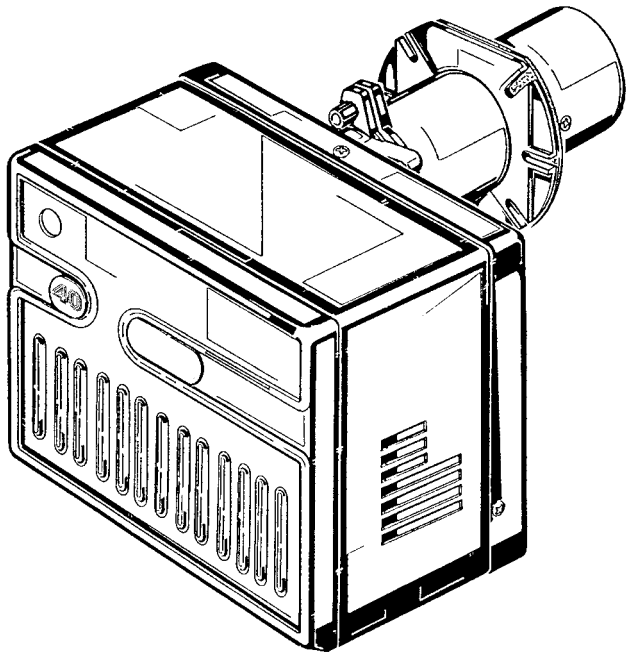
GB

Forced draught gas burner

One - stage operation



CODE	MODEL	TYPE
3755489	RIELLO 40 GS10	554T85

2903159 (2) - 07/2022

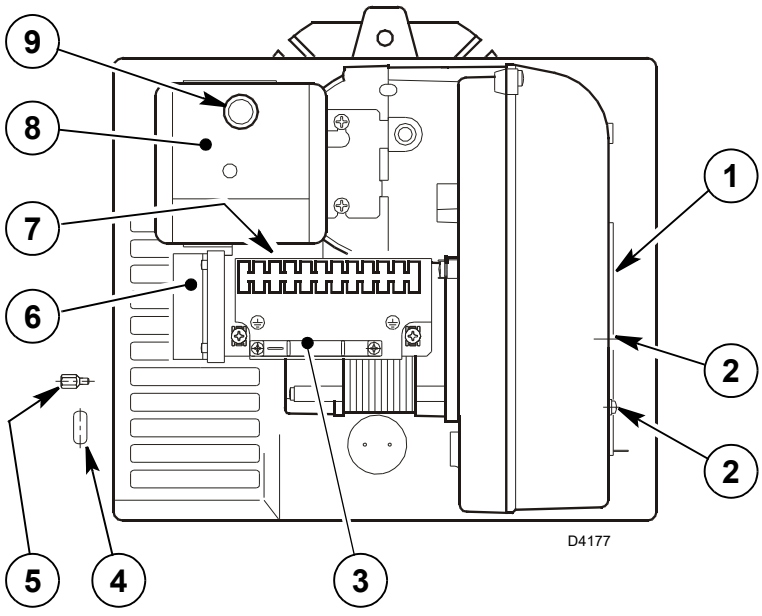
INDEX

1. BURNER DESCRIPTION

Gas burner with one stage working.

➤ The burner is approved for intermittent operation as per EN 676.
➤ The burner meets protection level of IP X0D (IP 40), EN 60529.
➤ Gas train according to EN 676.

Fig. 1



1 – Air-damper
2 – Screws for fixing the air-damper
3 – Cable clamps
4 – Cable grommet
5 – Screw for fixing the cover
6 – Air pressure switch
7 – Terminal strip
8 – Control box
9 – Reset button with lock-out lamp

NOTES:
– Gas train can be installed on the right or on the left of the burner.
– The cable grommet (4) and the screw for fixing the cover (5) supplied with the burner, must be fitted to the same side of the gas train.

1.1 BURNER EQUIPMENT

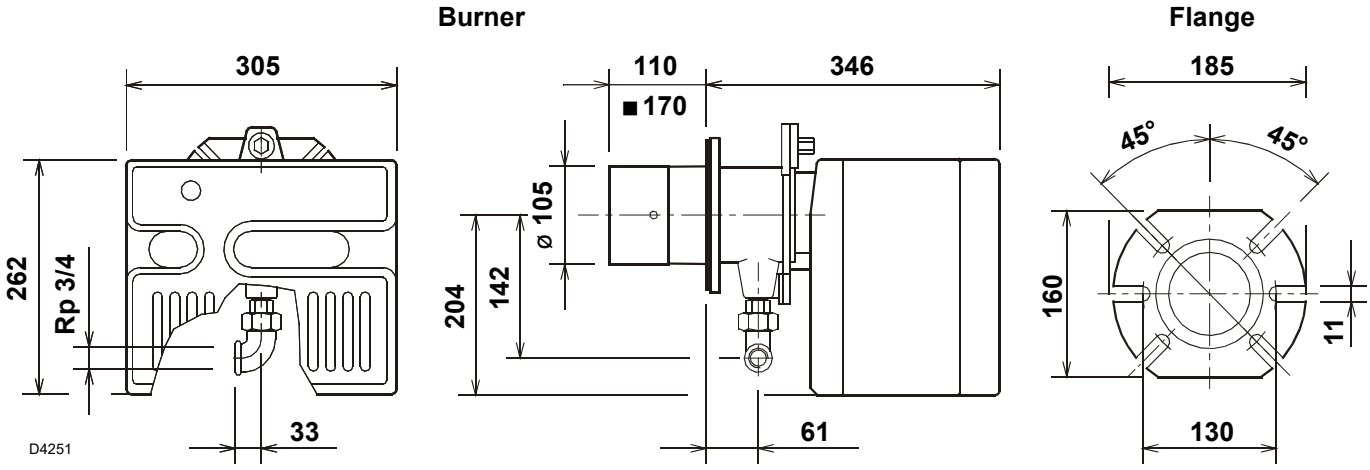
Insulating gasket . . . . . No. 1
Cable grommet . . . . . No. 1
Hinge . . . . . No. 1
Screws and nuts for flange to be fixed to boiler . . No. 4
Screw for fixing the cover . . . . . No. 1

2. TECHNICAL DATA

2.1 TECHNICAL DATA

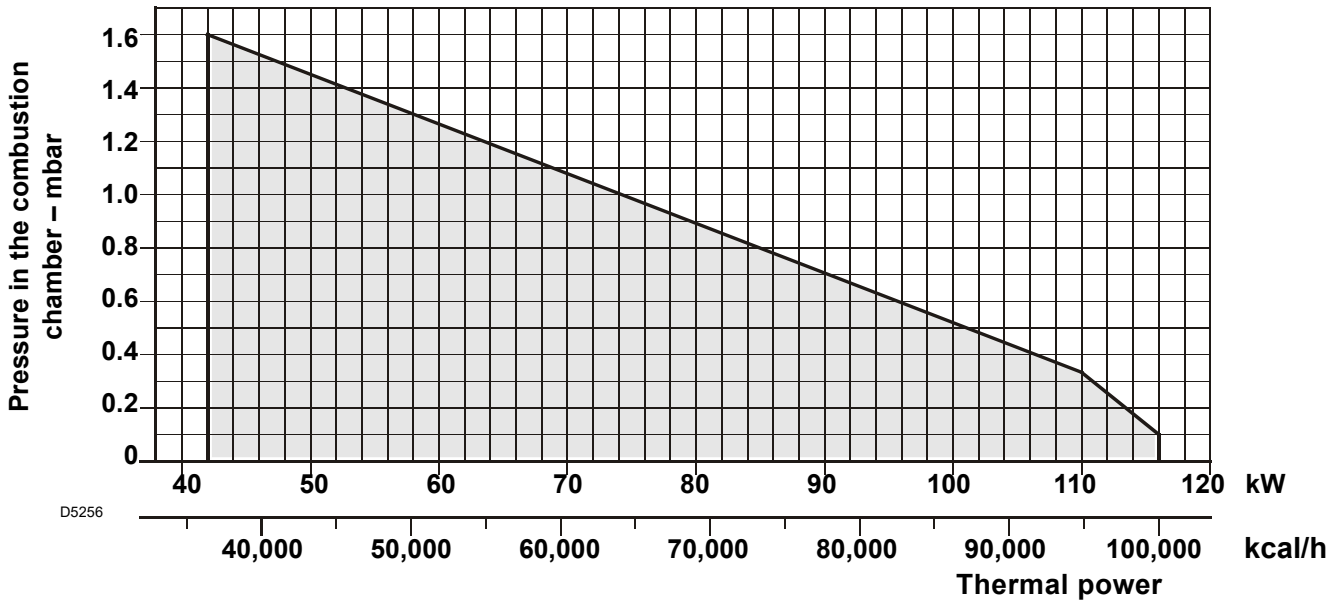
TYPE	554T85
Thermal power **(1)**	42 – 116 kW - 36,000 – 100,000 kcal/h
Natural gas **(Family 2)**	Net heat val3ue: 8 – 12 kWh/Nm^3 - 7,000 – 10,340 kcal/Nm^3
	Pressure: min. 16 mbar - max. 100 mbar
Electrical supply	Single phase, 100V ± 10% ~ 50/60 Hz
Motor	100V / 2.2A
Capacitor	5 μF
Ignition transformer	Primary 100V / 2.3/1.9A - Secondary 8 kV / 30 mA
Absorbed electrical power	0.13 kW
(1) Reference conditions: Temp. 20°C - Barometric pressure 1013 mbar – Altitude 0 m above sea level.	

2.2 OVERALL DIMENSIONS



■ Combustion head extension, supplied separately.

2.3 FIRING RATE, (as EN 676)



TEST BOILER

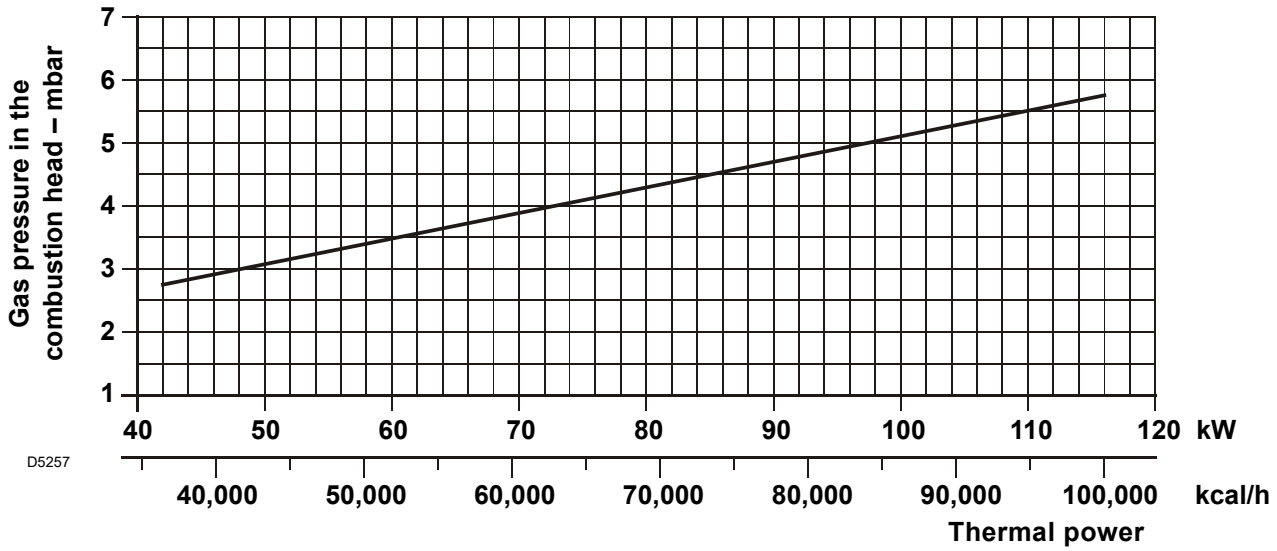
The working field has been defined according to EN 676 standard.

COMMERCIAL BOILERS

The burner-boiler matching is assured if the boiler conforms to EN 303 and the combustion chamber dimensions are similar to those shown in the diagram EN 676. For applications where the boiler does not conform to EN 303, or where the combustion chamber is much smaller than the dimensions given in EN 676, please consult the manufacturers.

CORRELATION BETWEEN GAS PRESSURE AND BURNER OUTPUT

To obtain the maximum output, a gas head pressure of 5.8 mbar is measured (**M2**, see chapter 3.3, page 4) with the combustion chamber at 0 mbar using gas G20 with a net heat value of 10 kWh/Nm3 (8,570 kcal/Nm3).



3. INSTALLATION

THE BURNER MUST BE INSTALLED IN CONFORMITY WITH LEGISLATION AND LOCAL STANDARDS.

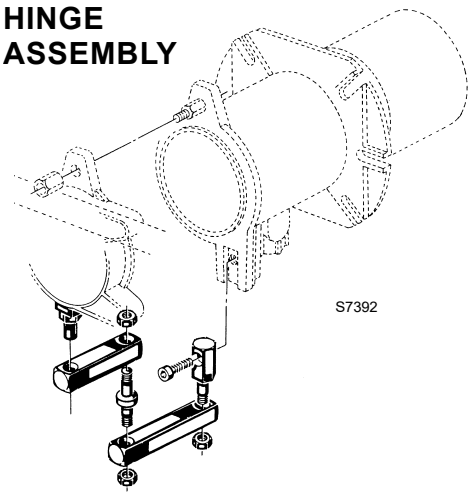
3.1 BOILER FIXING

IMPORTANT

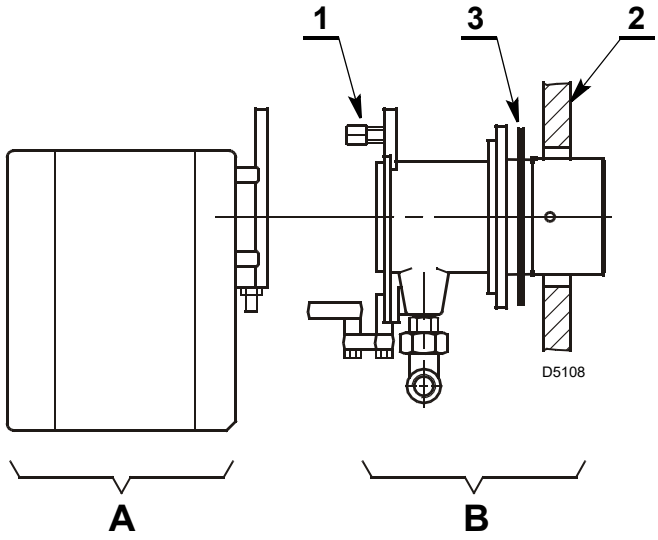
Boiler door must have a max. thickness of **90 mm**, refractory lining included.

If thickness is greater **(max. 150 mm)**, a combustion head extension must be fitted, which is supplied separately.

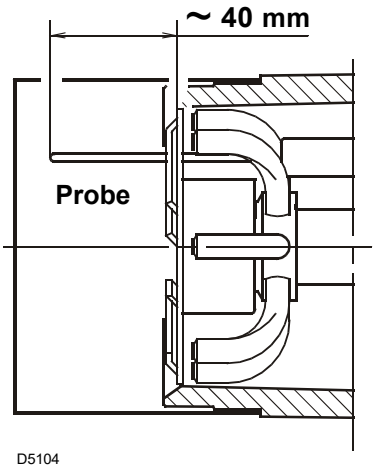
HINGE ASSEMBLY

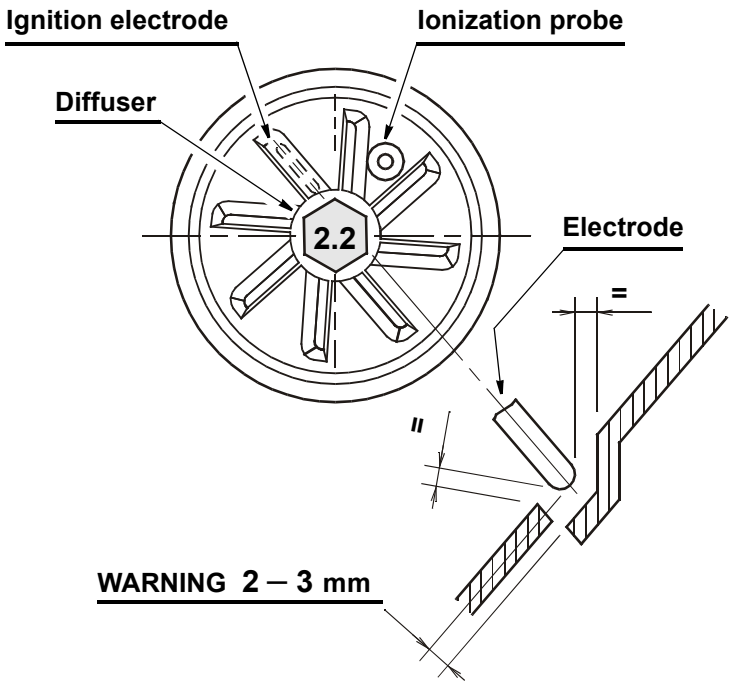


- Separate the combustion-head assembly from the burner body by removing nut (1) and removing group **(A)**.
- Fix the head assembly group **(B)** to the boiler (2) insert the supplied insulating gasket (3).

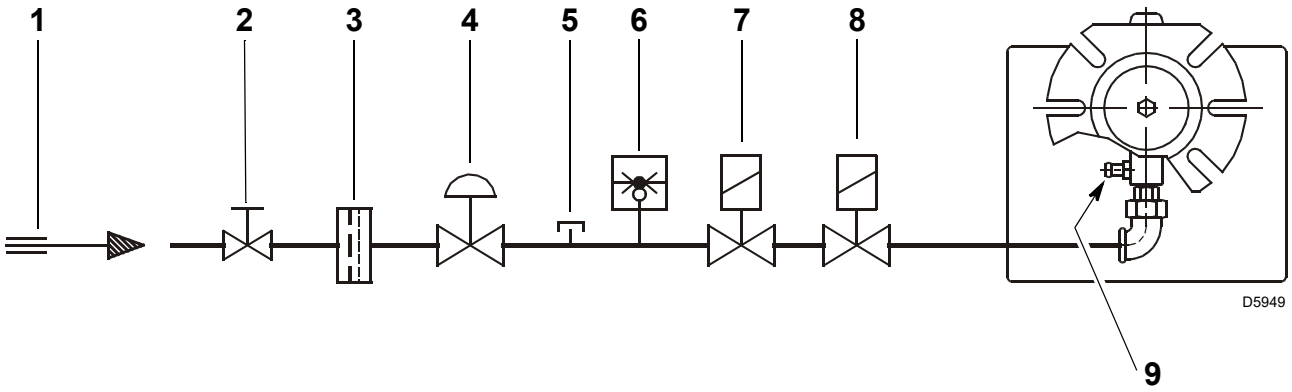


3.2 PROBE - ELECTRODE POSITIONING



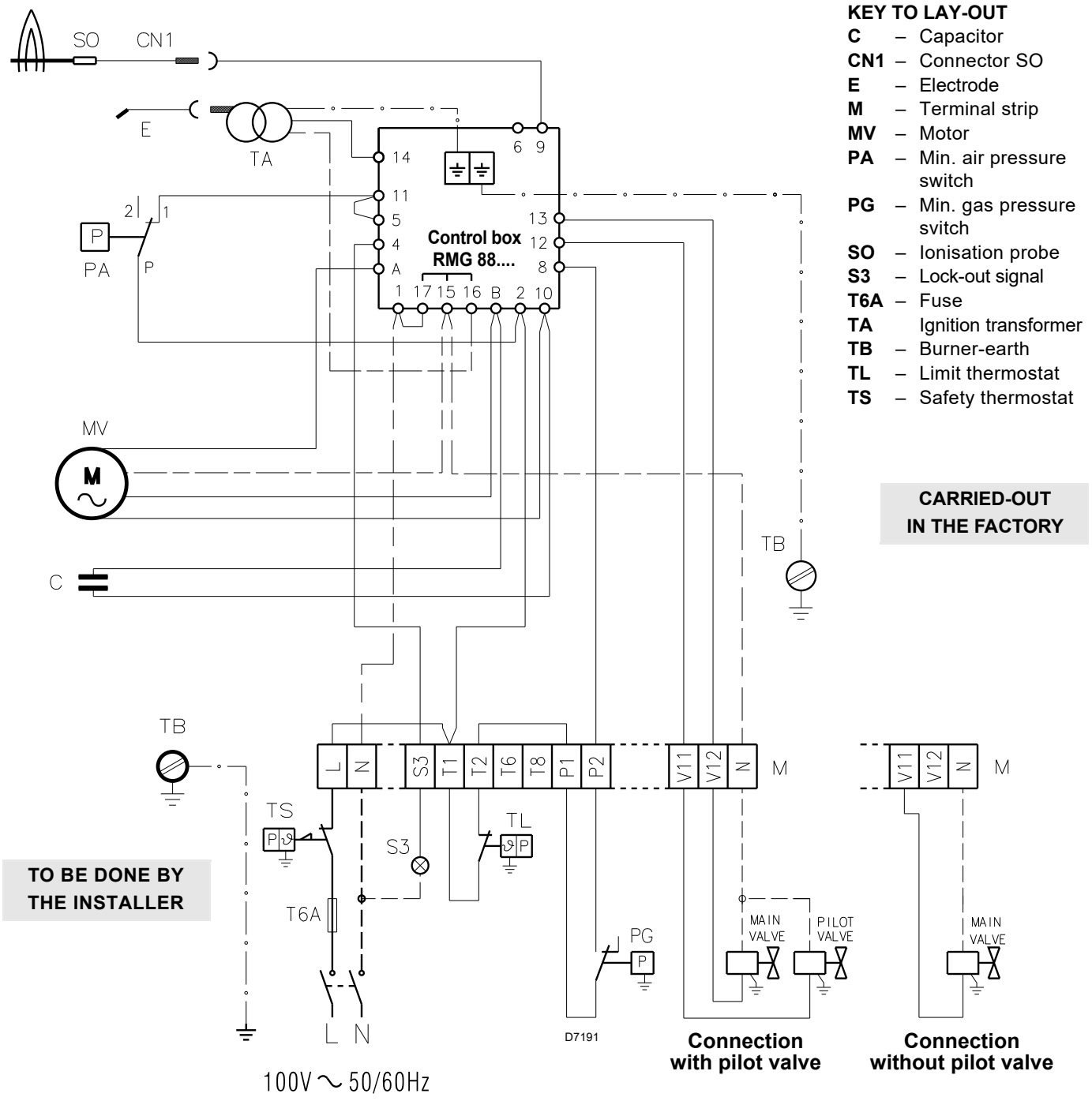


3.3 GAS FEEDING LINE



1 – Gas supply pipe
2 – Manual cock
3 – Filter
4 – Pressure governor
5 – Pressure test point
6 – Gas pressure switch
7 – Safety valve
8 – Adjustment valve
9 – Pressure coupling test point

3.4 ELECTRICAL WIRING



KEY TO LAY-OUT

C – Capacitor
CN1 – Connector SO
E – Electrode
M – Terminal strip
MV – Motor
PA – Min. air pressure switch
PG – Min. gas pressure svitch
SO – Ionisation probe
S3 – Lock-out signal
T6A – Fuse
TA – Ignition transformer
TB – Burner-earth
TL – Limit thermostat
TS – Safety thermostat

ATTENTION:

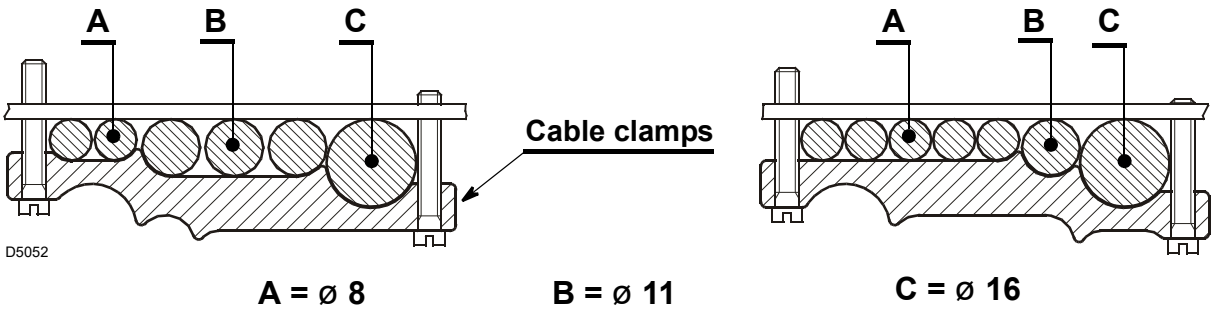
- ➤ **Do not swap neutral and phase over, follow the diagram shown carefully and carry out a good earth connection.**
- ➤ The section of the conductors must be at least 1mm². *(Unless requested otherwise by local standards and legislation).*
- ➤ The electrical wiring carried out by the installer must be in compliance with the rules in force in the country.
- ➤ Verify that the burner stops by operating the boiler control thermostats and that the burner locks out by separating the red ionisation probe lead connector.

NOTES

The burners have been type-approved for intermittent operation. This means they must stop at least once every 24 hours in order to allow the electrical control box to check its efficiency on start-up. The boiler limit thermostat (**TL**) normally ensures the burner halts. If this does not happen a time switch halting the burner at least once every 24 hours must be applied in series to limit thermostat (**TL**).

3.5 FIXING THE ELECTRICAL WIRING

All the electrical wires, which are to be connected to the terminal strip (7, fig. 1, page 1) should pass through the cable grommet (4, fig. 1). All the electrical wires, which are to be connected into the terminal strip must be gripped in the cable clamps (3, fig. 1). This is molded on both sides to allow the use of various diameter cables.



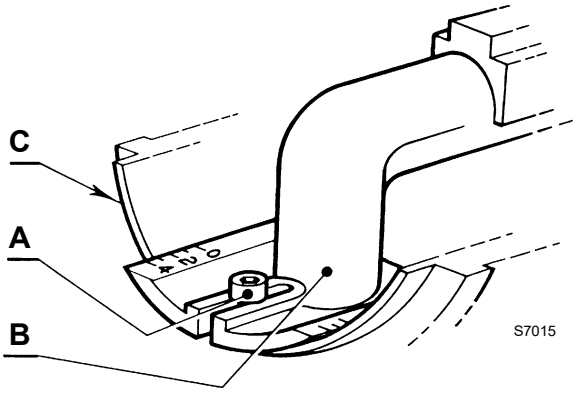
4. WORKING

4.1 COMBUSTION ADJUSTMENT

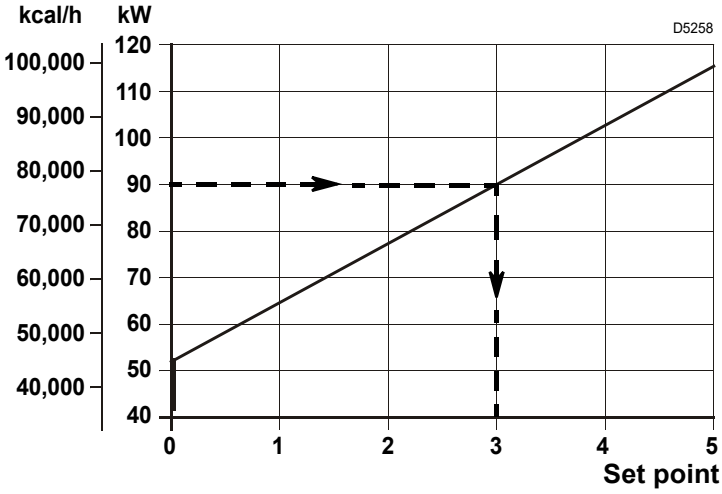
In conformity with Efficiency Directive 92/42/EEC the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and CO_2 concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.
To suit the required appliance output, choose the proper setting of the combustion head, and the air damper opening.

4.2 COMBUSTION HEAD SETTING

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



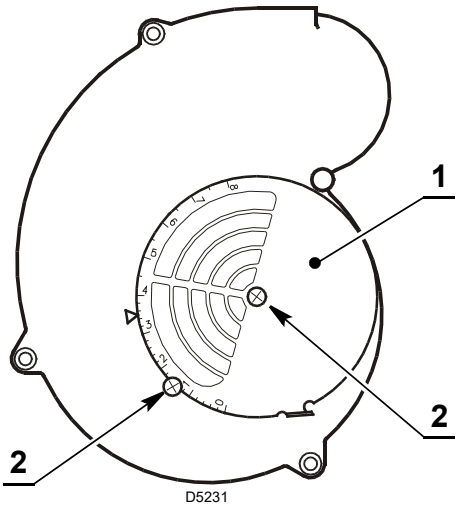
Example: The burner is installed on a 81 kW boiler with an efficiency of 90%, the burner input is about 90 kW using the diagram, the combustion set point is **3**.
The diagram is to be used only for initial settings, to improve air pressure switch operation or improve combustion, it may be necessary to reduce this setting *(set point toward position **0**)*.



4.3 AIR DAMPER SETTING

The regulation of the air-rate is made by adjusting the air damper **(1)**, after loosing the screws **(2)**.

When the optimal regulation is reached, **screw tight the screws (2)**.



4.4 COMBUSTION CHECK

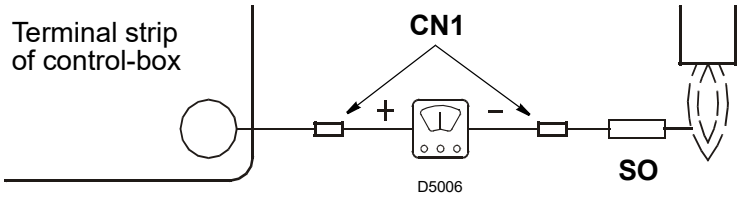
CO_2

It is advisable to not exceed 10% of CO_2 *(natural gas)*, 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.

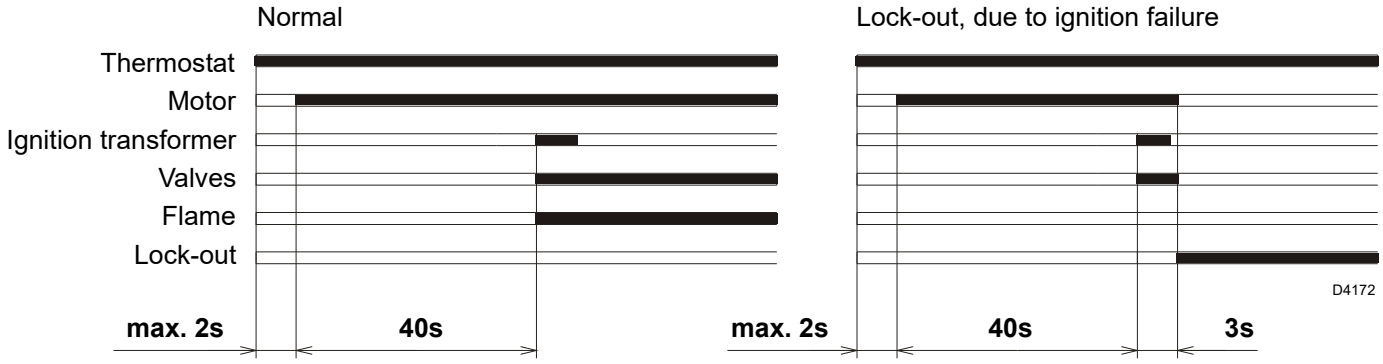
CO - Not exceeding 100 mg/kWh (93 ppm).

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 you want to measure the ionization current, you must open the connector fitted to the red wire and insert a microammeter.



4.5 BURNER START-UP CYCLE



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

4.6 START-UP CYCLE DIAGNOSTICS

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

COLOUR CODE TABLE	
Sequences	**Colour code**
Pre-purging	●●●●●●●●●
Firing phase	●○●○●○●○●
Operation, flame ok	□□□□□□□□□
Operating with weak flame signal	□○□○□○□○□
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●
Lockout	▲▲▲▲▲▲▲▲▲
Extraneous light	▲□▲□▲□▲□▲
Key to layout: ○ Off ● Yellow □ Green ▲ Red	

SAFETY TEST - WITH GAS BALL VALVE CLOSED

It is fundamental to ensure the correct execution of the electrical connections between the gas solenoid valves and the burner to perform safely the commissioning.

For this purpose, after checking that the connections have been carried out in accordance with the burner's electrical diagrams, an ignition cycle with closed gas ball valve -dry test- must be performed.

1 The manual ball gas valve must be closed
2 The electrical contacts of the burner limit switch need to be closed
3 Ensures closed the contact of the low gas pressure switch
4 Make a trial for burner ignition

The start-up cycle must be as follows:

– starting the fan for pre-ventilation
– Performing the gas valve seal control, if provided
– Completion of pre-ventilation
– Arrival of the ignition point
– Power supply of the ignition transformer
– Electrical Supply of solenoid gas valves

Since the manual gas ball valve is closed, the burner will not light up and its control box will go to a safety lockout condition.

The actual electrical supply of the solenoid gas valves can be verified by inserting a tester, Some valves are equipped with light signals (or close/open position indicator) that turn on at the same time as their power supply.

IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT UNEXPECTED TIMES. DO NOT OPEN MANUAL GAS BALL VALVE, SWITCH OFF POWER LINE; CHECK THE WIRES; CORRECT THE ERRORS AND REPEAT THE COMPLETE TEST.

SAFETY COMPONENTS

The safety components must be replaced at the end of their life cycle indicated in Tab. 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) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid) (if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes / couplings (metallic) (if present)	10 years
Fan impeller	10 years or 500,000 start-ups

4.7 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 (**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 pulses and identified the possible cause, the system must be reset by holding the button down for between 1 and 3 seconds.

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

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

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 lockout.
To view diagnostics, proceed as follows:
- Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, according to the coding system indicated in the table on page 10.

SOFTWARE DIAGNOSTICS
Reports burner life by means of an optical link with the PC, indicating hours of operation, number and type of lockouts, serial number of control box etc ...
To view diagnostics, proceed as follows:
- Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button for 1 second and then press again for over 3 seconds until the yellow light pulses again.
  Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

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

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

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

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	The operation solenoid lets little gas through	Increase
		One of the two solenoid valves does not open.	Replace
		Gas pressure too low	Increase pressure at governor
		Ignition electrode incorrectly adjusted	Adjust
		Electrode grounded due to broken insulation	Replace
		High voltage cable defective	Replace
		High voltage cable deformed by high temperature	Replace and protect
		Ignition transformer defective	Replace
		Incorrect valve or transformer electrical wiring	Check
		Defective control box	Replace
		A closed valve upline the gas train	Open
		Air in pipework	Bleed air
		Gas valves unconnected or with interrupted coil	Check connections or replace coil
3 blinks ● ● ●	The burner does not switch on, and the lockout appears	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:	
		Air pressure switch incorrectly adjusted.	Adjust or replace
		Pressure switch pressure test point pipe blocked	Clean
		Poorly adjusted head	Adjust
		High pressure in the furnace	Connect air pressure switch to fan suction line
	Lockout during pre-purging phase	Defective motor control contactor (only three-phase version)	Replace
		Defective electrical motor	Replace
		Motor lockout (defective electrical motor)	Replace
4 blinks ● ● ● ●	The burner switches on, but then stops in lockout	Flame simulation	Replace the control box
	Lockout when burner stops	Permanent flame in the combustion head or flame simulation	Eliminate persistence of flame or replace control box
6 blinks ● ● ● ● ● ●	The burner switches on, but then stops in lockout	Defective or incorrectly adjusted servomotor	Adjust or replace

Signal	Problem	Possible cause	Recommended remedy
7 blinks ● ● ● ● ● ● ●	The burner goes into lockout immediately following the appearance of the flame	The operation solenoid lets little gas through	Increase
		Ionisation probe incorrectly adjusted	Adjust
		Insufficient ionisation (less than 5 A)	Check probe position
		Earth probe	Withdraw or replace cable
		Burner poorly grounded	Check grounding
		Phase and neutral connections inverted	Invert them
		Defective flame detection circuit	Replace the control box
	Burner lockout moving between 1st and 2nd stages, or between 2nd and 1st stages	Too much air or too little gas	Adjust air and gas
	Burner goes into lockout during operation	Probe or ionisation cable grounded	Replace worn parts
10 blinks ● ● ● ● ● ● ● ● ● ●	The burner does not switch on, and the lockout appears	Incorrect electrical wiring	Check
	The burner goes into lockout	Defective control box	Replace
		Presence of electromagnetic disturbances in the thermostat lines Presence of electromagnetic disturbance	Filter or eliminate Use the radio disturbance protection kit
No blink	The burner does not start	No electrical power supply	Close all switches - Check connections
		A limiter or safety control device is open	Adjust or replace
		Line fuse blocked	Replace
		Defective control box	Replace
		No gas supply	Open the manual valves between contactor and train
		Mains gas pressure insufficient	Contact your GAS COMPANY
		Minimum gas pressure switch fails to close	Adjust or replace
		Servomotor fails to move to min. ignition position	Replace
	The burner continues to repeat the start-up cycle, without lockout	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.

Signal	Problem	Possible cause	Recommended remedy
No blink	Ignition with pulsations	Poorly adjusted head	Adjust
		Ignition electrode incorrectly adjusted	Adjust
		Incorrectly adjusted fan air damper: too much air	Adjust
		Output during ignition phase is too high	Reduce
	The burner does not move into the 2nd stage	Remote control device TR fails to close	Adjust or replace
		Defective control box	Replace
		Defective servomotor	Replace
	Burner stops with air damper open	Defective servomotor	Replace

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.

GREEN LED on wait at least 10s	Press reset for > 3s	Pulses	Interval 3s	Pulses
		●●●●		●●●●

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.

5. MAINTENANCE

Disconnect the electric supply to the burner by switching off the main power switch and close the gas shut-off valve before maintaining or checking the system.
The burner requires scheduled maintenance that must be carried out by qualified personnel and in compliance with local legislation.
Scheduled maintenance is vital for the smooth operation of the burner; it avoids waste of fuel and reduces harmful emissions into the atmosphere.

THE FUNDAMENTAL OPERATIONS TO CARRY OUT ARE AS FOLLOWS:

➤ Check that the burner and gas train electrical connections are correct.

➤ Check that the positioning of the air pressure test point is correct.

➤ Check that the gas train is suited to the burner capacity, the type of gas used and the network gas pressure.

➤ Check that the positioning of the combustion head is correct and that it is properly fixed to the boiler.

➤ Check that the air pressure switch and the gas pressure switch are set correctly.

➤ Check that the ionisation probe and the electrode are positioned correctly.

Let the burner run at full capacity for about ten minutes, setting all the elements correctly as explained in this manual. **Then carry out the analysis of the combustion by checking:**

- CO_2 percentage (%);
- CO content (ppm);
- NOx content (ppm);
- Ionisation current (µA).
- Flue gases temperature at the stack.

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