in opening and in closing position.

Black lever:

it controls the opening of the 2nd stage oil valve. It has always to anticipate the orange lever. The control of the 3rd stage valve is automatic through one of the cam next to the red lever.

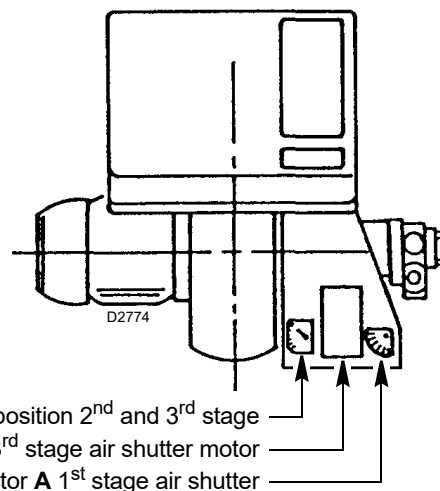


Fig. 15

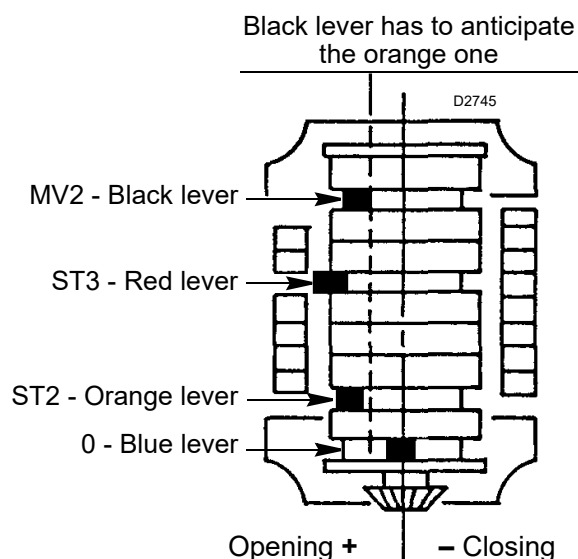


Fig. 16

7.5 Atomising temperature setting

7.5.1 Thermostat for adjustment - maximum value - minimum value

Electronic adjustment thermostat by means of information relayed from a PT100 probe immersed in the oil in the delivery manifold, the thermostat adjusts spray temperature. The correct conditions for fuel spray are shown in Fig. 17.

Example: fuel oil with 7 °E viscosity at 50 °C is pre-heated to approximately 110 °C.

IMPORTANT

Although the temperature set on the thermostat should correspond to the temperature of the fluid, it is good practice to check that the thermometer shows the correct reading once the unit has been in operation for a few minutes. The LED will illuminate to indicate that the heating resistances are working properly.

The pre-heater fitted to the burner supplies a Δt di 75°C at 450 kg/h (Fig. 18). If there is a Δt shortfall, this can be made up by an auxiliary pre-heater.

Minimum temperature thermostat (Fig. 18), in addition to shutting down the burner if the fuel temperature should fall below the critical value for correct combustion, this thermostat also provides a permissive signal at the time of burner start-up. (Factory set at approximately 80°C, adjustable by removing the pre-heater cover and relative plate).

Maximum temperature thermostat (Fig. 18) this switches off the resistance when, because of failure of the adjustment thermostat, the temperature of the pre-heater increases to unacceptable levels; a "high temperature" alarm output is provided on the burner terminal strip. (Factory setting is approximately 180°C).

Renewing the minimum and maximum temperature thermostats.

Reposition the probes of the new thermostat, after having first loosened the plate pack securing screws. Make sure that the probe is touching the resistance and the plate pack as shown in Fig. 18.

The same precautions should be taken when renewing the resistances in contact with the thermostat probes.

If the pre-heater should malfunction, use an ohmmeter to check that the resistances located in contact with the temperature probes are not burnt out (reading of approximately 35 Ohm).

Changing the PT100 probe in the oil delivery manifold.

Fit the supplied nut and biconical collar on the new probe, insert a length of approximately 40mm in the manifold, and secure firmly into place. At this point, the section remaining outside the manifold can be bent as required, with no risk of damaging the resistance.

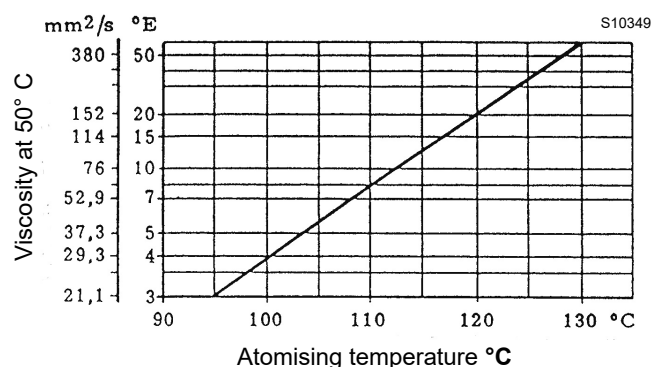


Fig. 17

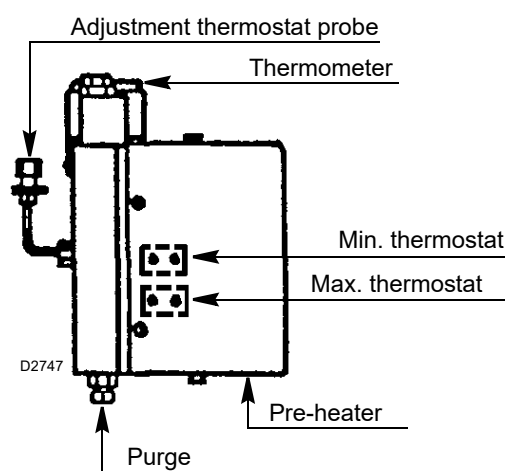


Fig. 18

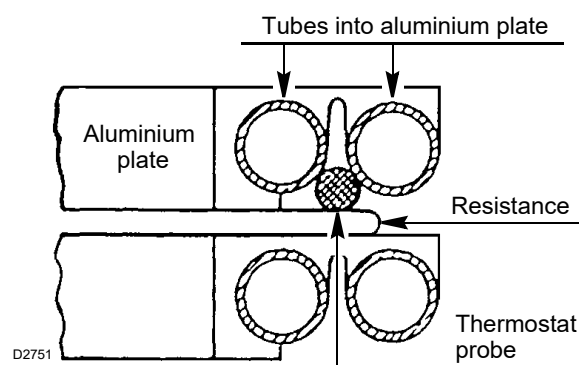


Fig. 19

7.6 Operation sequence of the burner

7.6.1 Burner start-up program

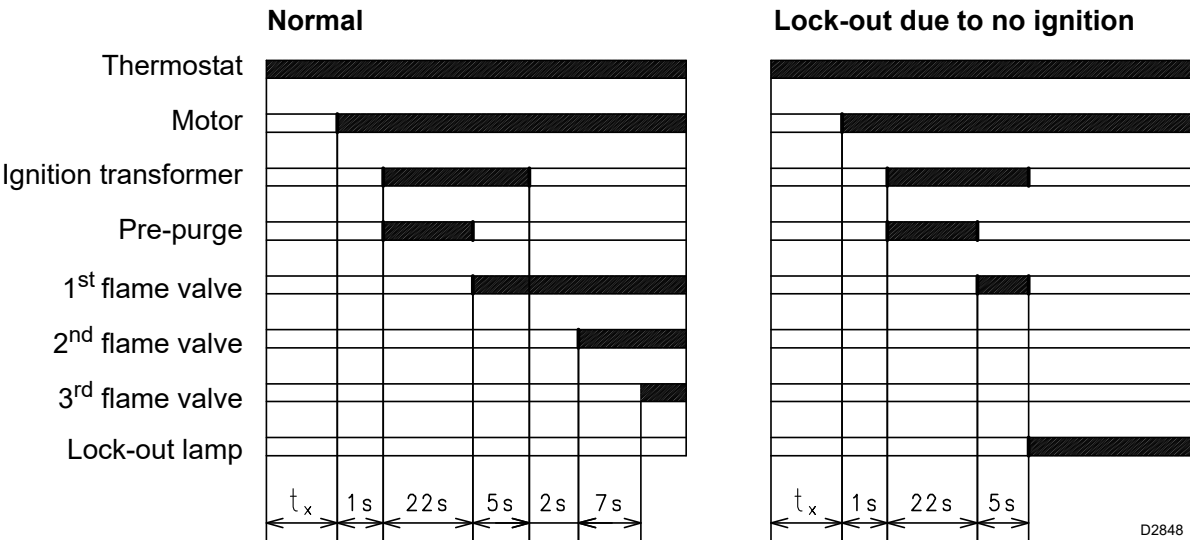


Fig. 20

(t_x) Factory setting: 20 s.
This time determines the heavy oil temperature at ignition. It can be adjusted, according to the fuel's viscosity, by the timer.
Fig. 21 shows the suggested settings.

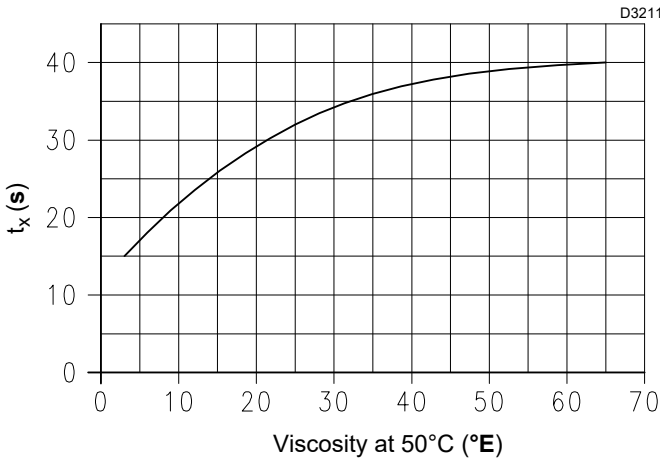


Fig. 21

t_x max = 60 s



ATTENTION

Motor lock-out

It is caused by the over load relay when overload occurs or no current supply.
Periodically clean the filter of the pre-heater tank.



ATTENTION

Make sure that the mechanical locking systems on the adjustment devices are fully tightened.

7.7 Three stage operation

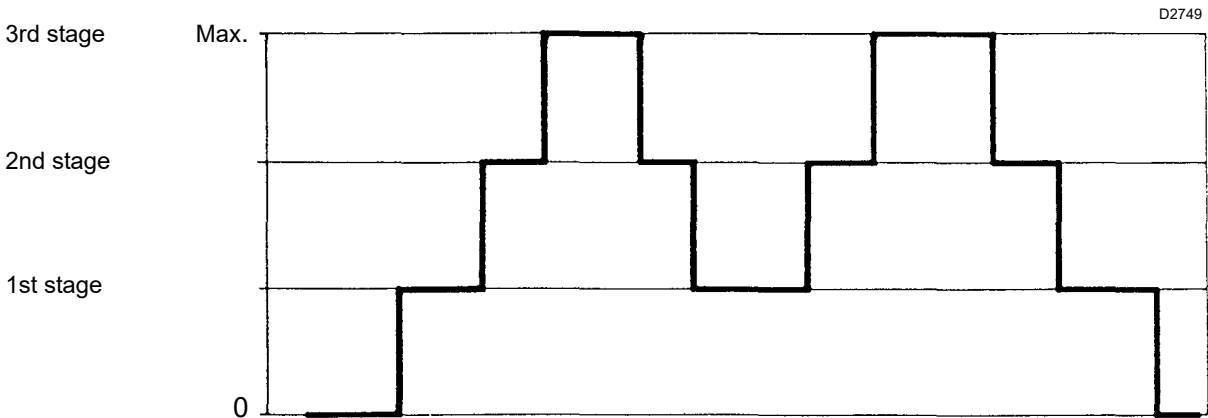


Fig. 22

8 Burners start-up cycle diagnostics

8.1 Burner start-up cycle diagnostics

During start-up, indication is according to the colour code table (Tab. G).

Sequences	Colour code
Pre-purging	● ● ● ● ● ● ● ● ● ●
Ignition phase	● ○ ● ○ ● ○ ● ○ ●
Operation, flame OK	□ □ □ □ □ □ □ □ □ □
Operation with weak flame signal	□ ○ □ ○ □ ○ □ ○ □
Electrical supply below ~ 170V	● ▲ ● ▲ ● ▲ ● ▲ ●
Lockout	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲
Extraneous light	▲ □ ▲ □ ▲ □ ▲ □ ▲

Tab. G

Key (Tab. G):

▲ Off ○ Yellow ● Green □ Red

RED LED lit wait for at least 10s	Lockout	Press reset for > 3s	Pulses	3s interval	Pulses
■	■	■	● ● ● ●	■	● ● ● ●

Tab. H

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

8.1.2 Control box reset

To carry out the control box reset, 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.

8.1.3 Visual diagnostics

Indicates the type of burner malfunction causing lockout. To display the 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 blink to tell you the operation is done.
- Release the button once the light has blinked. The number of blinks indicates the reason for the malfunctioning (refer to the coding in Tab. G).

8.1.1 Resetting of control box and diagnostics use

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

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

The 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 blinks and identified the possible cause, the system must be reset by holding the button down for 1 - 3 seconds.

8.1.4 Software diagnostics

Gives an analysis of the life of the burner, through optical connections with a PC showing the working hours, number and types of lockout, control box serial number etc...

To display the 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 blink 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 blinks 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 status must be restored using the resetting procedure described above.

PRESSURE ON THE BUTTON	STATE OF CONTROL BOX
From 1 to 3 seconds	Reset of the control box without visualisation of the visual diagnostics.
More than 3 seconds	Visual diagnostics of the lockout condition: (LED blinks at 1-second intervals).
More than 3 seconds starting from the condition of visual diagnostics	Software diagnostics, with the help of optical interface and PC (possibility to visualise the working hours, irregularities, etc.)

Tab. I

The sequence of led pulses issued by the control box identifies the possible types of malfunction, which are listed in the table Tab. G.

8.2 Final checks (with burner operating)

➤ Block out the UV sensor and switch on the control devices:	➡	the burner should start and then go into lockout after about 10 seconds from the opening of the 1st stage working valve.
➤ Block out the UV sensor when the burner is operating:	➡	the flame should switch off within 1 sec., as also the repetition of the starting cycle and then the stopping of the burner.
➤ Switch off the TL control device and then the TS device when the burner is operating:	➡	the burner must stop.

Tab. J



Make sure that the mechanical locking systems on the various adjustment devices are fully tightened.

9 Maintenance

9.1 Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel shut-off valve.



Wait for the components in contact with heat sources to cool down completely.

9.2 Maintenance programme

9.2.1 Maintenance frequency



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

9.2.2 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

Carry out an analysis of the combustion flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

If the combustion values measured before starting maintenance do not comply with applicable Standards or do not indicate efficient combustion, consult the table below or contact our Technical Support Service to implement the necessary adjustments.

EN 267	Air excess		CO
	Max. output $\lambda \leq 1.2$	Min. output $\lambda \leq 1.3$	
Theoretical max CO ₂ 0 % O ₂	CO ₂ % Calibration		mg/kWh
	$\lambda = 1.2$	$\lambda = 1.3$	
15.2	12.6	11.5	≤ 100

Tab. K

Burner

Make sure that the screws are well secured.

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.

Nozzle

It is advisable to replace nozzles once a year during periodical maintenance.

Do not clean the nozzle openings.

Flexible hoses

Check to make sure that the hoses are still in good condition.

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.

Pump

Unusual noise must not be evident during pump operation.

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

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

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

9.2.3 Safety components

The safety components should be replaced at the end of their life cycle indicated in the following table.

The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

Safety component	Life cycle
Flame control	10 years or 250.000 operation cycles
Flame sensor	10 years or 250.000 operation cycles
Gas valves (solenoid)	10 years or 250.000 operation cycles
Pressure switches	10 years or 250.000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam)	10 years or 250.000 operation cycles
Oil valve (solenoid)	10 years or 250.000 operation cycles
Oil regulator	10 years or 250.000 operation cycles
Pipes/ oil fittings (metallic)	10 years
Fan impeller	10 years or 500.000 start-ups

Tab. L

9.3 Opening and closing the burner



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



Wait for the components in contact with heat sources to cool down completely.



Close the fuel shut-off valve.



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

10 Faults - Possible causes - Solutions



In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row. If the burner locks out for a third time, contact the customer service.



In the event there are further lockouts or faults with the burner, the maintenance interventions must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

SIGNAL	FAULTS	PROBABLE CAUSE	RECOMMENDED SOLUTION
No blink	The burner does not start	No electrical supply	Close all the switches - Check the fuses
		Limiter or safety control device is open	Adjust or replace
		Control box lockout	Reset the control box (not before 10 sec. after the lockout)
		The pump is jammed	Replace
		Incorrect electrical wiring	Check the connections
		Defective control box	Replace
		Defective electrical motor	Replace
		Capacitor of the motor defective	Replace
2 x blinks ● ●	After pre-purging and the safety time, the burner goes to lockout at the end of the safety time	No fuel in the tank; air sucked up	Fuel level too high or water on the bottom of the tank
		Head and air damper adjusted incorrectly	Adjust
		Light oil solenoid valves do not open (1st stage or safety)	Check the connections; replace the coil
		1st nozzle clogged, dirty or deformed	Replace
		The ignition electrodes are badly adjusted or dirty	Adjust or clean
		Electrode grounded due to broken insulation	Replace
		Faulty or grounded high voltage cable	Replace
		High voltage cable deformed by high temperatures	Replace and protect
		Ignition transformer defective	Replace
		Incorrect valve or transformer electrical wiring	Check
		Defective control box	Replace
		Pump not primed	Prime the pump and see "The pump does not prime"
		Motor/pump coupling broken	Replace
		Pump suction line pipe connected to the return line	Correct the connection
		The valves upstream from the pump are closed	Open them
		Dirty filters: piping - pump - nozzle	Clean
		Defective control box or flame sensor	Replace the sensor or control box
		Dirty flame sensor	Clean
		Operation of the 1st stage cylinder faulty	Replace the cylinder
		Motor lockout	Release the thermal relay
		Faulty motor remote control switch	Replace
		The electrical supply two-stage circuit breaker trips when the third phases are reconnected	Release the thermal relay
		Wrong motor rotation direction	Change the electrical wiring of the motor

4 x blinks ● ● ●	The burner turns on and then goes into lockout	Flame sensor short-circuit	Replace the sensor
		Light is getting in or else the flame is simulated	Eliminate the light or replace the control box
7 x blinks ● ● ● ● ● ● ●	Flame loss	Poorly adjusted head	Adjust
		The ignition electrodes are badly adjusted or dirty	Adjust them
		Fan air damper badly adjusted: excessive air	Adjust
		1st nozzle is too big (pulsations)	Reduce the flow rate of the 1st nozzle
		1st nozzle too small (flame loss)	Increase the flow rate of the 1st nozzle
		1st nozzle is dirty or deformed	Replace
		Inadequate pump pressure	Adjust it: between 10 - 14 bar
		1st nozzle not suitable for the burner or boiler	See Nozzles table, reduce the 1st stage nozzle
		1st stage nozzle defective	Replace
	Burner repeats starting cycle.	Dirty flame sensor	Clean
		Excess air	Reduce
	Insufficient fuel supply	Check whether the cause lies in the pump or the fuel supply system	Supply fuel to the burner from a tank near the burner
	Pump rusty on the inside	Water in the tank	Remove the water from the bottom of the tank with a separate pump
	Noisy pump, unstable pressure	Air entering the suction pipe Depression too high (more than 35 cm Hg)	Tighten the couplings
		Excessive difference of level between burner and tank	Feed burner with a loop circuit
		Piping diameter too small	Increase
		Suction filters dirty	Clean
		Suction valves closed	Open them
		The paraffin solidifies due to the low temperature	Put additive in the light oil
	Pump unprimes after prolonged pause	Return pipeline not immersed in the fuel	Bring it to the same height as the suction line
		Air in the suction line	Tighten the couplings
	The pump is losing light oil	Leak from sealing organ	Replace the pump
	Flame with smoke	Little air	Adjust the fan head and damper
	- dark Bacharach	Nozzle dirty or worn	Replace
		Nozzle filter clogged	Clean or replace
		Incorrect pump pressure	Adjust between 10 - 14 bar
		Flame stabiliser disk dirty, loose or deformed	Clean, tighten or replace
	- yellow Bacharach	Insufficient boiler room ventilation openings	Increase
		Excessive air	Adjust the fan head and damper
	Dirty combustion head	Nozzle or filter dirty	Replace
		Unsuitable nozzle delivery or angle	See recommended nozzles
		Loose nozzle	Tighten it
		Impurities on flame holder	Clean
		Incorrect head adjustment, or else not enough air	Adjust it, open the damper
		Blast tube length not suitable for the boiler	Contact the boiler manufacturer
10 blinks ● ● ● ● ● ● ● ●	The burner does not start and the lockout appears	Internal or connection error	
		Presence of electromagnetic interference radio interference	Use the protection kit

Tab. M

A Appendix - Accessories**Soundproofing box kit**

Burner	Type	dB(A)	Code
PRESS 200 T/N	C4/5	10	3010404

Self-cleaning filter kit

Burner		Code
PRESS 200 T/N	Diameter 1" 1/2 (60° E at 50°C)	3010022
	Thermostatic heater with LED	3010050
	Heater	3010061
	Thermostat (two-stage/modulating)	3010062

Extended head kit

Burner	Code
PRESS 200 T/N	20047317

Gas separator bottle

Burner	Code
PRESS 200 T/N	3010022

Heavy oil kit

Burner	Code
PRESS 200 T/N	3000721

Spacer kit

Burner	Code
PRESS 200 T/N	3000722

Heavy oil pre-circulation kit

Burner	Code
PRESS 200 T/N	3000749

PC interface kit

Burner	Code
PRESS 200 T/N	3002719

Protection kit (electromagnetic interferences)

Burner	Code
PRESS 200 T/N	3010386

**ATTENTION**

The installer is responsible for the addition of any safety device not foreseen in this manual.

B Appendix - Electrical panel layout

1	Index of layouts
2	Reference indication
A	Internal wiring diagram (carried out in factory)
B	Wiring connectors to the terminal board (carried out by the installer)

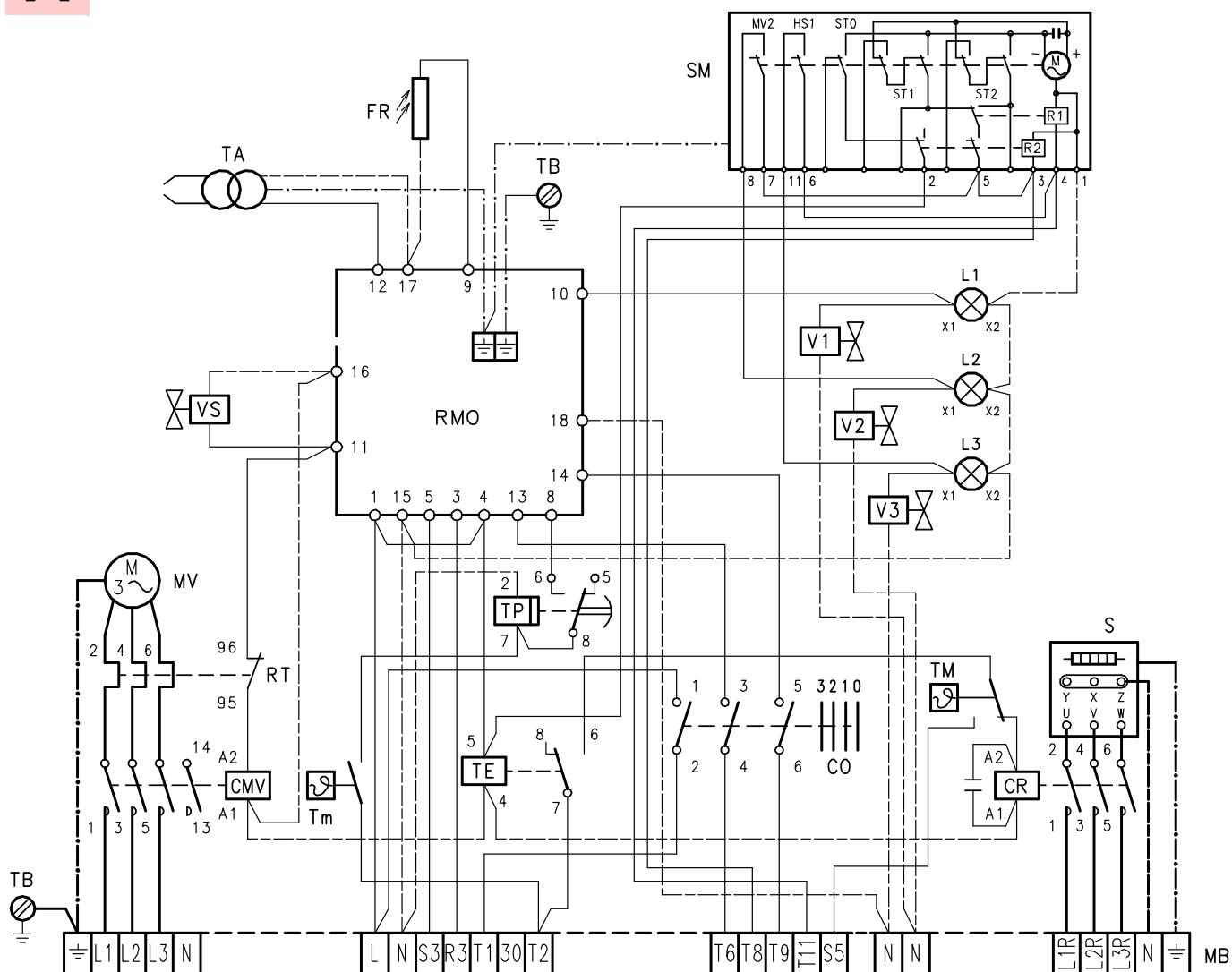
2Reference indication

Sheet no.

Coordinates

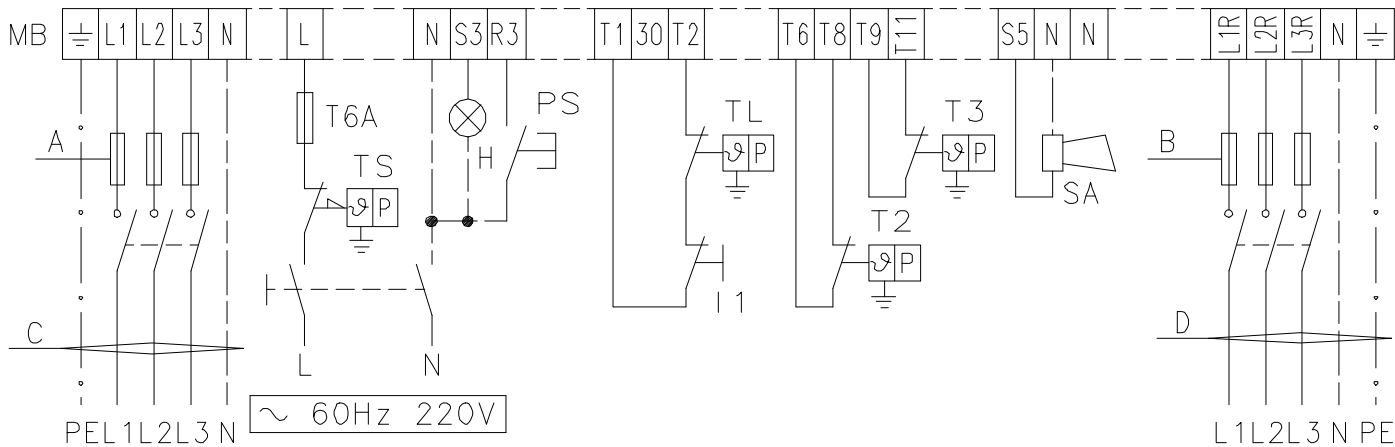
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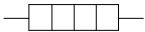
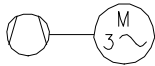
B

D2645



3 ~ 60Hz 380/220V
3 ~ 60Hz 220V

3 ~ 60Hz 380/220V
3 ~ 60Hz 220V



	220V	380V
A Ampere	T35	T25
B Ampere	T50	T35
C mm ²	4,0	2,5
D mm ²	10	6

WIRING DIAGRAM KEY (A)

CMV	Fan motor contact maker
CO	Commutator
CR	Resistor contact maker
FR	Flame sensor
MB	Burner terminal strip
MV	Fan motor
RMO	Control box
RT	Overload
S	Pre-heater tank
SM	Air-damper actuator
SO	Probe PT100
TA	Ignition transformer
TB	Burner earth
TE	Electronic thermostat
TM	Maximal thermostat
Tm	Minimal thermostat
TP	Timer
L1	Lamps for 1st stage
L2	Lamps for 2nd stage
L3	Lamps for 3rd stage
V1	Oil valves for 1st stage
V2	Oil valves for 2nd stage
V3	Oil valves for 3rd stage
VS	Safety valves

WIRING DIAGRAM KEY (B)

H	Remote lock-out signal
I1	Optional switch on-off burner
MB	Burner terminal strip
PS	Reset push - button
SA	High temperature oil alarm
TL	Limit control device system
TS	Safety control device system
T2	Load control system for 2nd stage
T3	Load control system for 3rd stage

The logo consists of the word "RIELLO" in a bold, red, sans-serif typeface.

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