

GB **Forced draught gas burners**

One stage operation



Gulliver



CODICE CODE	MODELLO - MODELL MODEL	TIPO - TYP TYPE
3761912 - 3761916 3761958	RS5	920T1

INDEX

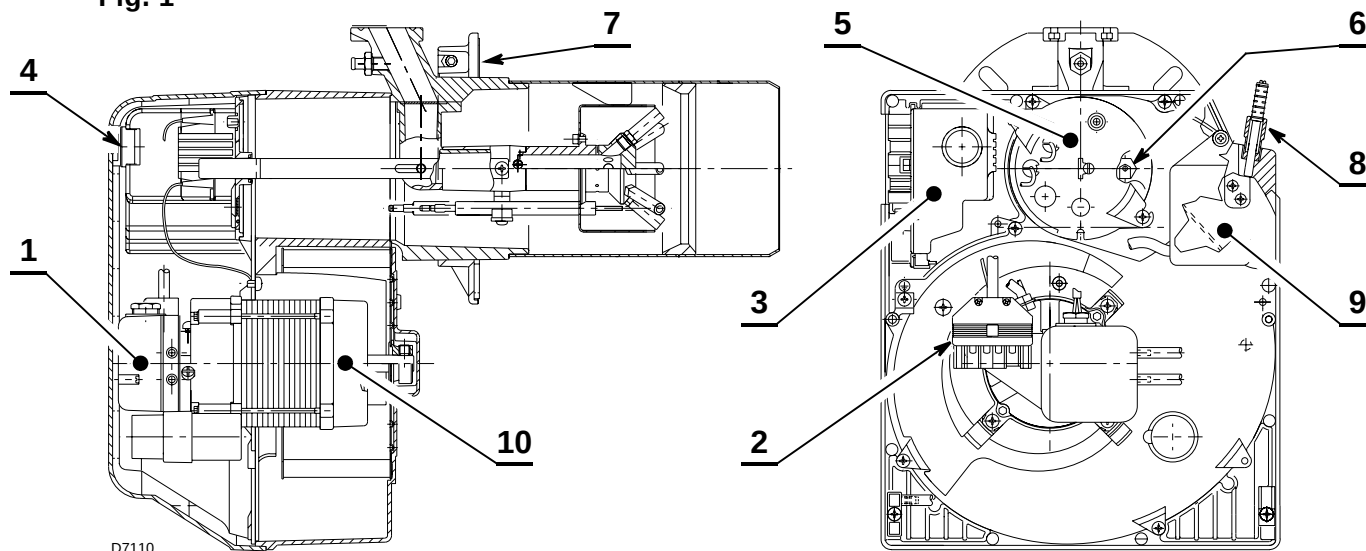
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1. BURNER DESCRIPTION

One stage gas burner.

- The burner meets protection level of IP X0D (IP 40), EN 60529.
- CE marking according to Gas Appliance directive 90/396/EEC; PIN **0085BM0114**.
According to directives: EMC 89/336/EEC, Low Voltage 73/23/EEC and Machines 98/37/EEC.
- Gas train according to EN 676.
- The burner is approved for intermittent operation as per Directive EN 676.

Fig. 1



- 1 – Air pressure switch
- 2 – 6 pole socket for gas train
- 3 – Control box with 7 pole socket
- 4 – Reset button with lock-out lamp
- 5 – Head holder assembly

- 6 – Pressure test point
- 7 – Flange with insulating gasket
- 8 – Air damper adjustment assembly
- 9 – Servomotor
- 10 – Motor

1.1 BURNER EQUIPMENT

Flange with insulating gasket No. 1
Screw and nut for flange No. 1
Remote reset connection No. 1

Screws and nuts for flange to be fixed to boiler . . . No. 4
7 pin plug No. 1

1.2 ACCESSORIES

SOFTWARE DIAGNOSTIC KIT

A special kit is available that, by an optical link to a PC, shows the burner life together with operating hours, type and number of failures, serial number, etc.

To visualise the diagnostics proceed as follows:

- Connect the kit supplied separately to the control box socket.

Reading of the information begins when the software programme included in the kit starts.

REMOTE RESET KIT

The burner has a remote reset kit (**RS**) consisting of a connection and a push-button operating at a distance of 20 metres max.

In order to install it remove the protective lock-out installed at the factory and insert the lock-out supplied with the burner (see electrical diagram on page 7).

MULTIBLOC ROTATION KIT

There is a special kit available that can be used to install the burner turned 180°, as illustrated on page 5 in position 5 in the section entitled "**3.1 WORKING POSITION**". This kit is designed to ensure the gas train valve works properly. The kit must be installed in conformity with laws and local regulations.

2. TECHNICAL DATA

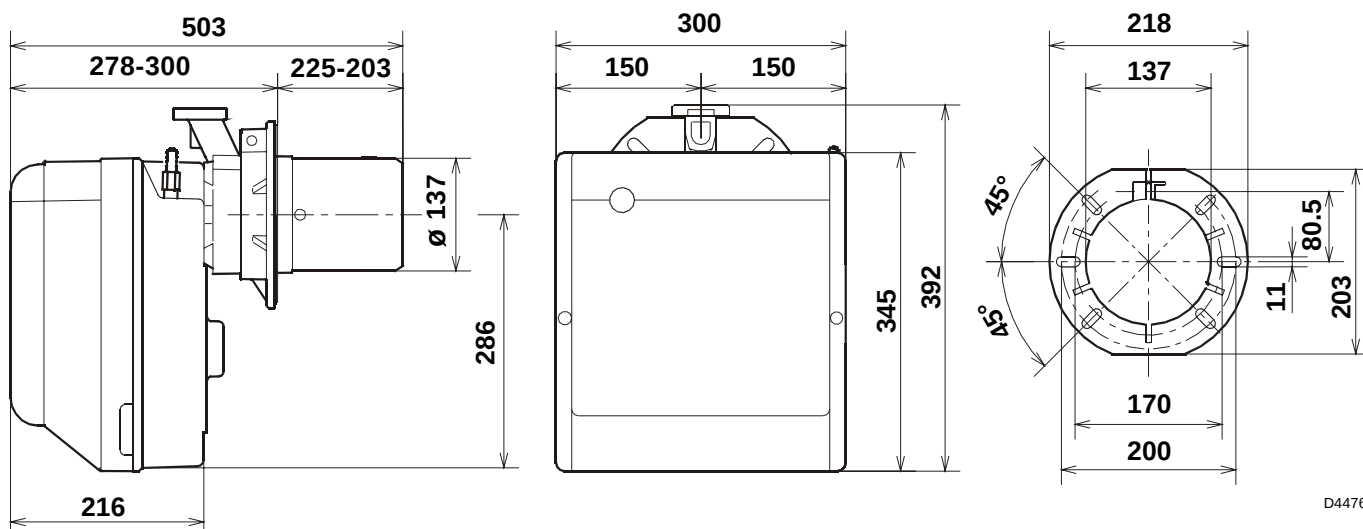
2.1 TECHNICAL DATA

TYPE	920 T1
Thermal power (1)	160 – 330 kW - 137.600 – 283.800 kcal/h
Natural gas (Family 2)	Net heat value: 8 – 12 kWh/Nm ³ = 7000 – 10,340 kcal/Nm ³
	Pressure: min. 20 mbar - max. 100 mbar
Electrical supply	Single phase, 230V ± 10% ~ 50Hz
Motor	Run current 1.9A - 2720 rpm - 288 rad/s
Capacitor	8 µF
Ignition transformer	Primary 230V / 0.2A - Secondary 8 kV / 12 mA
Absorbed electrical power	0.43 kW
(1) Reference conditions: Temp. 20°C - Barometric pressure 1013 mbar – Altitude 0 m above sea level.	

For gas family 3 (LPG) ask for separate kit.

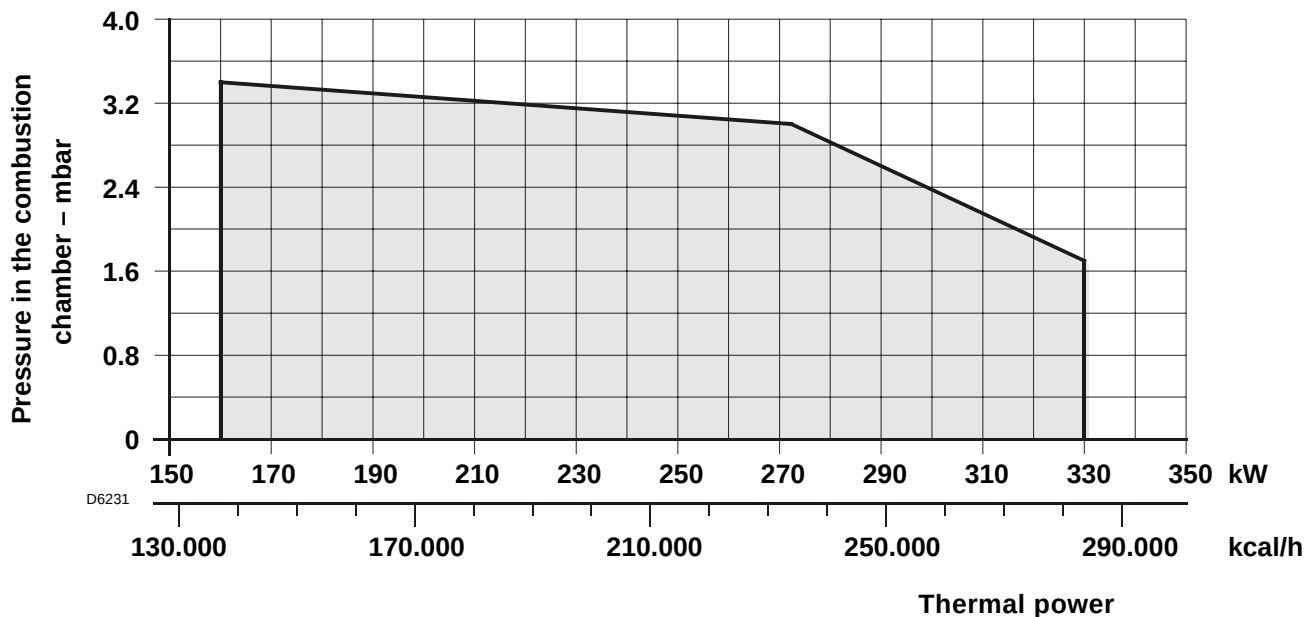
COUNTRY			AT - IT - DK - CH	GB - IE	DE	FR	NL	LU	BE
GAS CATEGORY			I12H3B/P	I12H3P	I12ELL3B/P	I12Er3P	I12L3B/P	I12E3B/P	I2E(R)B, I3P
GAS PRESSURE	G20	H	20	–	–	–	–	–	–
	G25	L	–	25	20	–	25	25	–
	G20	E	–	–	20	20/25	–	–	20/25

2.2 OVERALL DIMENSIONS



D4476

2.3 FIRING RATE (as EN 676)



TEST BOILER

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

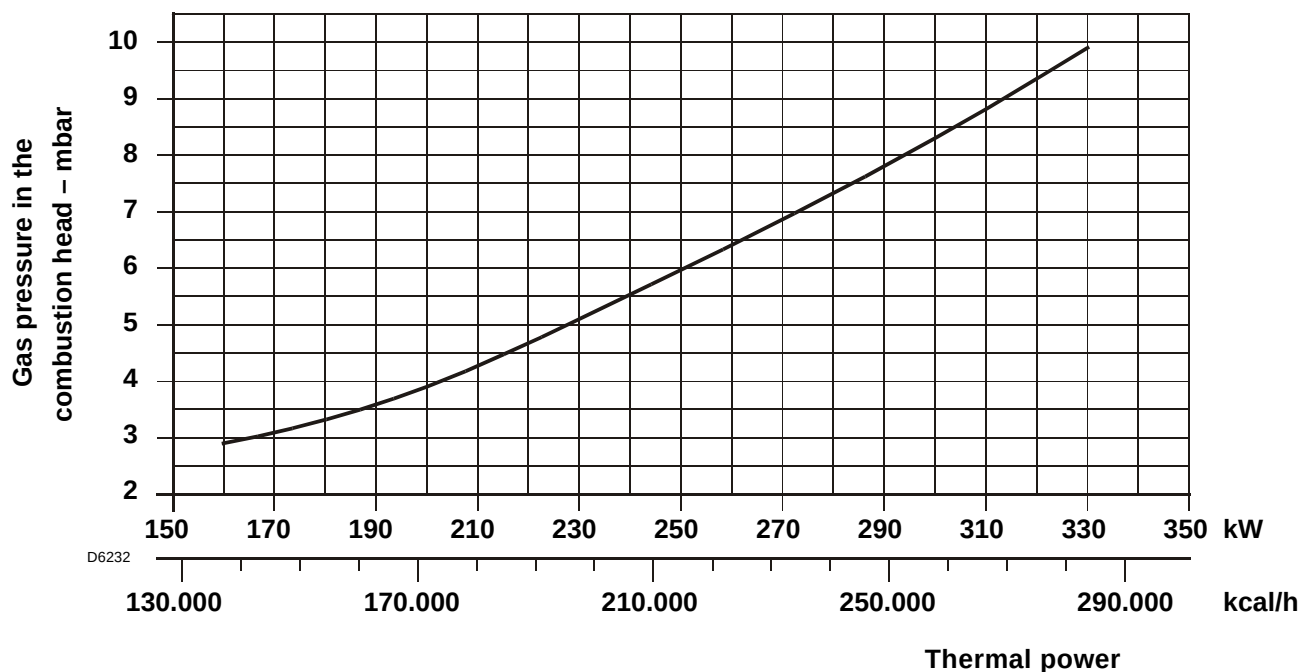
COMMERCIAL BOILERS

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 9.9 mbar is measured (**M2**, see chapter 3.5, page 6) with the combustion chamber at 0 mbar using gas G20 with a net heat value of 10 kWh/m³ (8.570 kcal/m³).



3. INSTALLATION

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

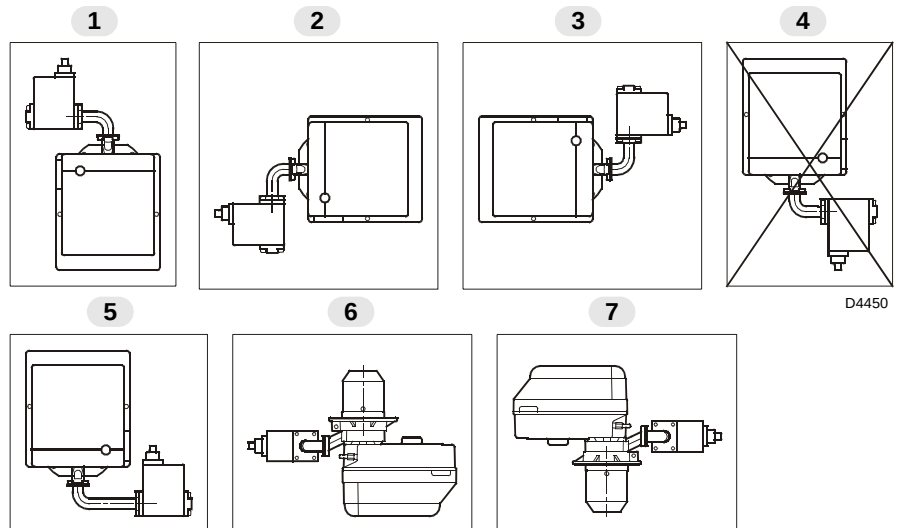
3.1 WORKING POSITION

The burner is designed for operation in position **1** only.

Installation in positions **2, 3, 5, 6** and **7** is not recommended as it is likely to hinder the unit's proper operation since air damper closure cannot be guaranteed when the burner is on standby.

Installation in position **5** is only possible using the "MULTIBLOC rotation kit", to be ordered separately.

Installation **4** is prohibited as safety is compromised.

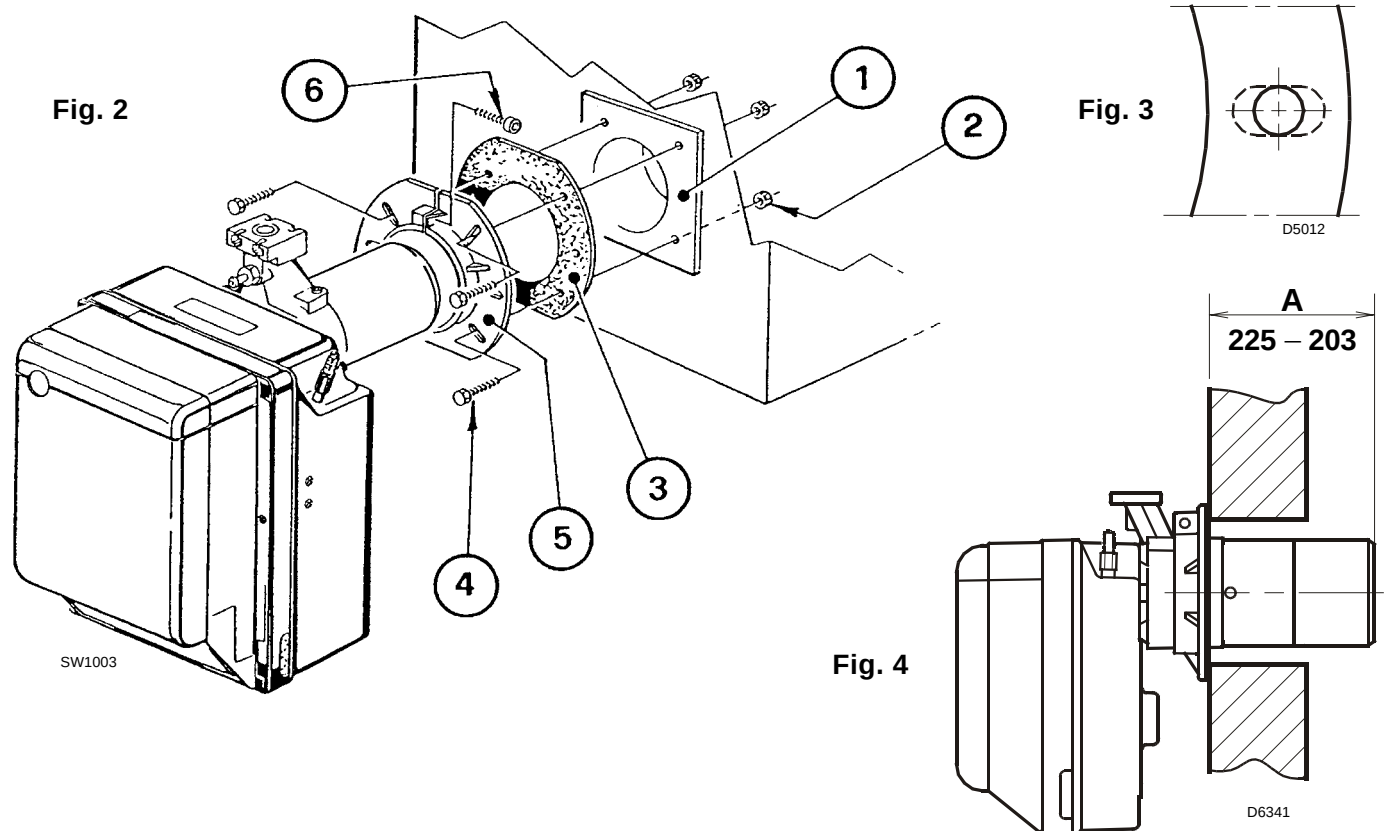


3.2 BOILER FIXING

To fit the burner to the boiler it is necessary to carry out the following:

- Widen, if necessary, the insulating gasket holes (3, fig. 3).
- Fix the flange (5) to the boiler door (1) using four screws (4) and (if necessary) the nuts (2) **interposing the insulating gasket (3)** but keep unloosing one of the two upper screws (4) (see fig. 2).
- Put on the flange (5) the burner combustion head, tighten the flange with the screws (6) and lock the loose screw (4).

N.B.: The burner can be fixed with the variable dimension **(A)** (see fig. 4). Anyway, make sure that the combustion head crosses completely the boiler door thickness.



3.3 GAS TRAIN, (as EN 676)

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

GAS TRAIN		CONNECTIONS		USE
TYPE	CODE	INLET	OUTLET	
MBDLE 410 B01	3970549	Rp 1 1/4	Flange 3	Natural gas $\leq 200\text{kW}$ and LPG 160 – 330 kW
MBDLE 412 B01	3970550	Rp 1 1/4	Flange 3	Natural gas $\leq 300\text{ kW}$
MBDLE 415 B01	3970558	Rp 1 1/2	Flange 3	Natural gas $\geq 300\text{ kW}$

3.4 GAS TRAIN ELECTRICITY SUPPLY

The gas train's power cables can be fed to the right or left of the burner, as illustrated in figure 5.

Depending on the entry point, the cable clamp with pressure test point (1) and simple cable clamp (2) may need swapping over.

Consequently, you must make sure:

- cable clamp (1) is positioned correctly;
- the tube is positioned correctly so that there are no restrictions likely to impede air flowing to the pressure switch.

WARNING

If necessary, cut the tube to the right size.

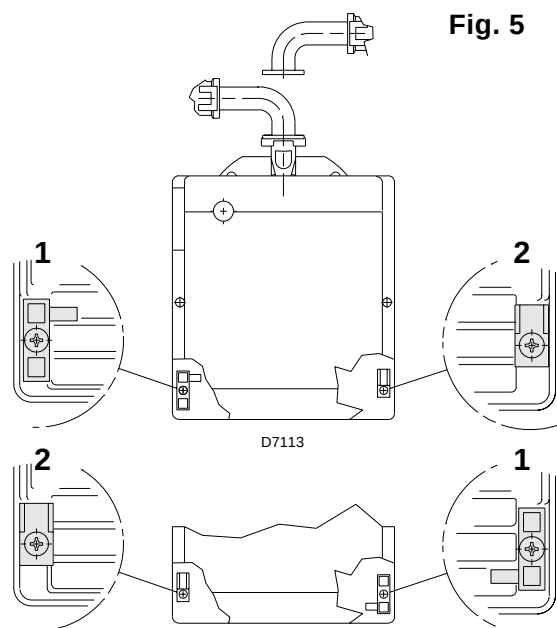
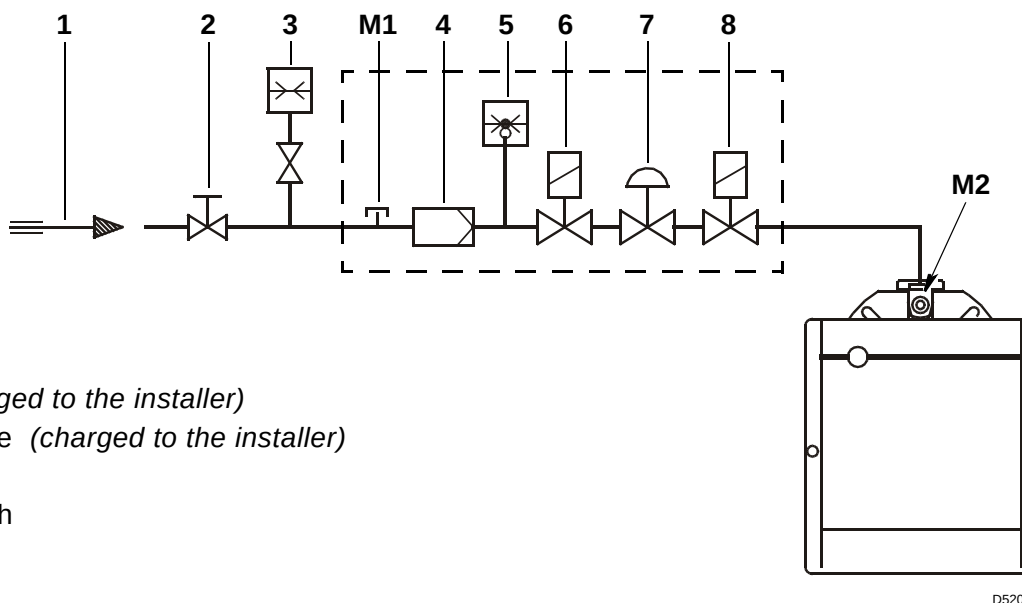


Fig. 5

3.5 GAS FEEDING LINE

Fig. 6



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

3.6 ELECTRICAL WIRING

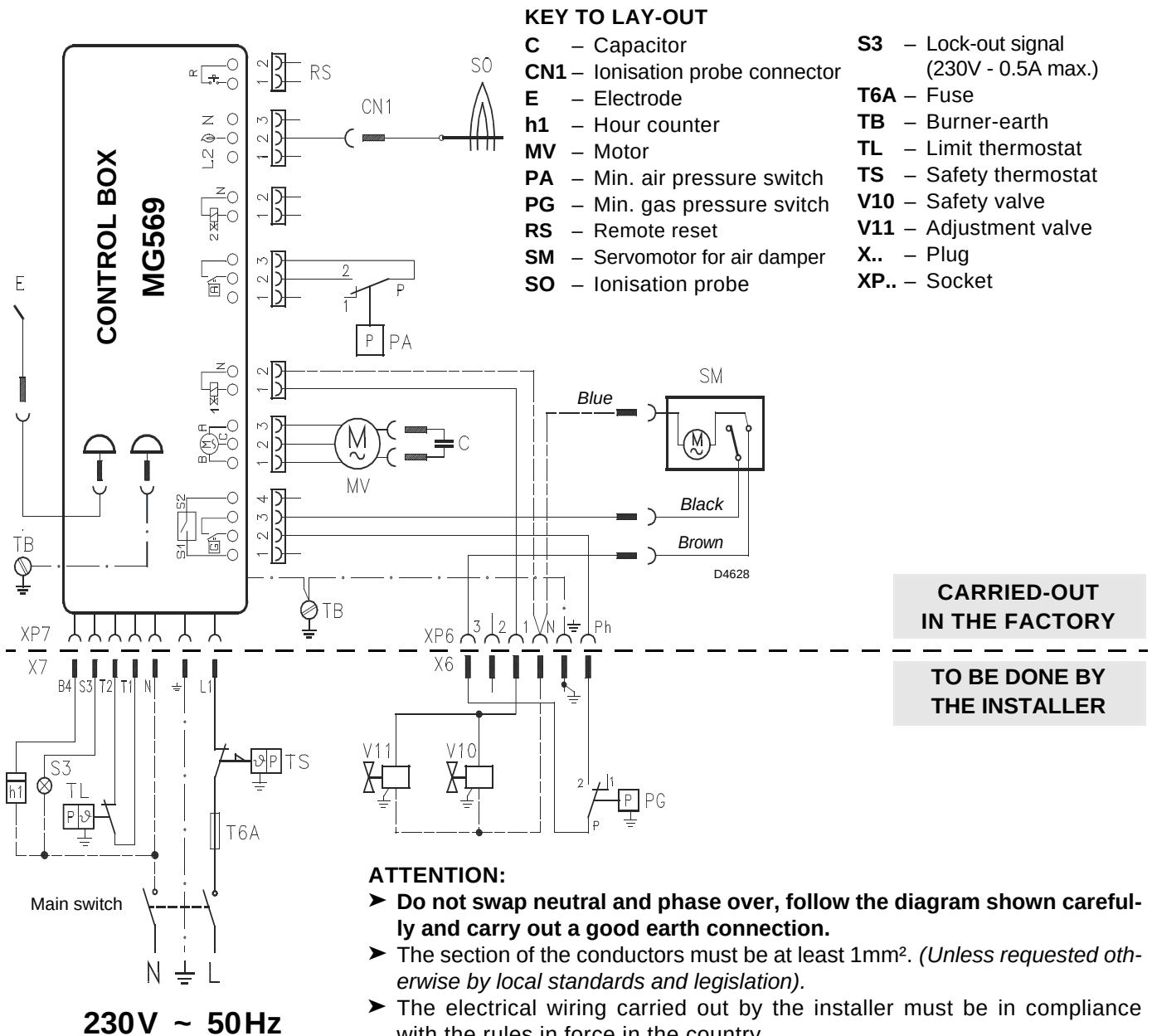
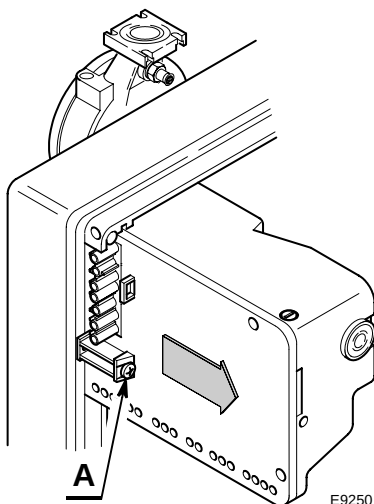


Fig. 7



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

TESTING

- Check the burner has stopped by opening the thermostats.
- Check that the burner is blocked by opening the connector (CN1) inserted in the probe red wire and located outside the control box.

CONTROL BOX, (see fig. 7)

To remove the control box from the burner it is necessary to:

- disconnect all the connectors, the 7-pin plug, the high voltage cables and the earth wire (TB);
- unscrew the bolt (A, fig. 7) and pull the control box in the direction of the arrow.

To install the control box it is necessary to:

- screw the bolt (A) in at a torque of 1 - 1.2 Nm;
- reconnect all the connectors previously disconnected.

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).

4. WORKING

FIRING OUTPUT

The firing must occur at reducer output and not higher than 120 kW.

In order to measure the firing output:

- Disconnect the connector (CN1) on the ionization probe cable (see *electrical wiring* at page 7); the burner will fire and then go into lock-out after the safety time (3s) has elapsed.
- Perform 10 firings with consecutive lock-outs.
- On the meter read the total quantity of gas burned. This quantity must be equal to or lower than the quantity here given:
 - 0.10 Nm³ for G20 (natural gas H)
 - 0.10 Nm³ for G25 (natural gas L)
 - 0.03 Nm³ for G31 (LPG).

4.1 COMBUSTION ADJUSTMENT, (see fig. 8)

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 CO₂ 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.

The burner leaves the factory set for the minimum output.

4.2 COMBUSTION HEAD SETTING

It depends on the output of the burner and is carried out by rotating clockwise or counterclockwise the setting screw (6) until the set-point marked on the regulating rod (2) is level with the outside plane of the head assembly (1).

In the sketch of fig. 8 the combustion head is set for an output of 230 kW.

The set point 4 marked of the regulating rod is at the same level with the outside plane of the head-assembly as indicated in the diagram.

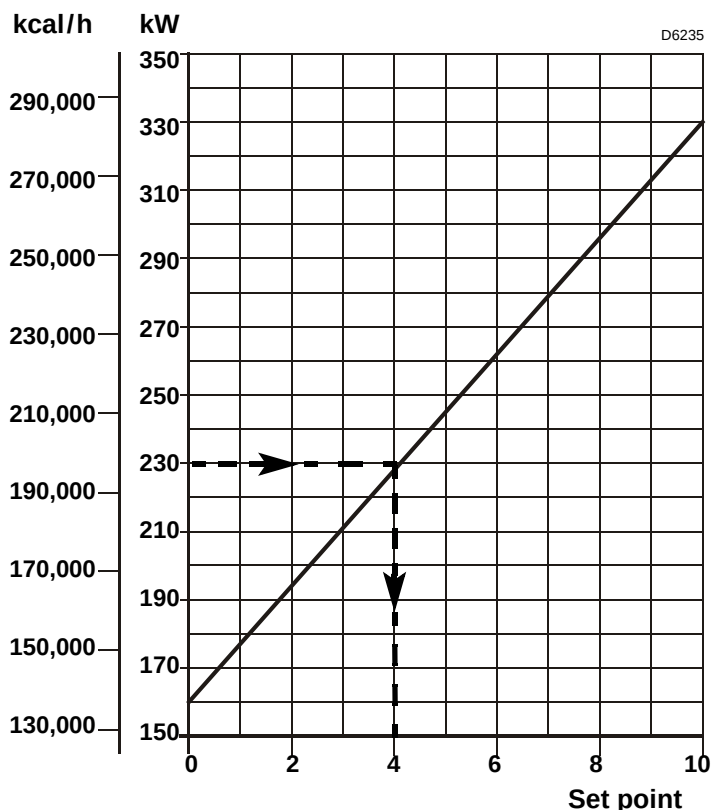
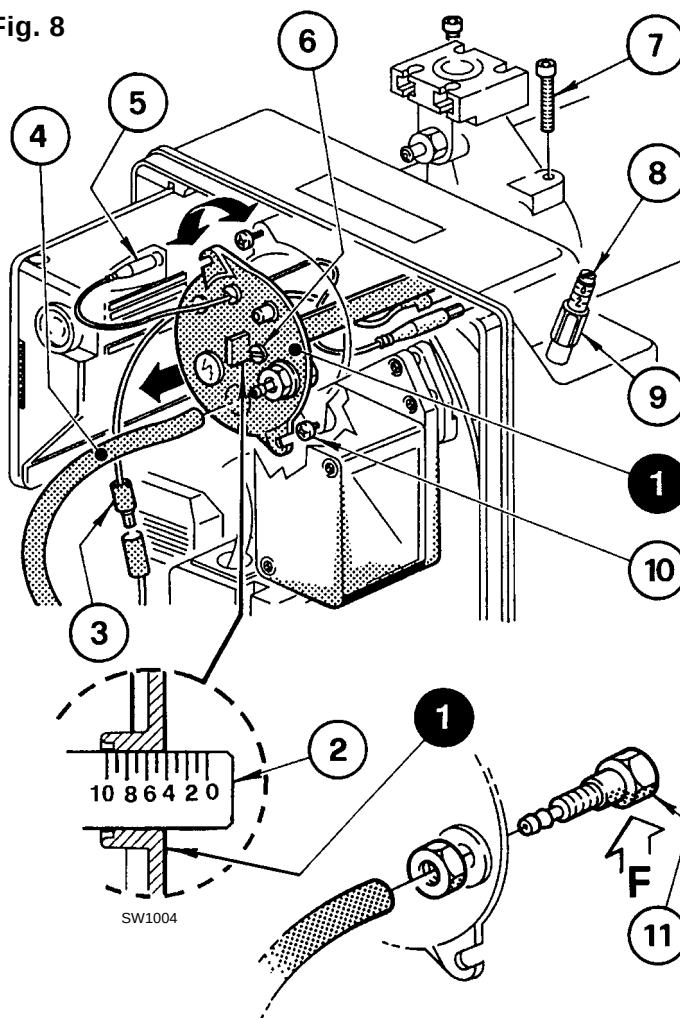
Example:

The burner is installed in a 210 kW boiler.
The burner will have to deliver about 230 kW, considering an efficiency of 90%.
The diagram indicates, that for this efficiency the adjustment has to be effected on the set-point 4.

NOTE

The diagram is orientative; to assure a good working of the burner, we suggest to adjust the combustion head according to the boiler.

Fig. 8



HEAD ASSEMBLY REMOVING, (see fig. 8, page 8)

To remove the head assembly, carry out the following operations:

Remove the head-older assembly (1), after taking away the screws (7), disconnect the connections (3 and 5), extract the small tube (4) and loose the screws (10).

Do not modify the setting position of the bracket-elbow during the disassembly.

REASSEMBLY OF THE HEAD SYSTEM, (see fig. 8, page 8)

Warning

- During the reassembly of the system, tighten the screws (7) completely (*without locking them*); then lock them with a torque wrench setting of 3 - 4 Nm.
- Control that, during the working, there are not gas losses coming from the screws.
- If casually the pressure test point (11) looses, fix correctly and be sure that the hole (F), placed in the external side of the head-assembly (1) turns towards the lower part.

4.3 AIR DAMPER SETTING, (see fig. 8, page 8)

WARNING

Do not carry out the first ignition with the air damper lower than set point 1.

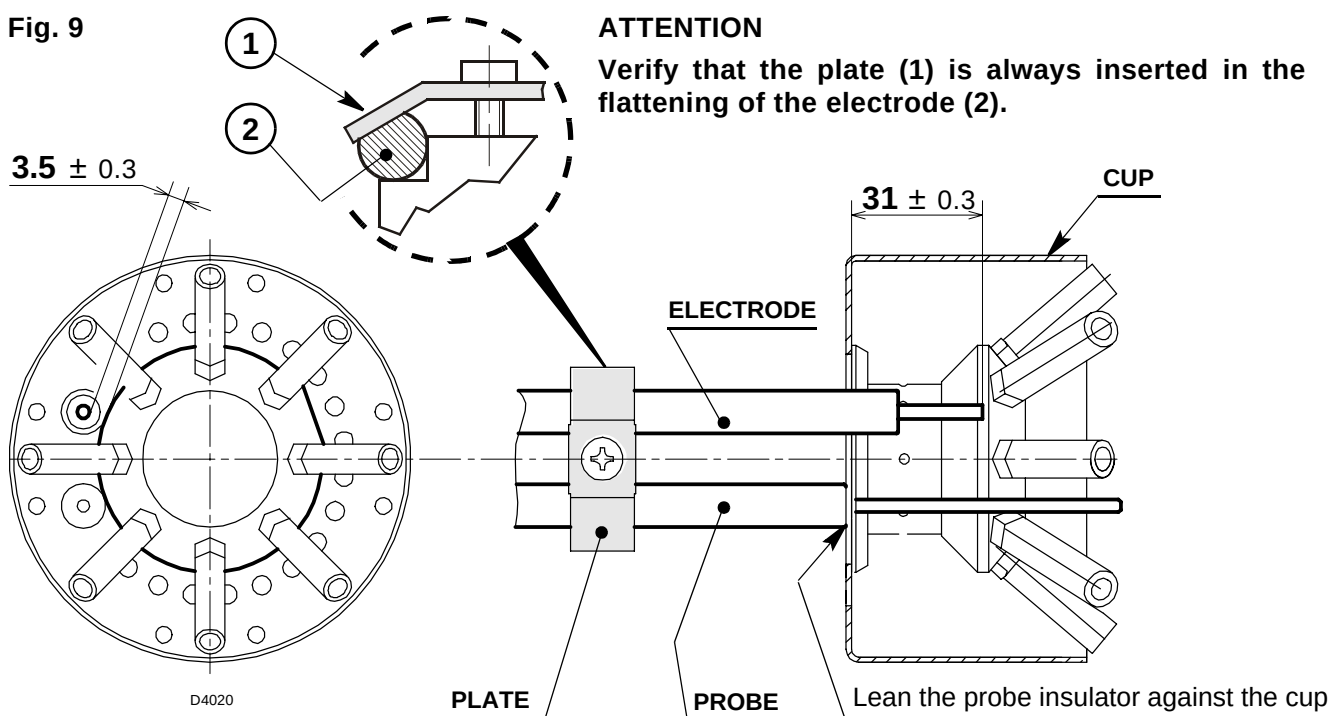
The air damper leaves the factory set for minimum output.

To vary the setting proceed as follows:

- Loosen the nut (9) and the screws (8).
- When the burner shuts down the air damper closes automatically until a max. chimney depression of 0.5 mbar is reached.

4.4 PROBE - ELECTRODE POSITIONING, (see fig. 9)

Fig. 9



4.5 COMBUSTION CHECK

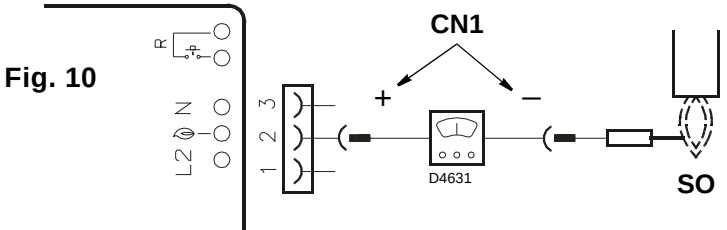
It is advisable to set the burner according to the type of gas used and following the indications of the table:

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

IONIZATION CURRENT

The minimum current necessary for the control box operation is 5 μ A.

The burner normally supplies a higher current value, so that no check is needed. Anyway, if you want to measure the ionization current, you have to open the connector (CN1) (see electrical scheme page 7) fitted on the wire and insert a microammeter.



4.6 AIR PRESSURE SWITCH

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale.

With the burner operating at the required power, slowly turn knob clockwise until burner locks out. Then turn the knob anti-clockwise by about 20% of the set point and subsequently check to see if burner has started correctly. If the burner locks out again, turn the knob anti-clockwise a little bit more.

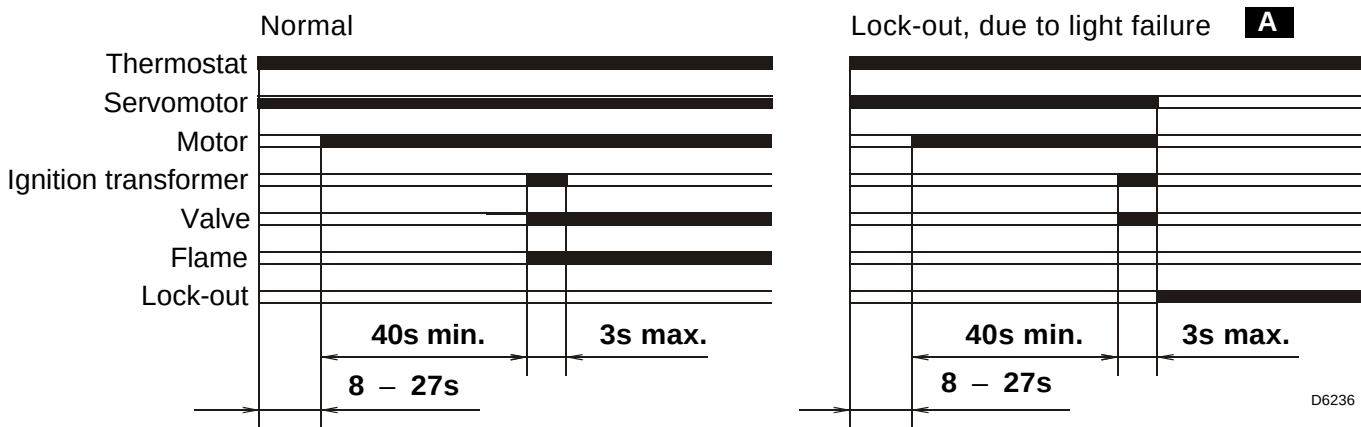
The burner leaves the factory with the pressure switch set at the beginning of the scale.

Attention:

As a rule, the air pressure switch must prevent the air pressure from lowering below 80% of the adjustment value as well as preventing the CO in the fumes from exceeding 1% (10,000 ppm).

To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 1%.

4.7 BURNER START-UP CYCLE



A Lock-out is indicated by a lamp on the control box (4, fig. 1, page 2).

4.8 RE-CYCLE FUNCTION

The control box allows re-cycling, i.e. the complete repetition of the starting programme, for 3 attempts maximum, in the event the flame goes out during operation.

4.9 POST-VENTILATION FUNCTION

Post-ventilation is a function that maintains air ventilation even after the burner is switched off. The burner switches off when the limit thermostat (TL) opens, cutting off the fuel supply to the valves.

To use this function the reset button must be pressed when the limit thermostat is not switched over (**BURNER SWITCHED OFF**).

Post-ventilation time can be set to a maximum of 6 minutes. Proceed as follows:

- Press and hold the reset button for at least 5 seconds till the LED indicator changes to red.
- Set the desired time pressing the button repeatedly: **once = post-ventilation for 1 minute.**
- After 5 seconds the control box automatically shows the minutes set by the red LED flashing:
1 pulse = post-ventilation for 1 minute.

To reset this function, press and hold the button for at least 5 seconds at least, till the LED indicator changes to red then release it without carrying out any operation, then wait for 20 seconds for the burner to start.

If during post-ventilation there is a new request for heat, post-ventilation time is halted and a new operating cycle starts when the limit thermostat (TL) switches over.

The control box leaves the factory with the following setting: **0 minutes = no post-ventilation.**

4.10 CONTROL BOX RESET

To carry out the control box reset, proceed as follows:

- Press the reset button for at least 1 second.
In the event of the burner not restarting it is necessary to check if the limit thermostat (TL) is closed.

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 at regular intervals that the holes of the gas head are not obstructed. If they are, clean them with a suitable tool as shown in the figure 11.
- Check there are no occlusions or obstructions in the inlet or return pipes, in the air suction areas and in the combustion product waste pipe.
- Check that the burner and gas train electrical connections are correct.
- Check that the positioning of the air pressure test point (6, fig. 1, page 2) 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 damper is positioned correctly.

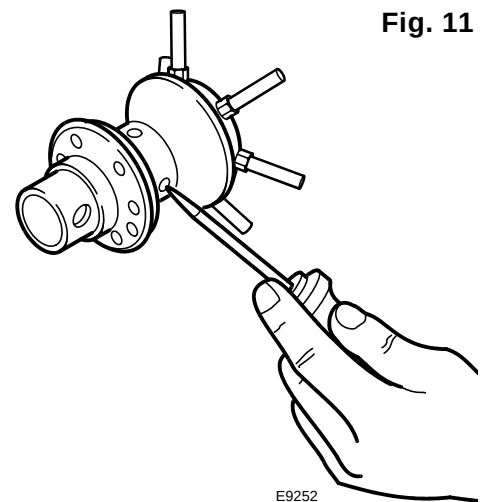


Fig. 11

- Check that the ionisation probe and the electrode are positioned correctly (see fig. 9, page 9).
- Check that the air pressure switch and the gas pressure switch are set 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:

- CO₂ percentage (%); ● CO content (ppm); ● NO_x content (ppm); ● Ionisation current (μA);
- Flue gases temperature at the stack.

5.1 VISUAL DIAGNOSTIC CONTROL BOX

The control box has a diagnostic function that can identify the likely causes of any malfunctions (indicator: **RED LED**).

In order to be able to use this function, press and hold the reset button for at least 3 seconds from when the appliance is made safe (**lock-out**).

The control box sends a sequence of pulses that are repeated at 2-second intervals.

RED LED illuminated press reset for 3 sec.	Pulses	Interval 2s	Pulses
	● ● ● ● ●		● ● ● ● ●

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 ● ● ●	Min. air pressure switch does not close or is already closed before the limit thermostat closed: – air pressure switch faulty; – air pressure switch incorrectly regulated.
4 pulses ● ● ● ●	Light present in the chamber before the burner's switching on or off: – presence of a strange light before or after the limit thermostat switching over; – presence of a strange light during pre-ventilation; – presence of a strange light during post-ventilation.
6 pulses ● ● ● ● ● ●	Loss of ventilation air: – air loss during pre-ventilation; – air loss during and after safety time.
7 pulses ● ● ● ● ● ● ●	Loss of flame during operations: – poor burner regulation (insufficient gas); – faulty or soiled gas valves; – short circuit between ionisation probe and earth.

ATTENTION To reset the control box after the diagnostics display, press the lockout-reset button.

6. 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 (4, fig. 1, page 2).

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.

6.1 START-UP PROBLEMS

FAULTS	POSSIBLE CAUSES	SOLUTION
The burner doesn't start when the limit thermostat closes.	Lack of electrical supply.	Check presence of voltage in the L1 - N clamps of the 7 pin plug.
		Check the condition of the fuses.
		Check that safety thermostat is not lock out.
	Lack of gas.	Check the manual cock opening.
		Check that the valves charge over to the opening position and there are not short circuits.
	The gas pressure switch does not close its contact.	Adjust them.
	The connections in the control box are wrongly inserted.	Check and connect all the plugs.
	The air pressure switch is changed over to the operational position.	Replace the pressure switch.
The burner runs normally in the prepurge and ignition cycle and locks out after about 3 seconds.	The servomotor is locked.	Check the right electrical connection.
		The servomotor doesn't close completely and therefore it doesn't pull in the burner ignition micro: check the micro working.
	Phase and neutral connection is inverted.	Invert them.
	The earth connection lacks or is inefficient.	Make the earth connection efficient.
	The ionization probe is earthed or not in contact with the flame, or its wiring to the control box is broken, or there is a fault on its insulation to the earth.	Check the right position and if necessary set it according to the instructions of this manual.
		Reset the electrical connection.
The burner starts with an ignition delay.	The ignition electrodes is wrongly positioned.	Replace the faulty connection.
		Adjust it according to the instructions of this manual.
	Air output is too high.	Set the air output according to the instructions of this manual.
	Valve brake is too close with insufficient gas output.	Adjust it.

FAULTS	POSSIBLE CAUSES	SOLUTION
The burner locks out after the prepurge phase due to flame-failure.	The solenoid valves is passing too little gas.	Check the pressure in the network and/or adjust the solenoid valve according to the instructions of this manual.
	The solenoid valves are defective.	Change them
	The ignition arc is irregular or has failed.	Check the right insertion of the connectors.
		Check the right position of the electrode according to the instructions of this manual.
	The pipe has not been purged from the air.	Carry out a complete breathing of the line of gas-supply.
The burner locks out during the prepurge phase.	The air pressure switch does not change over to the operational position.	The pressure switch is faulty, change it.
		The air pressure is too low, (the head is bad adjusted).
	The flame exists.	Faulty valves: replace them.
	The pressure test point (11, fig. 8, page 8) is badly positioned.	Place it in the right position according to the instructions of this manual on page 8, chapter 4.2.
The burner continues to repeat the starting cycle without going on lock-out.	The gas pressure in the gas-mains lies very close to the value to which the gas pressure switch has been set. The sudden falling-off pressure at the opening of the valve causes the opening of the pressure switch. However this only temporarily, because the valve immediately closes again, so then does the pressure switch, because the pressure builds-up again, causing the cycle to be repeated over and over.	Lower and set the pressure switch.

6.2 OPERATING IRREGULARITIES

FAULTS	POSSIBLE CAUSES	SOLUTION
The burner locks out during operation.	Earth probe.	Check the right position and if necessary set it according to the instructions of this manual.
		Clean or replace the ionization probe.
	The flame disappears 4 times.	Check the gas pressure in the network and/or adjust the solenoid valve according to the instructions of this manual.
	Air pressure switch opening.	The air pressure is too low, (the head is bad adjusted).
		The air pressure switch is faulty, change it.
Burner shut down.	Gas pressure switch opening.	Check the pressure in the network and/or adjust the solenoid valve according to the instructions of this manual.

7. SAFETY WARNINGS

The dimension of the boiler's combustion chamber must respond to specific values, in order to guarantee a combustion with the lowest polluting emissions rate.

The Technical Service Personnel will be glad to give you all the information for a correct matching of this burner to the boiler.

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

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

7.1 BURNER IDENTIFICATION

The Identification Plate on the product gives the serial number, model and main technical and performance data. If the Identification Plate is tampered with, removed or missing, the product cannot be clearly identified thus making any installation or maintenance work potentially dangerous.

7.2 BASIC SAFETY RULES

- Children or inexperienced persons must not use the appliance.
- Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.
- Unauthorised persons must not attempt to repair the appliance.
- It is dangerous to pull or twist the electric leads.
- Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.
- Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not place anything on the burner.
- Do not block or reduce the size of the ventilation vents in the installation room.
- Do not leave containers and inflammable products in the installation room.