

## Forced draught gas burner

One stage operation

CODE	MODEL	TYPE
20025106	FS5	564M



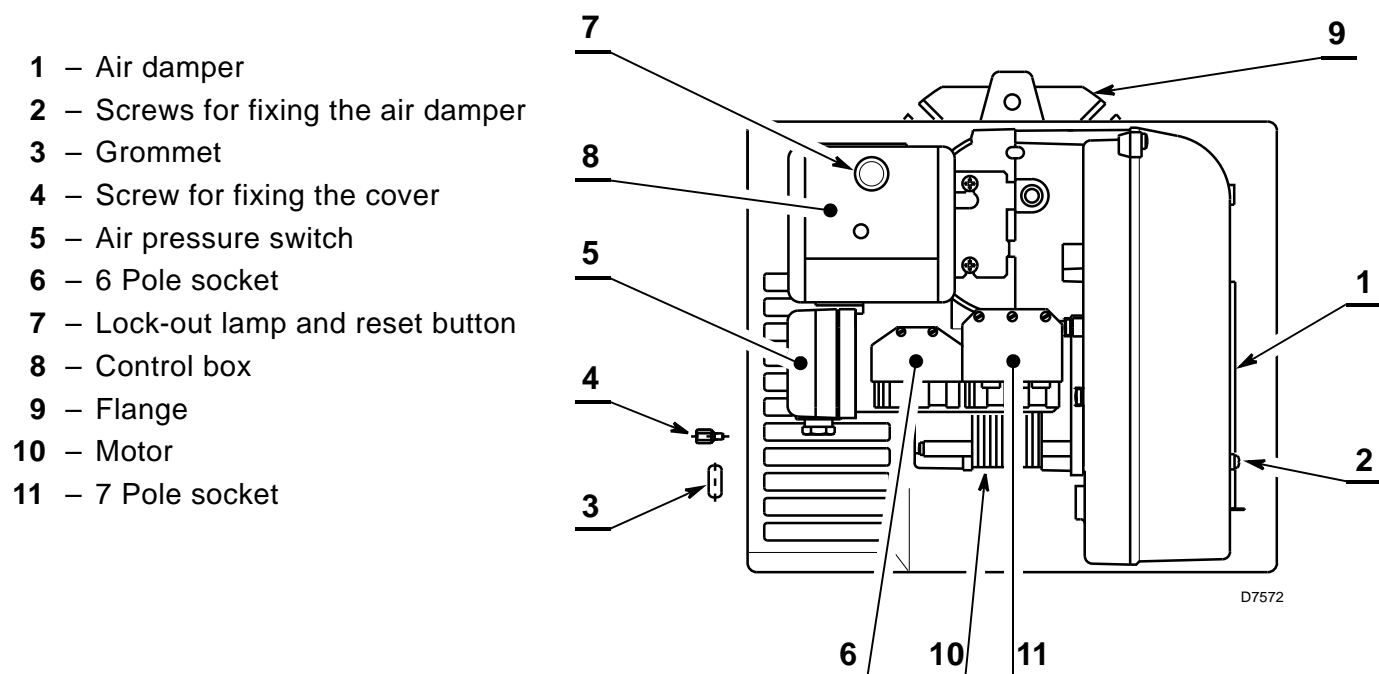
## TECHNICAL DATA

TYPE		564M
Thermal output		23 – 58 kW – 20,000 – 50,000 kcal/h
Gas (Family 2)	Net heat value	8 – 12 kWh/m <sup>3</sup> – 7,000 – 10,340 kcal/m <sup>3</sup>
	Pressure	min. 10 mbar – max. 40 mbar
Electrical supply		single phase, 230V ± 10% ~ 50Hz
Motor		230V / 0.65A
Capacitor		2 µF
Ignition transformer		primary 230V – secondary 15 kV
Absorbed electrical power		0.15 kW

## BURNER DESCRIPTION

- According to Directives: Electromagnetic Compatibility 89/336/EEC - 2004/108/EC, Low Voltage 73/23/EEC - 2006/95/EC and Machine 2006/42/EC.
- The burner meets protection level of IP X0D (IP 40), EN 60529.
- Gas train according to EN 676.

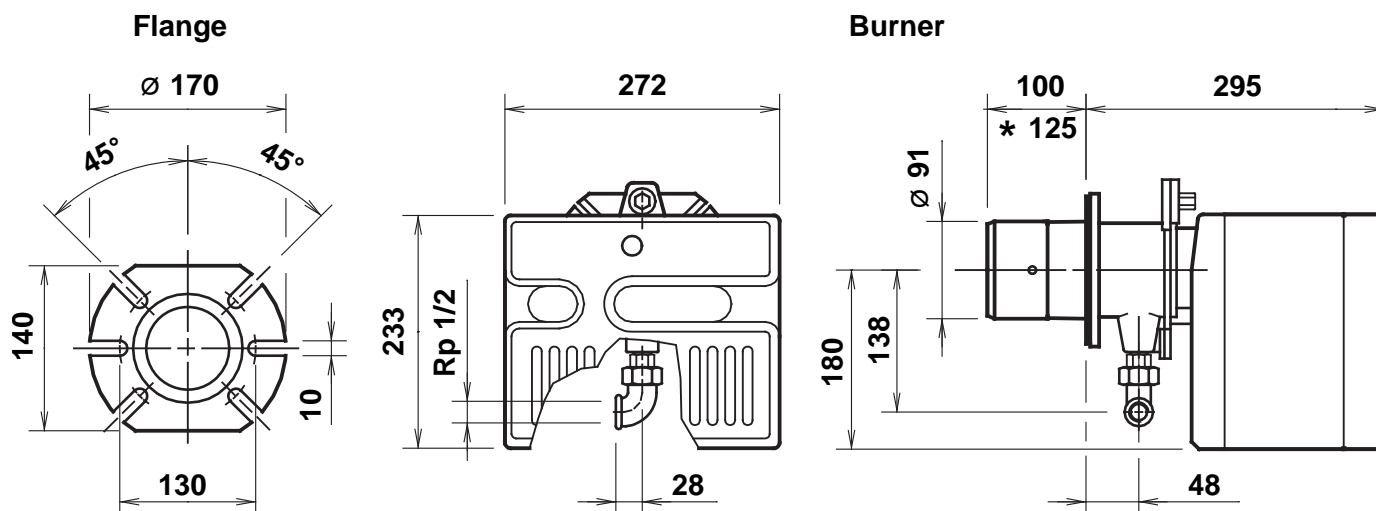
Fig. 1



## NOTES

- The grommet (3) supplied with the burner, must be fitted to the same side of the gas train.
- After having installed the burner verify the access to the fixing screws of the cover.  
 If necessary replace them with the fixing screws (4) fig. 1 supplied as equipment.

## OVERALL DIMENSIONS



\* Length available using an extended head kit.

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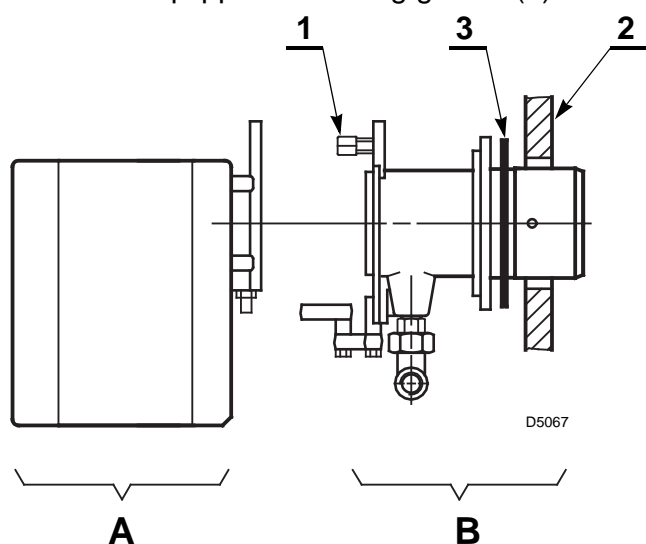
## BURNER EQUIPMENT

Quantity	Description
4	Screws with nuts
1	Insulating gasket
3	Screws for fixing the cover
1	Grommet
1	Hinge

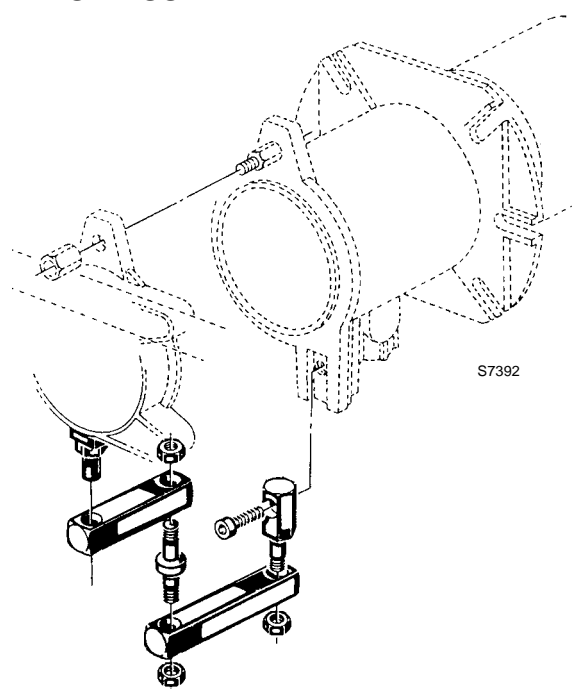
## BOILER FIXING

Separate the combustion-head assembly from the burner body by removing nut (1) and removing group (A).

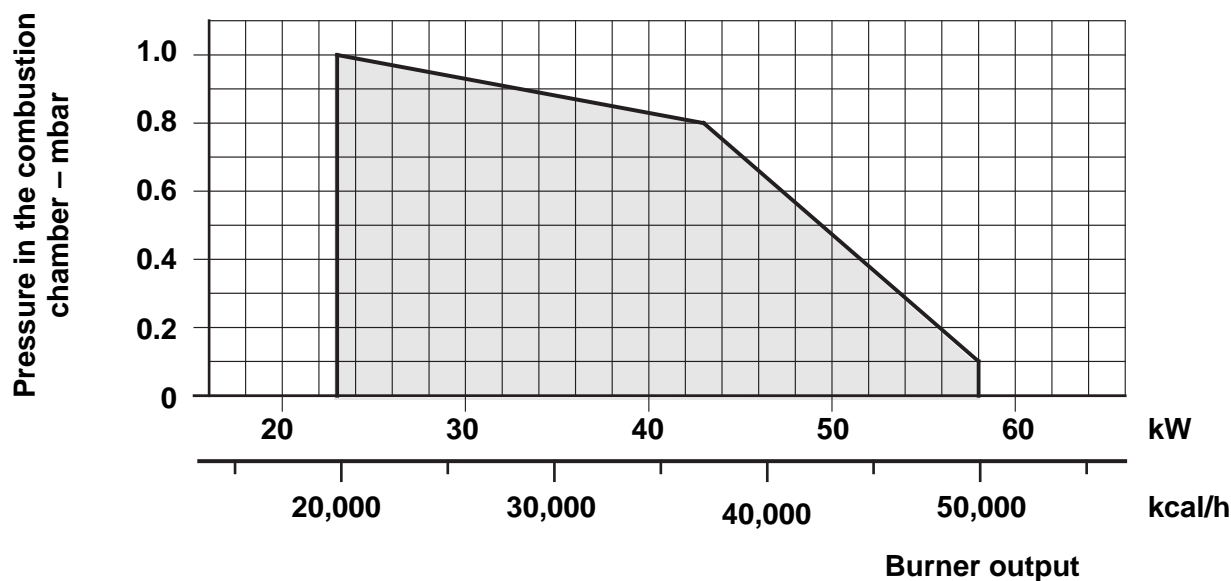
Fix the head assembly group (B) to the boiler (2) insert the equipped insulating gasket (3).



## HINGE ASSEMBLY



## FIRING RATE



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## TEST BOILER

The firing rate has been defined according to EN 676 standard.

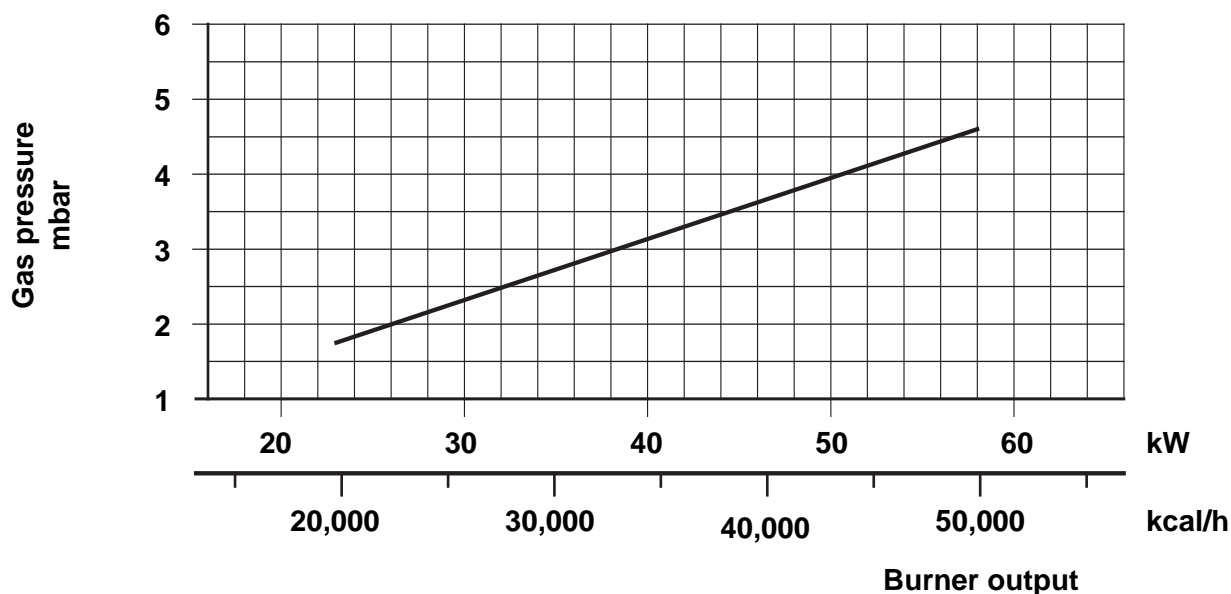
## COMMERCIAL BOILERS

The burner-boiler matching is assured if the boiler is according to EN 303 and the combustion chamber dimensions are similar to those shown in the diagram EN 676.

For applications where the boiler is not according to EN 303, or where the combustion chamber dimensions differ from those shown in EN 676, please consult the manufacturers.

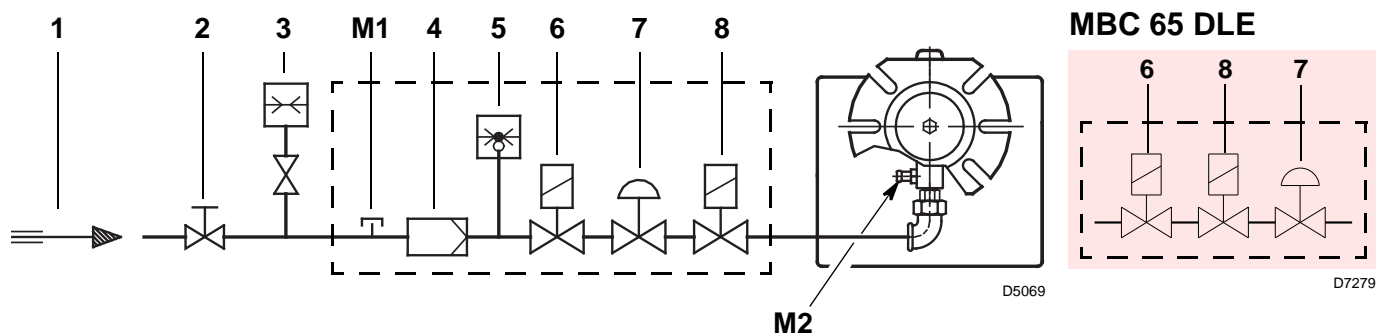
## CORRELATION BETWEEN GAS PRESSURE AND BURNER OUTPUT

To obtain the maximum output, a gas head pressure of 4.6 mbar is measured with the combustion chamber at 0 mbar using gas G20 with a net heat value of 10 kWh/m<sup>3</sup> (8,570 kcal/m<sup>3</sup>).



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## LINE OF GAS-SUPPLY



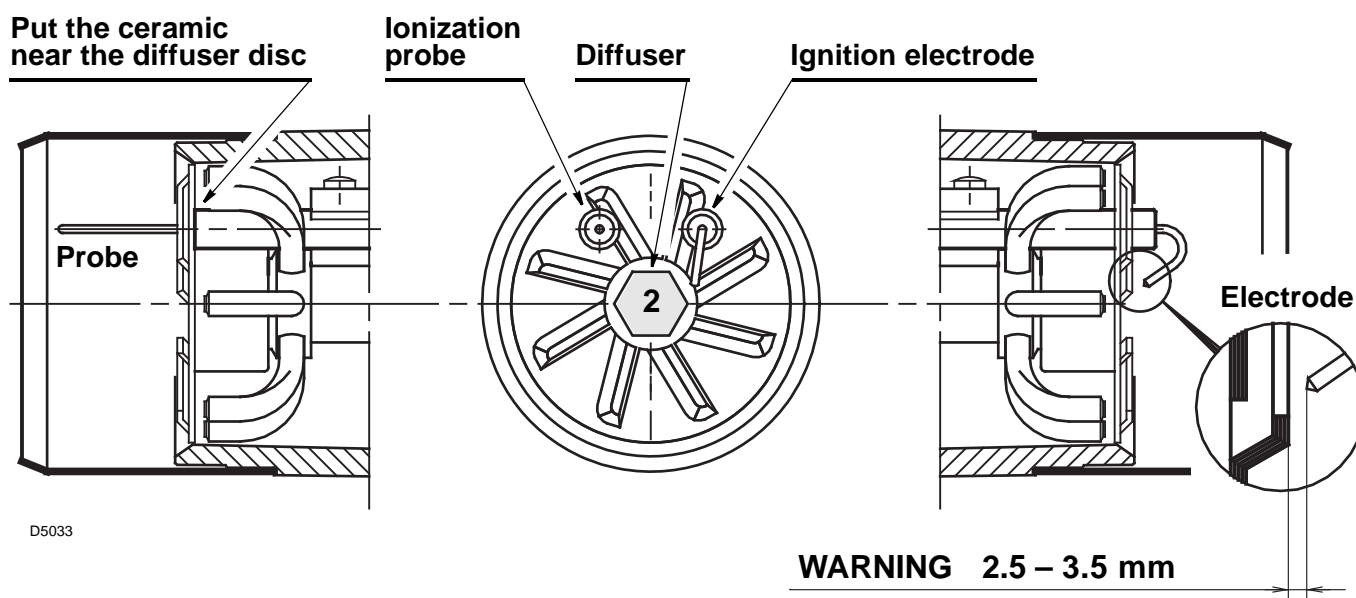
- |   |  |    |                                  |
|---|--|----|----------------------------------|
| 1 | – Gas supply pipe  | 7  | – Pressure governor              |
| 2 | – Manual cock ( <i>charged to the installer</i> )        | 8  | – Adjusting valve                |
| 3 | – Gas pressure gauge ( <i>charged to the installer</i> ) | M1 | – Gas-supply pressure test point |
| 4 | – Filter   | M2 | – Pressure coupling test point   |
| 5 | – Gas pressure switch                                    |    |                                  |
| 6 | – Safety valve   |    |                                  |

## GAS TRAIN ACCORDING TO EN 676

MULTIBLOC	CODE	CONNECTION		EMPLOY
		GAS TRAIN	BURNER	
MBC 65 DLE	3970569	Rp 1/2	Rp 1/2	Natural gas and LPG
MB DLE 405 B01	3970530	Rp 1/2	Rp 1/2	Natural gas and LPG

The gas train is supplied separately, for its adjustment see the enclosed instructions.

## POSITIONING ELECTRODE-PROBE



## IMPORTANT

Do not turn the starting electrode but leave it as shown in the drawing; if the starting electrode is put near the ionization probe, the amplifier of the control box might be damaged.

## ELECTRICAL CONNECTIONS



### NOTES

The electrical wirings must be carried out in conformity with the regulations in force in the countries of destination, and by qualified personnel.

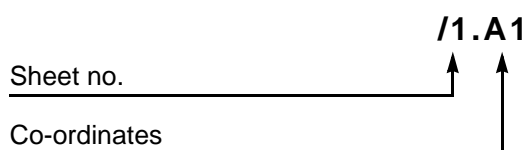
Riello S.p.A. cannot accept any responsibility for modifications or connections other than those shown in these diagrams.

Do not swap neutral and phase over, follow the diagram shown carefully and carry out a good earth connection.

The cross section of the wires must be at least 1 mm<sup>2</sup>. (*Unless requested otherwise by local standards and legislation*).

<b>1</b>	<b>INDEX</b>
<b>2</b>	Indication of references
<b>3</b>	Functional layout
<b>4</b>	Electrical wiring is the responsibility of the installation engineer

### 2 Indication of references



### KEY TO ELECTRICAL LAYOUT

<b>A</b>	– Electrical control box
<b>B4</b>	– Working signal
<b>+BB</b>	– Components on burners
<b>+BC</b>	– Components on boiler
<b>C</b>	– Motor capacitor
<b>E</b>	– Ignition electrode
<b>F1</b>	– Filter
<b>h1</b>	– Hour counter
<b>IN</b>	– Manual burner stop switch
<b>MV</b>	– Fan motor
<b>Q1</b>	– Single phase knife switch
<b>PA</b>	– Air pressure switch
<b>PG</b>	– Minimum gas pressure switch
<b>S3</b>	– Remote lock-out signal
<b>ION</b>	– Ionisation probe

<b>TA</b>	– Ignition transformer
<b>TB</b>	– Burner earth
<b>TL</b>	– Limit thermostat
<b>TS</b>	– Safety thermostat
<b>VR</b>	– Adjustment valve
<b>VS</b>	– Safety valve
<b>Y</b>	– Gas valve
<b>YVPS</b>	– Gas valve leak detection control device
<b>WF..</b>	– Filter connector
<b>WM</b>	– Motor connector
<b>WPA</b>	– Air pressure switch connector
<b>WS</b>	– Ionisation probe connector
<b>X6</b>	– 6-pole socket
<b>X7</b>	– 7-pole socket
<b>XP6</b>	– 6-pin plug
<b>XP7</b>	– 6-pin plug/socket





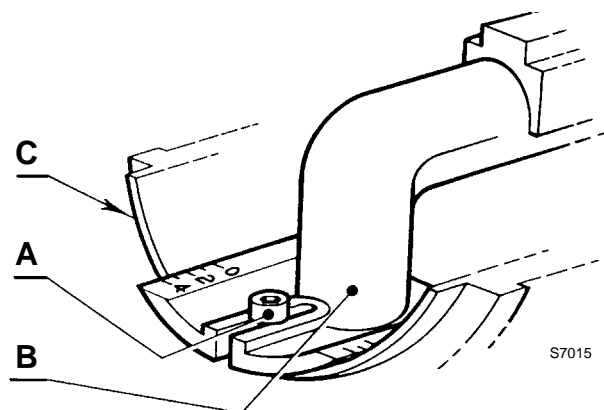


## COMBUSTION HEAD ADJUSTMENT

In conformity with Efficiency Directive 92/42/EEC the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and CO<sub>2</sub> concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.

Loose the screw (A), move the elbow (B) so that the rear plan of the coupling (C) coincides with the set point.

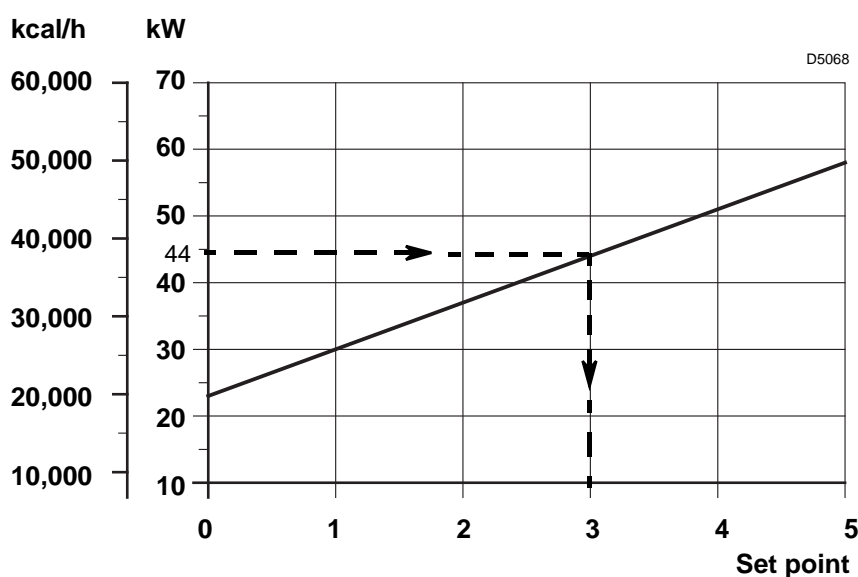
Tight the screw (A).



### Example:

The burner is installed on a 40 kW boiler with an efficiency of 90%, the burner input is about 44 kW using the diagram below, the combustion set point is 3.

The diagram is to be used only for initial settings, to improve air pressure switch operation or improve combustion, it may be necessary to reduce this setting (set point toward position 0).



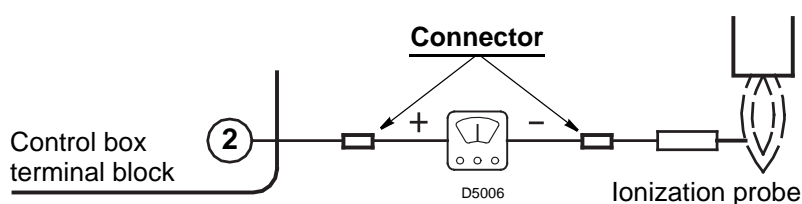
It is advisable to set the burner according to the type of gas used and following the indications of the table:

EN 676		AIR EXCESS: max. output $\lambda \leq 1.2$ – min. output $\lambda \leq 1.3$			
GAS	Theoretical max. CO <sub>2</sub> 0 % O <sub>2</sub>	Setting CO <sub>2</sub> %		CO mg/kWh	NO <sub>x</sub> mg/kWh
		$\lambda = 1.2$	$\lambda = 1.3$		
G 20	11.7	9.7	9.0	$\leq 100$	$\leq 170$
G 25	11.5	9.5	8.8	$\leq 100$	$\leq 170$
G 30	14.0	11.6	10.7	$\leq 100$	$\leq 230$
G 31	13.7	11.4	10.5	$\leq 100$	$\leq 230$

## IONIZATION CURRENT

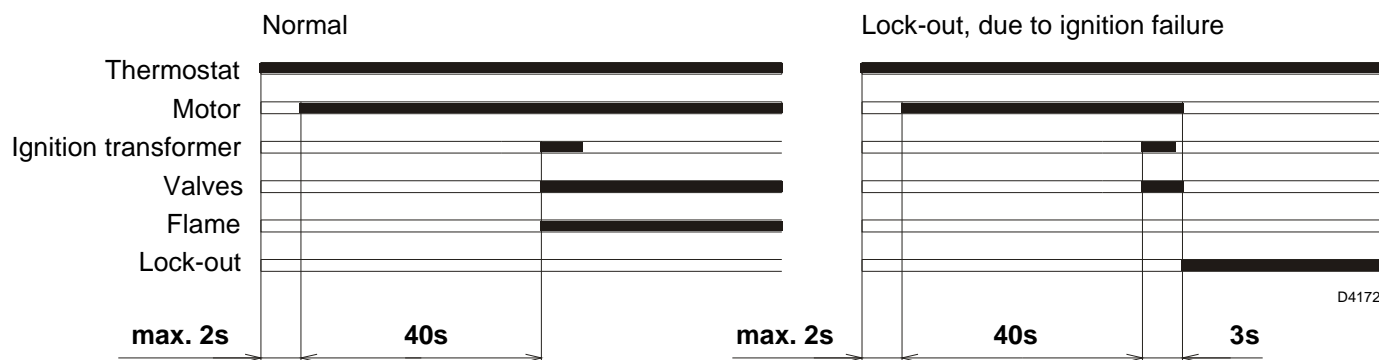
The minimum current required by the control box is 5  $\mu$ A.

The burner would normally have a higher current value than this, but if a check is required, open the connector fitted in the red probe lead and insert a microammeter as shown.



The air pressure switch is set after all other adjustments have been made. Begin with the switch at the lowest setting. With the burner function at the required power, turn the knob slowly in a clockwise direction until burner lockout. Then turn the knob anticlockwise to an extent that is around 20% of the adjusted value and then check that the burner starts up properly. If the burner locks out again turn the knob slightly in an anticlockwise direction.

In conformity with the standard, the air pressure switch must prevent the air pressure falling below 80% of the adjusted value and the CO in the flue gases exceeding 1% (10,000 ppm). To check this, insert a combustion analyser in the flue, slowly reduce the burner air setting (for example with a piece of cardboard) and verify that the burner locks out before the CO value in the flue gases exceeds 1%.



When flame-failure occurs during working, shut down takes place within one second.

During start-up, indication is according to the followin table:

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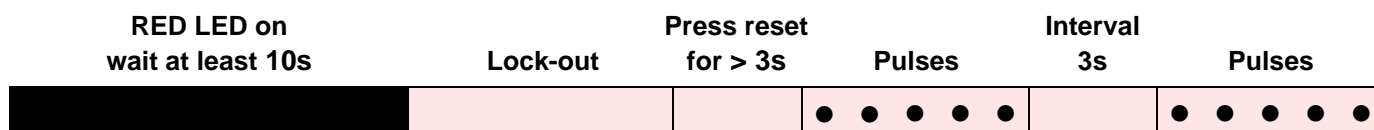
## RESETTING THE CONTROL BOX AND USING DIAGNOSTICS

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.



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

### 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.

### VISUAL DIAGNOSTICS

Indicates the type of burner malfunction causing lock-out.

To view diagnostics, proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lock-out) 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, indicated in the table below.

### SOFTWARE DIAGNOSTICS

Reports the life of the burner 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 lock-out) 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 lock-out 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 below.

SIGNAL	PROBABLE CAUSE
2 pulses ● ●	The flame does not stabilise at the end of the safety time: – faulty ionisation probe; – faulty or soiled gas valves; – neutral/phase exchange; – faulty ignition transformer – poor burner regulation (insufficient gas).
3 pulses ● ● ●	Minimum air pressure switch does not close: – make sure VPS trips to produce lockout; – air pressure switch faulty; – air pressure switch incorrectly regulated; – fan motor does not run; – maximum air pressure switch operating.
4 pulses ● ● ● ●	Min. air pressure switch does not open or light in the chamber before firing: – air pressure switch faulty; – air pressure switch incorrectly regulated.
7 pulses ● ● ● ● ● ● ●	Loss of flame during operations: – poor burner regulation (insufficient gas); – faulty or soiled gas valves; – short circuit between ionisation probe and earth.
10 pulses ● ● ● ● ● ● ● ● ● ● ● ●	– Wiring error or internal fault.

## MAINTENANCE

**Before cleaning or performing checks, switch off the burner's power supply with the system's master switch and close the gas shutoff valve.**

The burner requires periodic maintenance carried out by a qualified and authorised technician in conformity with legislation and local standards.

Periodic maintenance is essential for the reliability of the burner, avoiding the excessive consumption of fuel and consequent pollution.

### THE BASIC OPERATIONS ARE:

- Checking that there are no obstructions or kinks in the supply or return oil pipes, in the air intake regions and the combustion product discharge tubes.
- Checking that the burner and gas train electrical connections are correct.
- Checking that the gas train is suitable for the burner's power, the type of gas used and the mains gas pressure.
- Checking the proper positioning of the combustion head and its fixing to the boiler.
- Checking the proper positioning of the air damper.
- Checking the proper positioning of the ionisation probe and electrode.
- Checking the adjustment of the air pressure switch and the gas pressure switch.

Let the burner work at full speed for approximately ten minutes, correctly adjusting all the elements indicated in this manual. **Then carry out the analysis of the scale combustion by checking:**

- Percentage of CO<sub>2</sub> (%);
- CO Content (ppm);
- NOx content (ppm);
- Ionisation current (μA);
- Flue gases temperature at the flue.

## FAULTS / SOLUTIONS

Here below you can find some causes and the possible solutions for some problems that could cause a failure to start or a bad working of the burner. A fault usually makes the lock-out lamp light which is situated inside the reset button of the control box (9, fig. 1, page 1).

When lock out lamp lights the burner will attempt to light only after pushing the reset button. After this if the burner functions correctly, the lock-out can be attributed to a temporary fault.

If however the lock out continues the cause must be determined and the solution found.

### BURNER STARTING DIFFICULTIES

Signal	Problem	Possible cause	Recommended remedy
2 blinks ● ●	Once the pre-purging phase and safety time have passed, the burner goes into lockout without the appearance of the flame	1 - The operation solenoid lets little gas . through	Increase
		2 - One of the two solenoid valves does not open.	Replace
		3 - Gas pressure too low . . . . .	Increase pressure at governor
		4 - Ignition electrode incorrectly adjusted	Adjust
		5 - Electrode grounded due to broken . . insulation	Replace
		6 - High voltage cable defective . . . . .	Replace
		7 - High voltage cable deformed by high temperature	Replace and protect
		8 - Ignition transformer defective . . . . .	Replace
		9 - Incorrect valve or transformer . . . . . electrical wiring	Check
		10 - Defective control box . . . . .	Replace
		11 - A closed valve upline the gas train . .	Open
		12 - Air in pipework . . . . .	Bleed air
		13 - Gas valves unconnected or with . . . interrupted coil	Check connections or replace coil
3 blinks ● ● ●	The burner does not switch on, and the lockout appears	14 - Air pressure switch in operating position	Adjust or replace
	The burner switches on, but then stops in lockout	- Air pressure switch inoperative due to insufficient air pressure:	
		15 - Air pressure switch incorrectly adjusted.	Adjust or replace
		16 - Pressure switch pressure test point . pipe blocked	Clean
		17 - Poorly adjusted head . . . . .	Adjust
		18 - High pressure in the furnace . . . . .	Connect air pressure switch to fan suction line
	Lockout during pre-purging phase	19 - Defective motor control contactor . . . (only three-phase version)	Replace
		20 - Defective electrical motor . . . . .	Replace
		21 - Motor lockout (defective electrical motor)	Replace
4 pulses ● ● ● ●	The burner switches on, but then stops in lockout	22 - Flame simulation . . . . .	Replace the control box
	Lockout when burner stops	23 - Permanent flame in the combustion . head or flame simulation	Eliminate persistence of flame or replace control box

Signal	Problem	Possible cause	Recommended remedy
7 blinks ● ● ● ● ● ● ●	The burner goes into lockout immediately following the appearance of the flame	24 - The operation solenoid lets little gas . through 25 - Ionisation probe incorrectly adjusted. 26 - Insufficient ionisation (less than 5 A). 27 - Earth probe . . . . . 28 - Burner poorly grounded. . . . . 29 - Phase and neutral connections inverted 30 - Defective flame detection circuit . . . .	Increase  Adjust Check probe position Withdraw or replace cable Check grounding Invert them  Replace the control box
	Burner goes into lockout during operation	31 - Probe or ionisation cable grounded. .	Replace worn parts
10 blinks ● ● ● ● ● ● ● ● ● ●	The burner does not switch on, and the lockout appears	32 - Incorrect electrical wiring. . . . .	Check
	The burner goes into lockout	33 - Defective control box. . . . . 34 - Presence of electromagnetic . . . . . disturbances in the thermostat lines	Replace Filter or eliminate
No blink	The burner does not start	35 - No electrical power supply . . . . .	Close all switches - Check connections
		36 - A limiter or safety control device is open	Adjust or replace
		37 - Line fuse blocked . . . . .	Replace
		38 - Defective control box. . . . .	Replace
		39 - No gas supply . . . . .	Open the manual valves between contactor and train
	The burner continues to repeat the start-up cycle, without lockout	40 - Mains gas pressure insufficient. . . . .	Contact your GAS COMPANY
		41 - Minimum gas pressure switch fails to close	Adjust or replace
	Ignition with pulsations	42 - The gas pressure in the gas mains lies very close to the value to which the minimum gas pressure switch has been set. The sudden drop in pressure after valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the ignition cycle is repeated. And so on	Reduce the minimum gas pressure switch intervention pressure. Replace the gas filter cartridge.
		43 - Poorly adjusted head. . . . .	Adjust
		44 - Ignition electrode incorrectly adjusted	Adjust
		45 - Incorrectly adjusted fan air damper: too much air	Adjust
		46 - Output during ignition phase is too high	Reduce

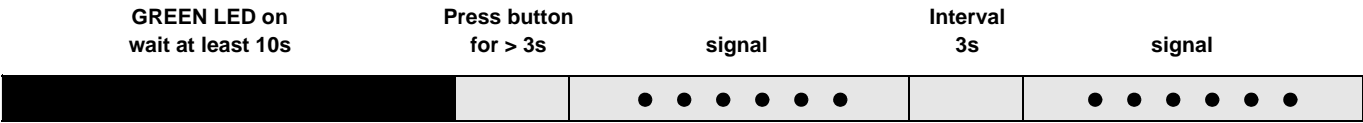
**N.B.:** If problems still occur after all of the above checks have been made, check the electrical connections on the plug and sockets, the damper and burner motor, gas control wiring ignition transformer and external interlocks, if the burner still fails to function, replace the control box.

**NORMAL OPERATION / FLAME DETECTION TIME**

The control box has a further function to guarantee the correct burner operation (signal: **GREEN LED** permanently on).

To use this function, wait at least ten seconds from the burner ignition and then press the control box button for a minimum of 3 seconds.

After releasing the button, the GREEN LED starts flashing as shown in the figure below.



The pulses of the LED constitute a signal spaced by approximately 3 seconds. The number of pulses will measure the probe DETECTION TIME since the opening of gas valves, according to the following table:

SIGNAL	FLAME DETECTION TIME
1 blink ●	0.4s
2 blinks ● ●	0.8s
6 blinks ● ● ● ● ● ●	2.8s

This is updated in every burner start-up. Once read, the burner repeats the start-up cycle by briefly pressing the control box button.

**WARNING**

If the result is > 2s, ignition will be retarded. Check the adjustment of the hydraulic brake of the gas valve, the air damper and the combustion head adjustment.

**KIT INTERFACE ADAPTER RMG TO PC Code 3002719**



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## WARNINGS AND SAFETY

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.

You are therefore advised to consult the Technical Assistance Department before choosing this type of burner for the combination with a boiler. Qualified personnel are those with the professional and technical requirements indicated by law no. 46 dated March 5, 1990.

The commercial organisation has a widespread network of agencies and technical offices whose personnel participates periodically in instructional and refresher courses at the Company Training centre.

This burner must only be used for the purposes it has specifically been designed for.

All contractual and other liability on the part of the manufacturer is excluded for injury caused to people, animals or damage caused to property due to faulty installation, adjustment, maintenance or improper use.

### BURNER IDENTIFICATION

The Identification Plate on the product gives the serial number, model and main technical and performance data. Tampering with, removal or absence of the Identification Plate will mean it is not possible to identify the product with certainty and therefore make any installation or maintenance difficult and/or dangerous.

### BASIC SAFETY MEASURES

- The control box may not be used by children or inexperienced people.
- Under no circumstances may intake grilles or heat dissipation grilles or the ventilation openings in rooms where the control box is installed be plugged with rags, paper or anything else.
- No attempt must be made to repair the control box by non-authorised personnel.
- It is dangerous to twist or pull the electrical cables.
- Under no circumstances must any attempt be made to carry out any cleaning operations before unplugging the control box from the electrical supply.
- Do not clean the control box or any of its parts with substances that can easily catch fire (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not rest anything on the burner.
- Do not plug or reduce the size of the ventilation openings in the room where the generator is installed.
- Do not leave containers and inflammable substances in the room where the control box is installed.

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## WARNINGS TO AVOID BURNOUT OR BAD COMBUSTION OF THE BURNER

- 1 – When the burner is stopped, the flue must stay open and effect a natural draught in the combustion chamber. If the smoke pipe is closed, the burner must be drawn back till the extraction of blast pipe from the furnace. Before operating in this way take the voltage off.
- 2 – The premises the burner operates in must have same openings to allow the air necessary for combustion to pass through. To be sure about this, you have to control CO<sub>2</sub> and CO in the exhaust gases with all the windows and doors closed.
- 3 – If there are air intakes in the premises the burner works in make sure there are intakes big enough to ensure the change required; in any case, check that when the burner stops the extractors do not draw hot fumes from pipes through the burner.





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

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