

# Forced draught gas burner

Code	Model	Type
3752182	GAS 3/2	521T80

## 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: Forced draught gas burner  
Model: GAS 3/2

These products are in compliance with the following Technical Standards:

EN 676

EN 12100

and according to the European Directives:

MD	2006/42/EC	Machine Directive
LVD	2006/95/EC	Low Voltage Directive
EMC	2004/108/EC	Electromagnetic Compatibility

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

Legnago, 22.02.2010

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



## TECHNICAL DATA

Thermal output	2 <sup>nd</sup> stage 130 - 340 kW - 112.000 - 292.000 kcal/h
Operation	Two stages, high and low flame
Fuel	Natural gas Pci 8 - 10 kWh/m <sup>3</sup> = 7000 - 8600 kcal/m <sup>3</sup>
Minimum gas pressure	For maximum output 11.1 mbar are needed measured at the coupling with nil pressure in the combustion chamber and gas with calorific value of 8600 kcal/m <sup>3</sup>
Maximum gas pressure	150 mbar
Electrical supply	Single phase 220 V + 10% - 10% ~ 60Hz
Motor	1.85A / 220V
Capacitor	6.3 µF
Ignition transformer	Primary: 1.8A / 220V - Secondary: 1 x 8 kV - 30 mA
Absorbed electrical power	0.4 kW

## BURNER DESCRIPTION

- 1 – Air damper controlling motor
- 2 – Control box re-set button
- 3 – Fair leads
- 4 – Wiring terminal block
- 5 – Air pressure switch
- 6 – Gas pressure test-point

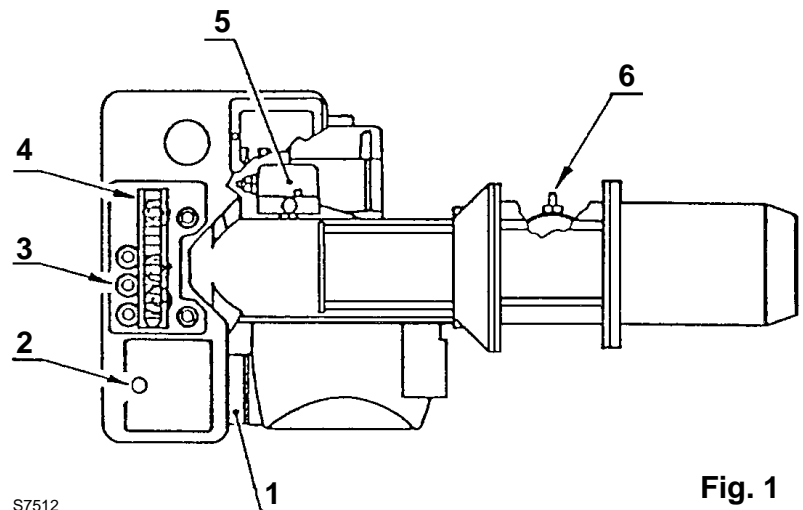
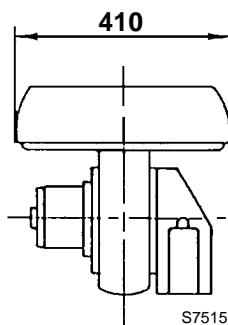
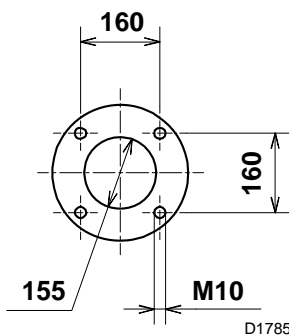


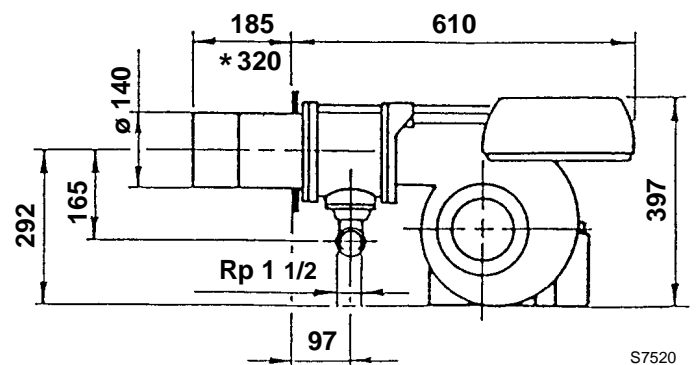
Fig. 1

## OVERALL DIMENSIONS

### Boiler front-plate drilling



### Burner



\*Length available with special blast tube to be separately required.

## STANDARDS EQUIPMENT

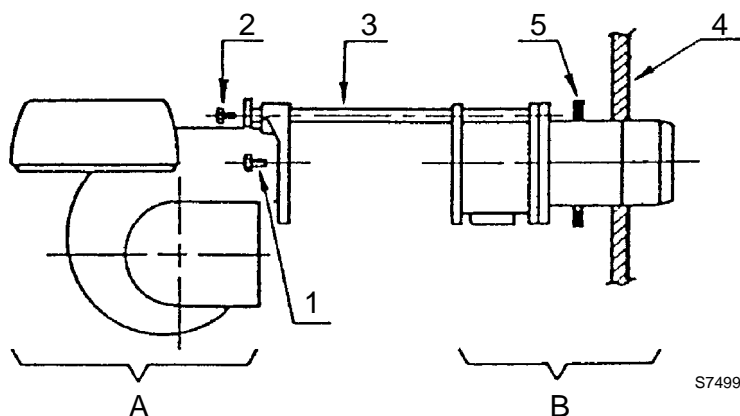
Quantity	Description
1	Flange
1	Gasket
8	Screws
1	Flange gasket

## ACCESSORIES

### • RADIO DISTURBANCE PROTECTION KIT code 3010386

If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the control box and the burner.

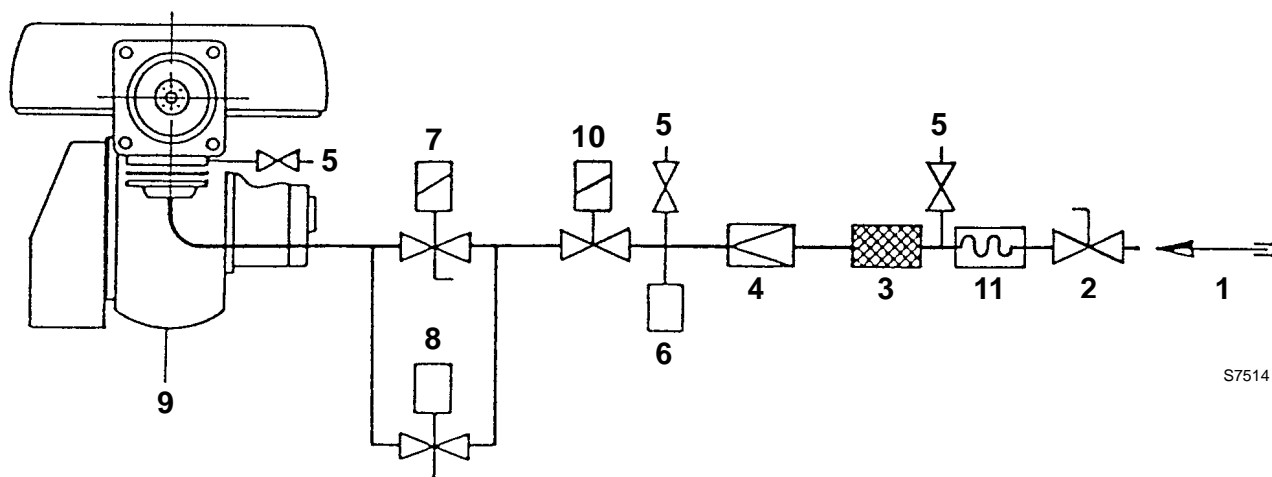
## FIXING TO THE BOILER



Separate the combustion head from the burner body by loosening the screws 1) and 2) and withdrawing the group A) from the holding bars 3).

Fix the group B) to the boiler front plate 4) using the gasket 5) provided as accessory.

## GAS SUPPLY



1 - Gas pipe line

2 - Cock valve

3 - Filter

4 - Pressure stabilizer

5 - Pressure test-point

6 - Minimal gas pressure switch

7 - 1<sup>st</sup> stage gas shut off valve

8 - 2<sup>nd</sup> stage gas shut off valve

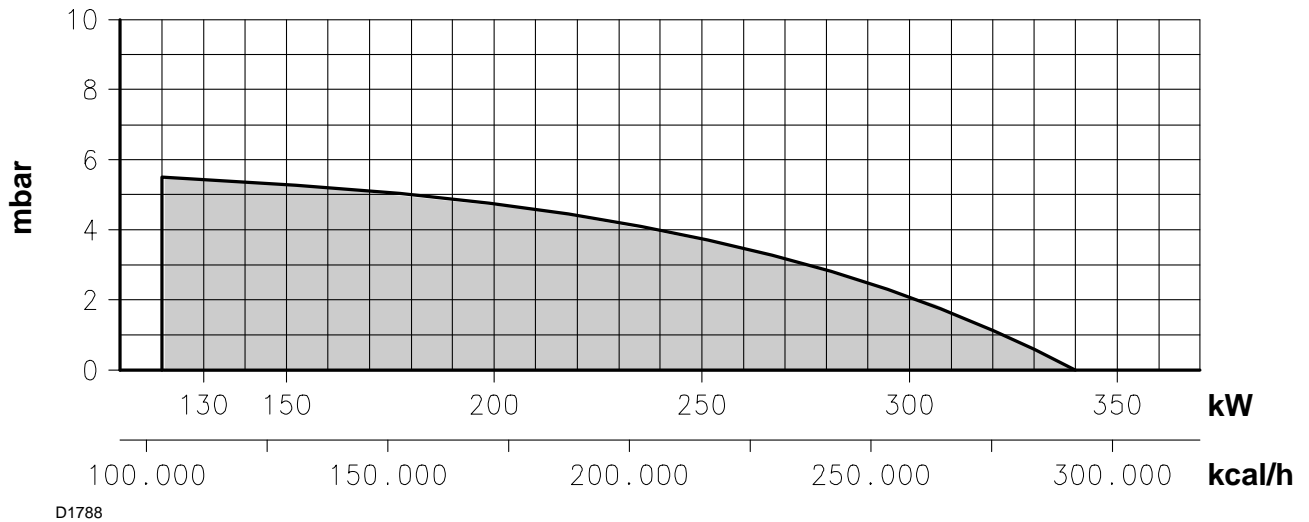
9 - Burner

10 - Gas safety shut off valve

11 - Isolator joint

## WORKING RANGE

### COMBUSTION CHAMBER PRESSURE 2<sup>nd</sup> STAGE OUTPUT (in compliance with DIN 4788)



Min. output at 1<sup>st</sup> stage: 80 kW - 69.000 kcal/h.

### MINIMUM GAS PRESSURE - OUTPUT

**Pressure:** detected at the pressure test-point 6) (fig. 1) with nil mbar into the combustion chamber. Should the combustion chamber be pressurized, the pressure necessary will be that of the graph plus the pressurization value.

**Example:** to obtain 270 kW it is necessary a gas pressure of 8 mbar and the combustion head set as indicated at page 7.

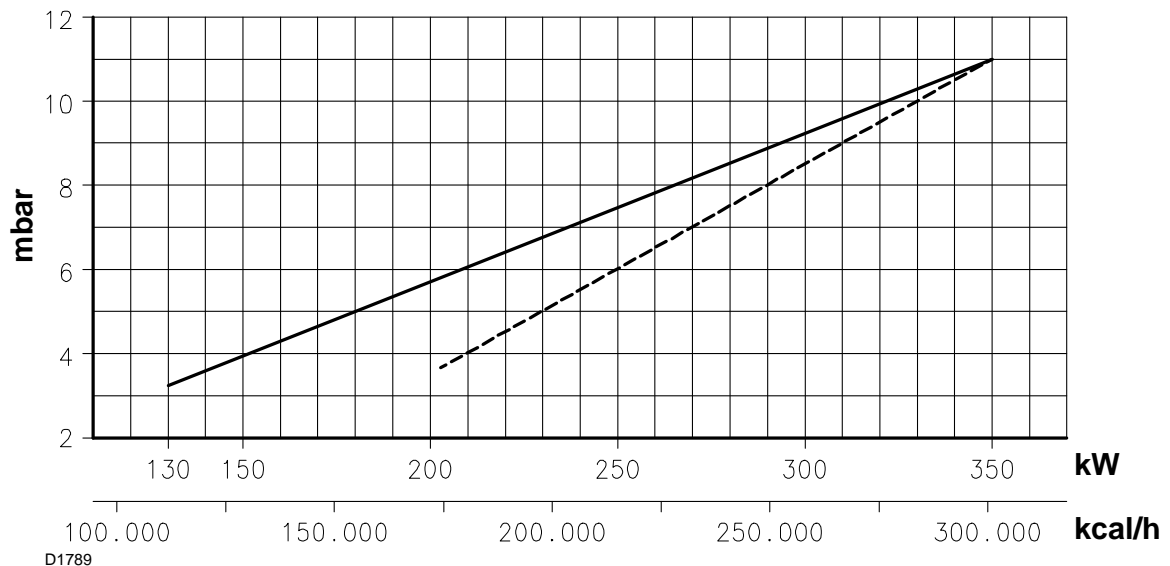
If the combustion chamber is pressurized at 2 mbar, the pressure detected at the test-point 6) is:  $8 + 2 = 10$  mbar.

If this value is too high, for very low gas pipework pressures, the gas gear 6) (page 7) could be more open.

Do not decrease the pressure at the coupling under the values shown in the diagram.

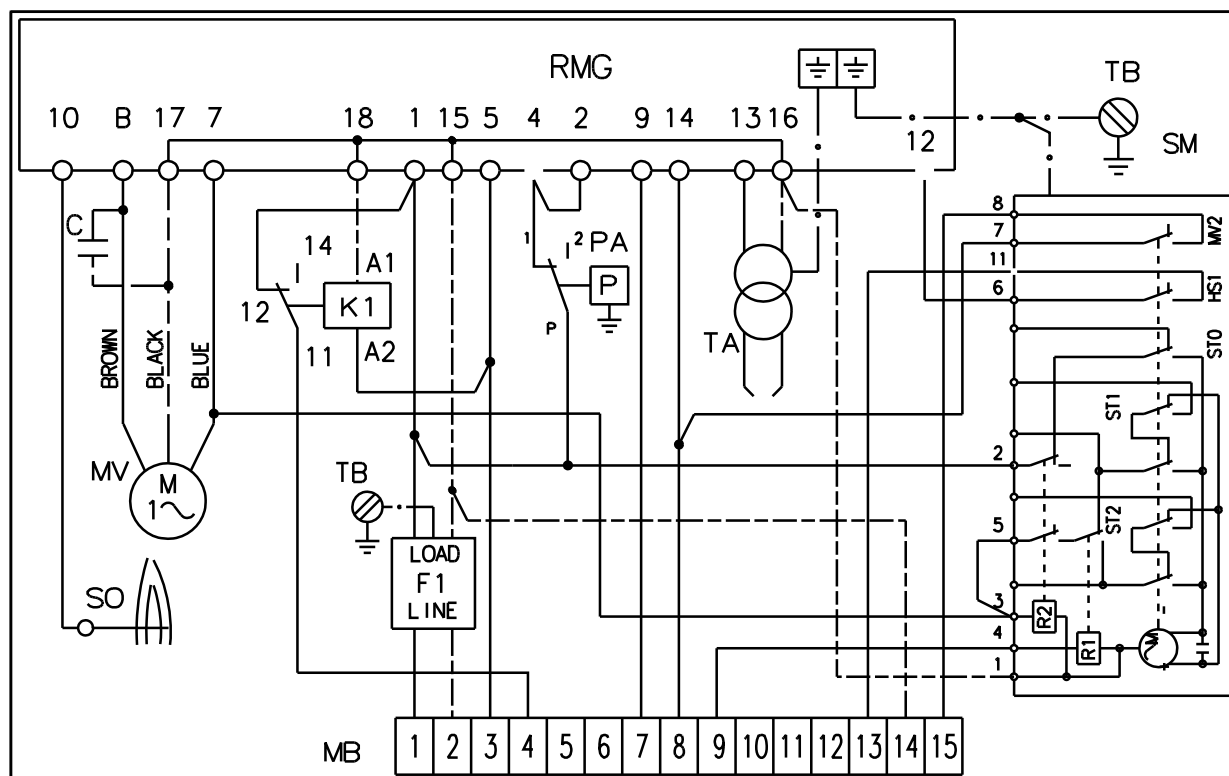
**Output:** the maximum value is obtainable with gas Pci 8600 kcal/m<sup>3</sup>.

### CORRELATION BETWEEN GAS PRESSURE AND BURNER OUTPUT



## BURNER ELECTRICAL WIRING

(carried out in the factory)



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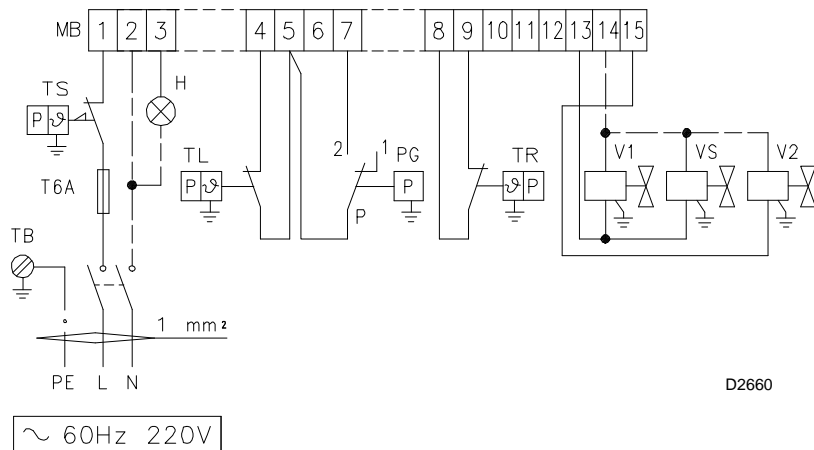
- C** Capacitor
- F1** Protection against radio interference
- K1** Relay
- MB** Burner terminal strip
- MV** Fan motor
- PA** Air pressure switch
- RMG** Control box
- SO** Ionisation probe
- SM** Servomotor
- TA** Ignition transformer
- TB** Burner earth

### ATTENTION

In the case of phase-phase feed, a bridge must be fitted on the control box terminal board between terminal 6 and the earth terminal.

# ELECTRICAL CONNECTIONS TO THE WIRING TERMINAL BLOCK

(to be carried out by the installer)



- H** Remote lock-out signal
- MB** Burner terminal strip
- PG** Minimum gas pressure switch
- TB** Burner earth
- TL** Limit control device system
- TR** High-low mode load control system
- TS** Safety control device system
- VS** Gas safety shut off valve
- V1** 1° stage gas shut off valve
- V2** 2° stage gas shut off valve

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## NOTICE

- The electric wiring carried out by the installer must be in compliance with the rules in force in the Country.
- Leads minimal section 1 mm<sup>2</sup>.
- Burners with non-stop operation. For safety reasons, this type of burner must be stopped every 24 hours of operation, by means of an hours-counter to be connected in series with the adjustment devices.

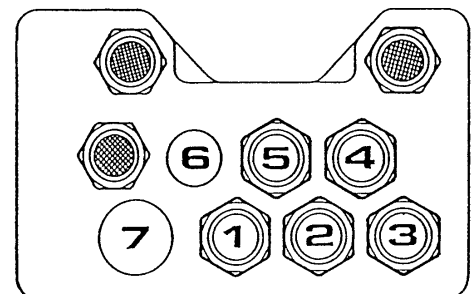
## FLAME MODULATION

The flame modulation is obtainable through the thermostat, controlling the second valve, connected to the terminals 8 and 9.

## FIXING OF THE ELECTRICAL WIRES

All the electrical wires, which are to be connected to the terminal block 4) (fig. 1) shall pass through the fair leads 3) (fig. 1) as for this scheme.

- |              |                                    |                                     |
|--------------|------------------------------------|-------------------------------------|
| <b>1</b>     | - Single phase supply              | : fair lead Pg 13.5                 |
| <b>2</b>     | - Adjustment thermostat            | : fair lead Pg 13.5                 |
| <b>3</b>     | - Safety thermostat                | : fair lead Pg 13.5                 |
| <b>4</b>     | - Gas train                        | : fair lead Pg 13.5,<br>sheath ø 13 |
| <b>5</b>     | - 2 <sup>nd</sup> stage thermostat | : fair lead Pg 13.5                 |
| <b>6 / 7</b> | - Pre-sheared holes                |                                     |



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Further prospective signals or controls can be connected to the burner wiring terminal board by removing the metal weldnuts from the pre-sheared holes and inserting a common fair lead for the passage and the clamping of the leads.

## NOTES

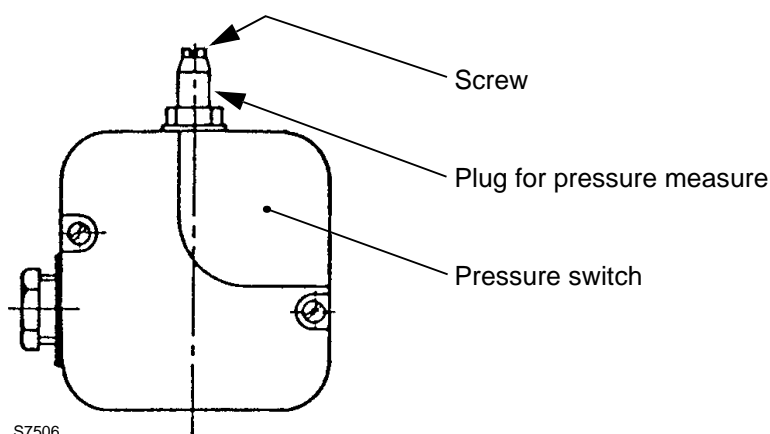
- Do not exchange the neutral wire with the phase (avoid the plug-pin connection).
- Carry out a safe earth connection.
- Check the stop of the burner, by opening the boiler thermostat and the burner lock-out, by disconnecting the lead from the flame probe.

## WARNING

When closing the burner on its slide-bars, pull towards the outside the high voltage cable and the cable of the flame detection probe, till to little tension.

## BURNER START-UP CYCLE

**Air-purge:** loosen the screw placed on the minimal gas pressure switch mounted on the gas train.

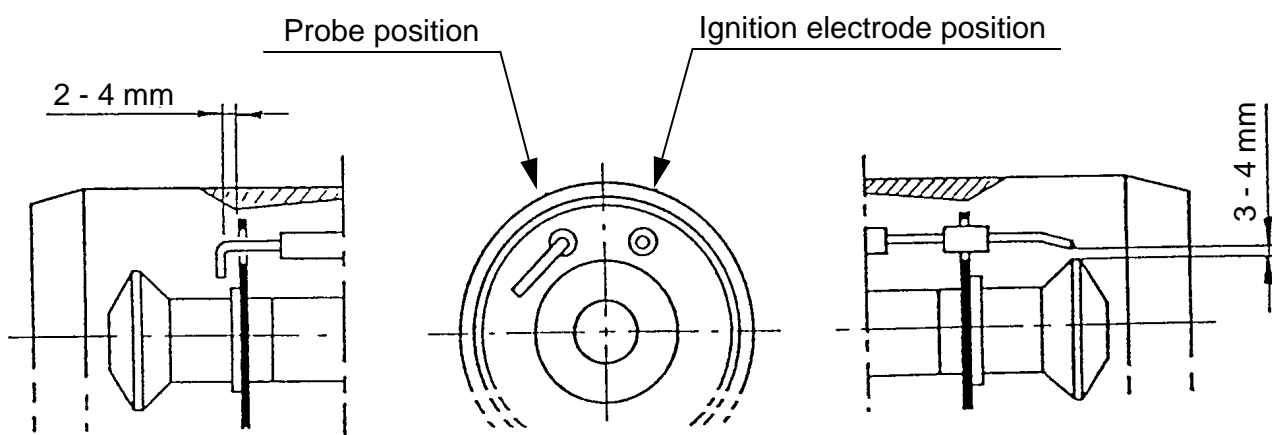
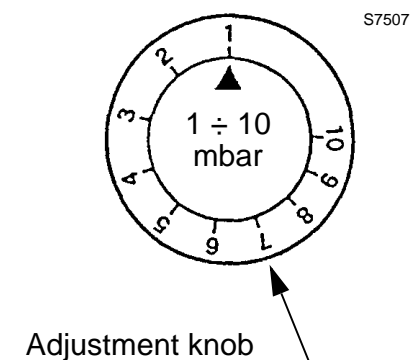


### AIR PRESSURE SWITCH 5) (fig.1)

The air pressure switch setting shall be carried out after having set all other adjustments of the burner and the air pressure switch shall be at its lowest set-point.

When the burner is operating, increase the adjustment pressure by turning - slowly - clockwise the knob till reaching the burner lock-out.

Thereafter, turn the knob anticlockwise for 1 mbar and repeat the burner start-up for checking the regularity: if lock-out intervenes turn the knob anticlockwise for 0.5 mbar.



### CAUTION:

do not turn the ionization probe, maintain the drawing position; should it be close to the ignition electrode, damage may occur to the control box amplifier.



## COMBUSTION HEAD ADJUSTMENT

Two separate adjustments have to be made: air and gas.

These adjustments can be carried out when the burner is still open, during the installation (see page 2 - Fixing to the boiler).

### Air setting

Loosen the two screws 1) and move the internal part of the combustion head 2) so that its rear edge 3) is coincident with the desired set-point on the plate 4). Tighten the screws 1).

### Gas setting

Loosen the screw 5), move the ring 6) so that the pointer 7) is coincident with the desired set-point 8). Tighten the screw 5).

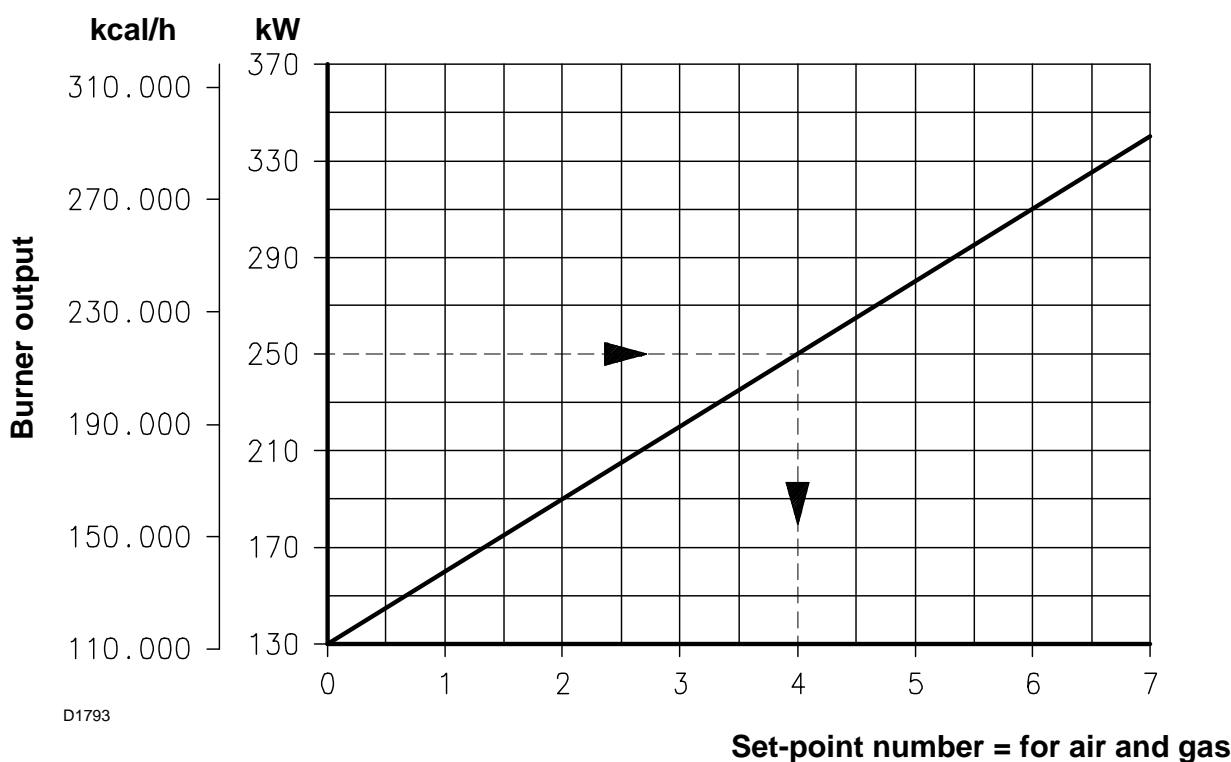
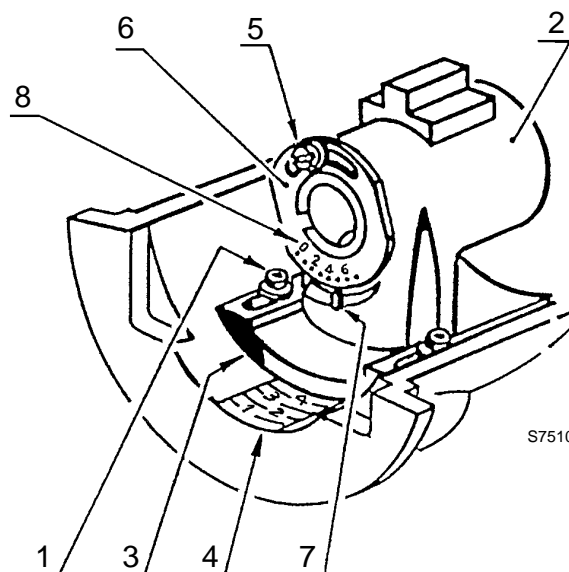
### Attention:

the set-point number is the same for air and gas setting and is given by the following diagram.

### Example:

the burner is installed on a boiler of 225 kW, assuming an efficiency of 90% the burner output should be 250 kW.

From the diagram it can be seen that the air and gas settings for this rating should be no. 4.



## ADJUSTMENT OF THE AIR DAMPER MOTOR

### STOP - Blue lever

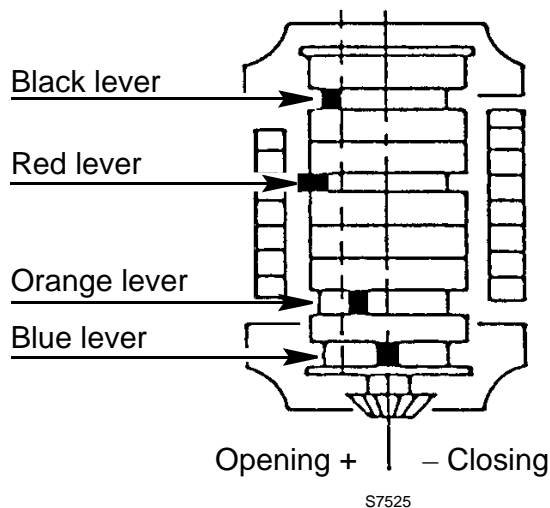
This lever leaves the factory vertically positioned and corresponds to the complete closing of the air damper.

A partial opening of the air damper might be obtained by moving leftwards this lever (+ on the label).

The new position of the air damper is detectable when the burner is off.

Do not overcome the position of the orange lever for the 1<sup>st</sup> stage.

**The black lever must anticipate the red one**



### 1<sup>st</sup> STAGE - Orange lever

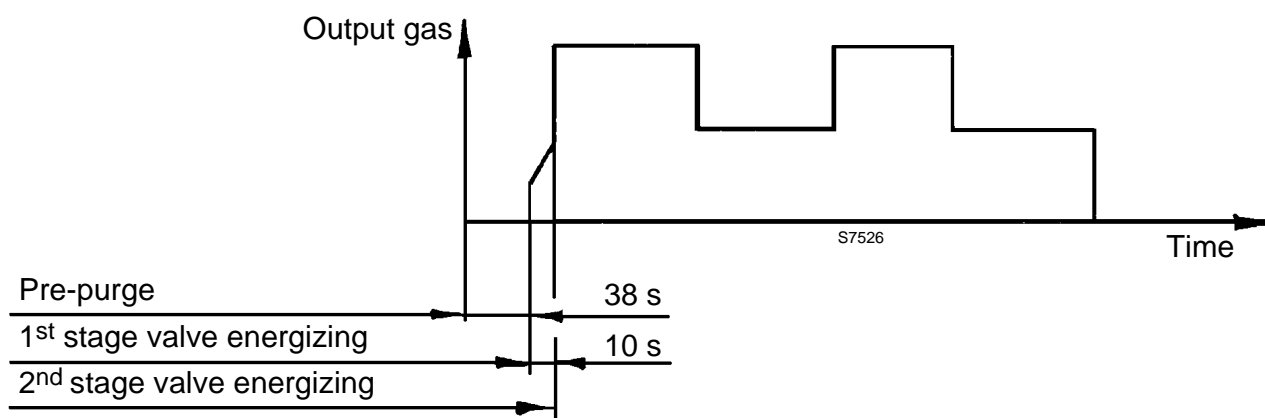
The orange lever controls the air damper position for the first flame, it is adjustable both for opening and closing.

### 2<sup>nd</sup> STAGE - Red and black levers

The red lever controls the air damper position for the second flame, it is adjustable both for closing and opening.

The black lever controls the opening of the second oil valve and it must always anticipate - for a bit - the red lever, but never the orange one.

### OPERATIONAL DIAGRAM



## COMBUSTION CHECKS

### CO<sub>2</sub>

It is advisable to not exceed 10% of CO<sub>2</sub> (gas with calorific value of 8600 kcal/m<sup>3</sup>), in order to avoid the risk that small changes of the adjustments due, for instance, at draught variation, may cause combustion with insufficient air and consequently formation of CO.

### CO

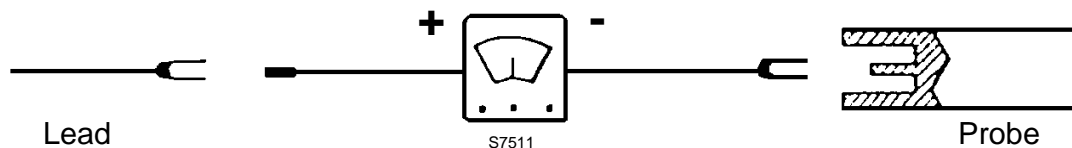
For safety reason the value of 0.1% (one thousand p.p.m.) must not be exceeded.

## IONIZATION CURRENT

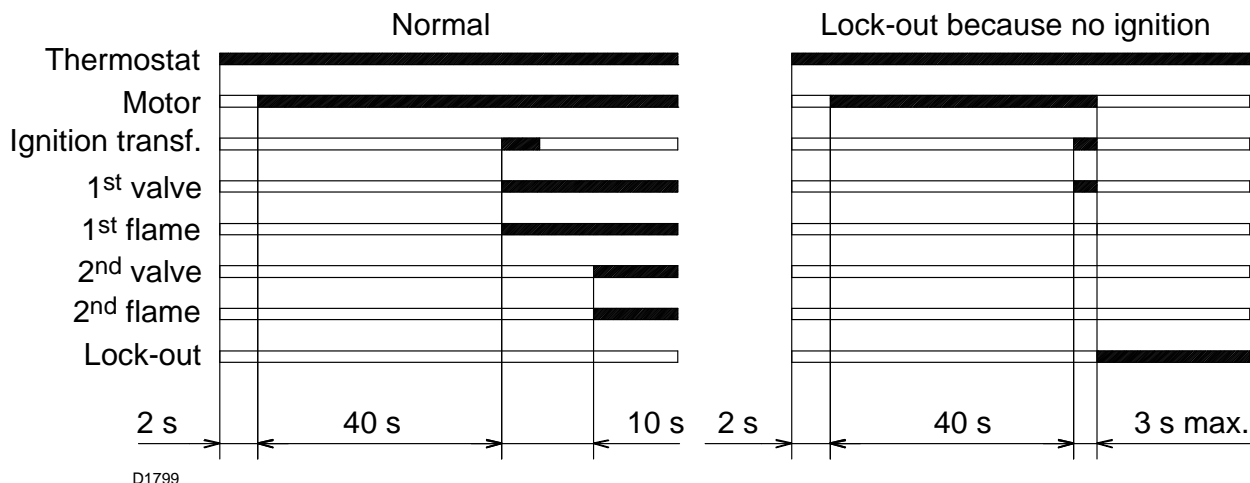
The minimum current necessary for the control box operation is 3 µA.

The burner normally supplies a higher current value, so that no check is needed.

However, if a measurement of the ionization current is required, it is necessary to disconnect the probe lead and insert a d.c. microamperometer.



## BURNER START-UP



If during operation the flame shuts off, lock-out occurs within 1 sec.

## BURNER STARTING DIFFICULTIES AND THEIR CAUSES

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 2 - One of the two solenoid valves does not open. 3 - Gas pressure too low. . . . . 4 - Ignition electrode incorrectly adjusted 5 - Electrode grounded due to broken . . insulation 6 - High voltage cable defective . . . . . 7 - High voltage cable deformed by high temperature 8 - Ignition transformer defective . . . . . 9 - Incorrect valve or transformer . . . . . electrical wiring 10 - Defective control box. . . . . 11 - A closed valve upline the gas train . . 12 - Air in pipework. . . . . 13 - Gas valves unconnected or with . . . . interrupted coil	Increase  Replace  Increase pressure at governor Adjust Replace  Replace Replace and protect  Replace Check  Replace Open Bleed air 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. 16 - Pressure switch pressure test point . pipe blocked 17 - Poorly adjusted head. . . . . 18 - High pressure in the furnace . . . . .	Adjust or replace  Clean  Adjust Connect air pressure switch to fan suction line
	Lockout during pre-purging phase	19 - Defective motor control contactor . . . (only three-phase version) 20 - Defective electrical motor . . . . . 21 - Motor lockout (defective electrical motor)	Replace Replace 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
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

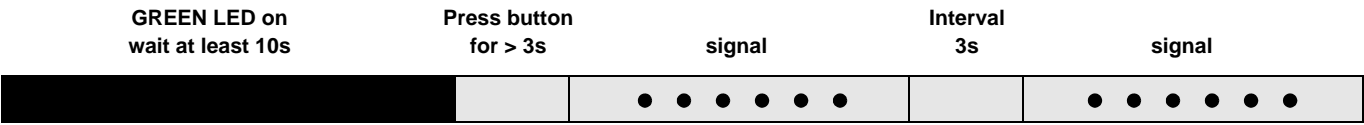
Signal	Problem	Possible cause	Recommended remedy
10 blinks ●●●●● ●●●●●	The burner does not switch on, and the lockout appears	32 - Incorrect electrical wiring . . . . .	Check
	The burner goes into lockout	33 - Defective control box . . . . . 34 - Presence of electromagnetic . . . . . disturbances in the thermostat lines 35 - Presence of electromagnetic . . . . . disturbance	Replace Filter or eliminate  Use the radio disturbance protection kit
No blink	The burner does not start	36 - No electrical power supply . . . . .	Close all switches - Check connections
		37 - A limiter or safety control device is open	Adjust or replace
		38 - Line fuse blocked . . . . .	Replace
		39 - Defective control box . . . . .	Replace
		40 - No gas supply . . . . .	Open the manual valves between contactor and train
		41 - Mains gas pressure insufficient . . . .	Contact your GAS COMPANY
		42 - Minimum gas pressure switch fails to close	Adjust or replace
	The burner continues to repeat the start-up cycle, without lockout	43 - 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.
	Ignition with pulsations	44 - Poorly adjusted head . . . . .	Adjust
		45 - Ignition electrode incorrectly adjusted	Adjust
		46 - Incorrectly adjusted fan air damper: too much air	Adjust
		47 - Output during ignition phase is too high	Reduce

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

BURNER START UP CYCLE DIAGNOSTICS

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

COLOUR CODE TABLE	
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

## OPERATING FAULT DIAGNOSTICS

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

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

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



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

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

SIGNAL	PROBABLE CAUSE
2 flashes • •	The flame does not stabilise at the end of the safety time: – faulty ionisation probe; – faulty or soiled gas valves; – neutral/phase exchange; – faulty ignition transformer; – poor burner regulation (insufficient gas).
3 flashes • • •	Min. air pressure switch does not close: – air pressure switch faulty; – air pressure switch incorrectly regulated; – max. air pressure switch triggered (if installed).
4 flashes • • • •	Min. air pressure switch does not open or light in the chamber before firing: – air pressure switch faulty; – air pressure switch incorrectly regulated.
7 flashes • • • • • • •	Loss of flame during operations: – poor burner regulation (insufficient gas); – faulty or soiled gas valves; – short circuit between ionisation probe and earth.
8 flashes • • • • • • • •	– Not used.
10 flashes • • • • • • • • • •	– Wiring error or internal fault.

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

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