

Handbook

Series SG Fully Automatic Gas Burners Models SG 18A & SG 18C

BURNER CAPACITY

SG 18A

190 kW (650,000Btu/h) Min.
293 kW (1,000,000Btu/h) Max.

SG 18C

278 kW (950,000Btu/h) Min.
425 kW (1,450,000Btu/h) Max.

THE SELECTOS RANGE

The Selectos SG 18 range of fully automatic gas burners are designed to meet the requirements of BS 5885.

The range is suitable for modern boilers, air heaters and process applications.

CONSTRUCTION

A monobloc metric design, the burners are suitable for flange mounting to the boiler/air heater frontplate.

The burners are delivered with a pre-wired packaged control system and simple plug in gas train arrangement for 1" gas inlet connection.

AIR REGULATION

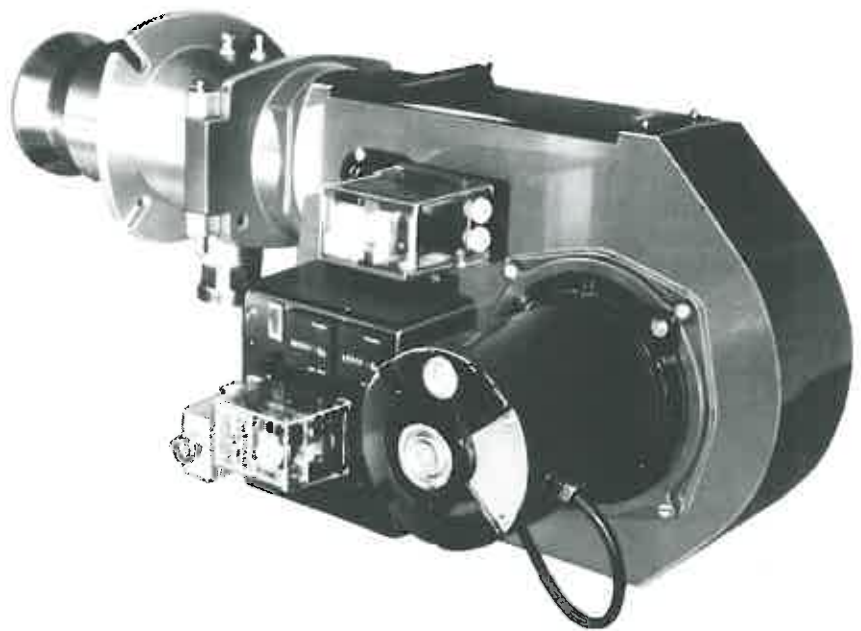
Air for combustion can be adjusted to give maximum efficiency.

CONTROLS

Flame supervision is by ionisation probe and automatic sequence control.

OPERATION

Single Stage (On/Off).
Two Stage (High/Low) and Modulating operation are available on request.



FUEL

Natural Gas at 178mm (7"Wg)
Special requirements on request.
i.e. Liquid Petroleum Gas/Towns Gas.

OPTIONAL EXTRAS

Fully Closing Air Damper (F.C.A.D.)
U.V. Flame supervision

INTRODUCTION

The SG18 is a fully automatic gas burner, designed to meet the requirements of BS 5885, and to be suitable for modern boilers, air heaters and process applications.

The burner should be installed and commissioned in accordance with these instructions by an experienced qualified engineer. Attention is also drawn to the Gas Safety Regulations.

These instructions cover standard burners and general applications. Where the burner is supplied as part of a matched tested unit the appliance manufacturers recommendations, regarding any specific combustion head settings, etc, should be followed. The burner and gas line are supplied disconnected, they are reconnected by means of a gas union and non-interchangeable electrical plugs and sockets. The burner is supplied complete with pre-wired controls and an assembled and pre-wired gas line. Electrical connections to the burner should be carried out in accordance with the wiring diagram supplied with the burner.

TECHNICAL DATA

Capacity		
SG 18A with GL 161 Gas Line		
Firing Rate	kW	Btu/h
Min.	190	650,000
Max.	293	1,000,000
SG 18C with GL 181 Gas Line		
Firing Rate	kW	Btu/h
Min.	278	950,000
Max.	425	1,450,000

Fuel : Natural Gas or L.P.G.

Burner Inlet Pressure

mbar (in w.g.) min. 17.5 (7.0)
max. 40.0 (16.0)

Electricity Supply

240V 1ph 50Hz or 415V 3ph 50Hz

Max. power demand, during ignition, approx 600 VA

Ambient Temperature

Maximum 60°C

Inlet Gas Connection

Gas lines GL 161 1" BSP & GL181 1½" BSP

INSTALLATION

Burner Mounting

The burner should be securely mounted on the appliance by means of the fixing flange, and using the gasket provided.

The size of the burner entry hole, and location of studs or bolts required is shown on the back cover of this handbook.

Gas Control Line

The gas control valve line assembly, Figs 4 & 5, should be connected to the burner extension manifold by means of the union nut. The gas line may be fitted on the left or right hand side of the burner and the plugs on the end of the flexible leads should be plugged in to the non-interchangeable sockets provided on the junction box.

Gas Supply

The gas supply pipe must be of adequate size to meet the pressure requirements specified in the Technical Data section.

The supply should have a main service cock fitted as close to the burner as possible and be adequately supported to avoid undue strain on the burner gas line.

Electrical Supply

An isolating switch should be fitted as close as possible to the appliance, and the supply protected by a fuse as specified in the Technical Data section. At least the last 450mm (18") of the supply to the burner, and also any connections to a thermostat should be run in flexible conduit to permit burner removal.

The supply must be properly earthed and wired to the wiring diagram provided.

Air Supply

To ensure an adequate supply of air for combustion, the room in which the burner is installed must be permanently ventilated from a fresh air inlet at least 40 sq.mm per kW (1 sq.in. per 5000 btu/h). This in addition to any air requirements for other appliances.

Combustion Chamber Pressure

Check that the operating combustion chamber pressure is within the range for the burner, see burner selection chart.

COMMISSIONING

Test Safety Shut Off Valves

Using a 0-30 mbar (0-12in w.g.) manometer, and referring to Fig.3, carry out the following sequence. Check that the electrical isolation switch is **OFF**. Close gas cocks C1, C2 and C3.

Main valve No.1

Link test points A and B (by removing the test nipple screws and connecting the nipples using rubber or plastic tube)

Connect manometer to test point C
Open main gas cock C1

After at least one minute (it takes time for pressure to either side of the pressure regulator to equalise because of the small orifices in the test nipples), check that there is no increase in pressure at the manometer, thus checking that the valve is not letting by.

Main valve No.2

Close gas cock C1
Link test points A and C
Connect manometer to test point D
Replace nipple screw B
Open gas cock C1
After one minute check that there is no pressure at the manometer.

Start gas valve No.1

Close gas cock C1
Link test points A and E
Connect manometer to test point F
Replace nipple screws C and D
Open gas cock C1
After one minute check manometer as before

Start gas valve No.2 (when fitted)

Close gas cock C1
Link test points A and F
Connect manometer to test point G
Replace nipple screw E
Open gas cock C1
After one minute check manometer as before

On completion of these checks close gas cock C1, disconnect the link and manometer and replace nipple screws.

Calculate Gas Rate

If the required gas rate is not specified it may be calculated approximately from the following formula, which assumes a typical calorific value of 34.7 MJ/m³ and an efficiency of 86% nett:-

$$\text{Gas Rate (dm}^3\text{/S)} = \frac{\text{Appliance Output (kW)}}{30}$$

$$\text{or Gas Rate (ft}^3\text{/h)} = 17 \frac{\text{Appliance Output (kW)}}{4}$$

It should be noted that gas rates are quoted in this document at standard conditions of 15°C and 1013 mbar. If the temperature and pressure differ significantly from these figures, it will be necessary to make corrections to obtain the actual gas rate to be set.

Set Combustion Head

SG18A

The venturi flame ring assembly is adjustable longitudinally so that the restriction between the flame ring and the throat of the draught tube effectively meters the combustion air and therefore the assembly should be set to approximately the position corresponding to the required gas rate, in accordance with Fig.7.

Method of adjustment

Undo the two safety bolts of the hinged extension.

Remove one hinge pin on the opposite side to that which it is required to swing the burner.

Unplug the flexible leads from the junction box.

Swing burner body away slowly, at the same time unclipping the ignition and flame detector leads.

Referring to fig.1

Undo lock nutted clamping bolt.

Lift out venturi flame ring assembly.

Undo socket set screw.

Adjust the position of the assembly in the socket of the supporting elbow, aligning the required scribed 'ring No.' against the end of socket.

Secure set screw and replace assembly in reverse order taking care that the assembly sits squarely on the gas inlet spigot and is securely locked in position by its clamping bolt, and that as the burner is swung

back into position the ignition and flame detector leads are carefully clipped back on to their respective electrodes (the terminal ends are dissimilar so that they cannot be wrongly connected).

SG18C

The gas head on this burner factory set.

Start Up

With the air intake damper still fully open the procedure for starting up should be as follows.

Check Lockout Function (Refer to fig.3)

With both cocks C2 and C3 closed, but the gas service cock C1 open, switch on the electricity. After about 10 seconds delay the burner should start and run for about 45 seconds then lockout as indicated by illumination of the re-set button on the control box.

Set Start Gas Rate

Open the start gas cock C3 and press the re-set button to restart the burner. This time, after 45 seconds, the burner should ignite and run, on start gas flame only.

Check the start gas rate on the gas meter. As a guide, the rate can be estimated by measuring the start gas governor outlet pressure at test nipple E and referring to Fig. 7.

If necessary alter the rate by removing the start gas governor cap and adjusting the exposed screw; clockwise to increase and anticlockwise to decrease. The rate should be 12% of the intended maximum firing rate. This is equivalent to 10% of the stoichiometric gas rate corresponding to the proved air purge rate, as stipulated in BS 5885.

Set Main Gas Rate

With the burner still operating, slowly open the main gas cock C2 allowing the gas rate to increase.

Check the total gas rate on the gas meter. As a guide, the rate can be estimated by measuring the main gas governor outlet pressure at test nipple B and referring to Fig. 7.

If necessary alter the rate by removing the main gas governor cap and adjusting the exposed screw; clockwise to increase and anticlockwise to decrease.

Check Combustion

Using recognised testing instruments check the CO₂ (carbon dioxide) and the O₂ (oxygen) percentage in the flue gases at the appliance flue outlet.

SG18A

To increase the CO₂, move the venturi flame ring backwards, and to decrease the CO₂, move the venturi flame ring forwards.

The CO₂ should be set to between 8 and 9% by this method but final tuning to obtain the optimum of 9%

(or 4.5% Oxygen) can be carried out by trimming the air intake flap.

SG18C

The CO₂ should be set as close as possible to the optimum of 9% (4.5% Oxygen) by adjustment of the air intake flap. This flap should be tightened securely when final settings have been reached.

Note : In the interest of safety measure the CO (carbon monoxide) percentage. The ratio of CO/CO₂ should not exceed 0.02.

Set Air Proving Switch

Remove the cover from the pressure switch (taking care to avoid touching live terminals) and turn the dial to increase the reading on the scale until the burner stops. Reverse the rotation of the dial by 3 stops and the burner should restart.

Check Ancillary Controls

Before leaving the site check that any thermostats or other safety limit controls are working correctly and are capable of switching the burner off.

Advice to User

Make sure that the user knows how to switch the burner off and where to close the main gas supply in the event of an emergency.

SERVICING

Very little attention is required except for cleaning any deposits from the burner fan and combustion head. The interval between service depends on the frequency of use but it is recommended that the burner should be checked two or three times a year.

Clean Burner

Switch off electricity and close the service cock.

Combustion Head

Swing aside burner housing and remove combustion head assembly.

Clean any deposits from the assembly and from the draught tube.

Inspect, and if necessary, adjust the ignition and flame detection electrodes. Replace if eroded.

Fan and Housing

Undo screw and remove access cover and clean the fan. If necessary undo motor retaining bolts and withdraw the motor and fan unit sufficiently to clean the fan properly and remove deposits from the housing. When replacing, make sure that the motor spigot is correctly located in the housing.

Carefully re-assemble the burner and restore gas and electricity.

Re-operating the Burner

Test the shut off valves for leakage, check the lockout function and when the burner has operated for at least ten minutes, check the combustion as detailed in the Commissioning section.

FAULT FINDING

The burner incorporates well tried and tested components but faults do sometimes arise and this simple guide covers the more likely eventualities.

Symptom & Possible Cause	Remedy
Does not start No electricity	Check that thermostats and time switches are in the energised position Check that there is a live supply to the appropriate terminal(s) of the control box. Check fuses.
Flame detector electrode or lead shorting to earth	Switch off and inspect leads and electrodes and check for open or short circuits.
Air pressure switch	Check that the pressure switch has been set correctly. (see Commissioning Instructions). Check for blockage of the ports and tube. Check that the switch contacts have returned to the 'No Air' state.
Starts and Locks Out No gas	Check that all gas cocks are open. Check that the gas valve leads are correctly plugged into the junction box. Check presence of gas with a manometer on the test point on the outlet of the start gas governor.
Air pressure switch	Check that the air pressure switch is not set too high. Adjust if necessary.
No ignition	Switch off and check the ignition lead and electrode for open or short circuit
Start gas rate	Increase start gas rate governor pressure and adjust to the correct rate
Flame signal	Check that the burner is properly earthed. Check flame signal with micrometer. If less than 5 (A), check location and condition of the flame detection probe. Check polarity of the transformer leads. If necessary, reverse live and neutral connections of the transformer at the control box.
Main gas rate	This may be too high. Adjust the main governor to a lower setting. When the burner operates, set it to give the correct input.
Combustion head	Check settings and adjust if necessary.
Air/Fuel ratio	Check combustion.

CONTROL BOX

The following information may be found useful in following the operation of the burner:-

Satronic MMI 810 Mod 45 Control Box

A coloured programme indicator on the control box shows each step of the start-up and shutdown sequences. These are as follows:-

Blue line on White	Start position.
Start of Blue sector	Pre-urge start.
Red line in Blue sector	Air supply proved.
Blue sector	Pre-purge.
End of Blue sector/ start of Yellow	End of pre-purge, start of ignition safety time and initial firing.
End of Yellow/start of Red	Lockout position due to ignition or detection failure.
Red sector	Start flame proving period
End of Red/start of Green	Main flame stage.
End of Green/start of White	Run position.

FIG. 1.
SG18A. COMBUSTION HEAD

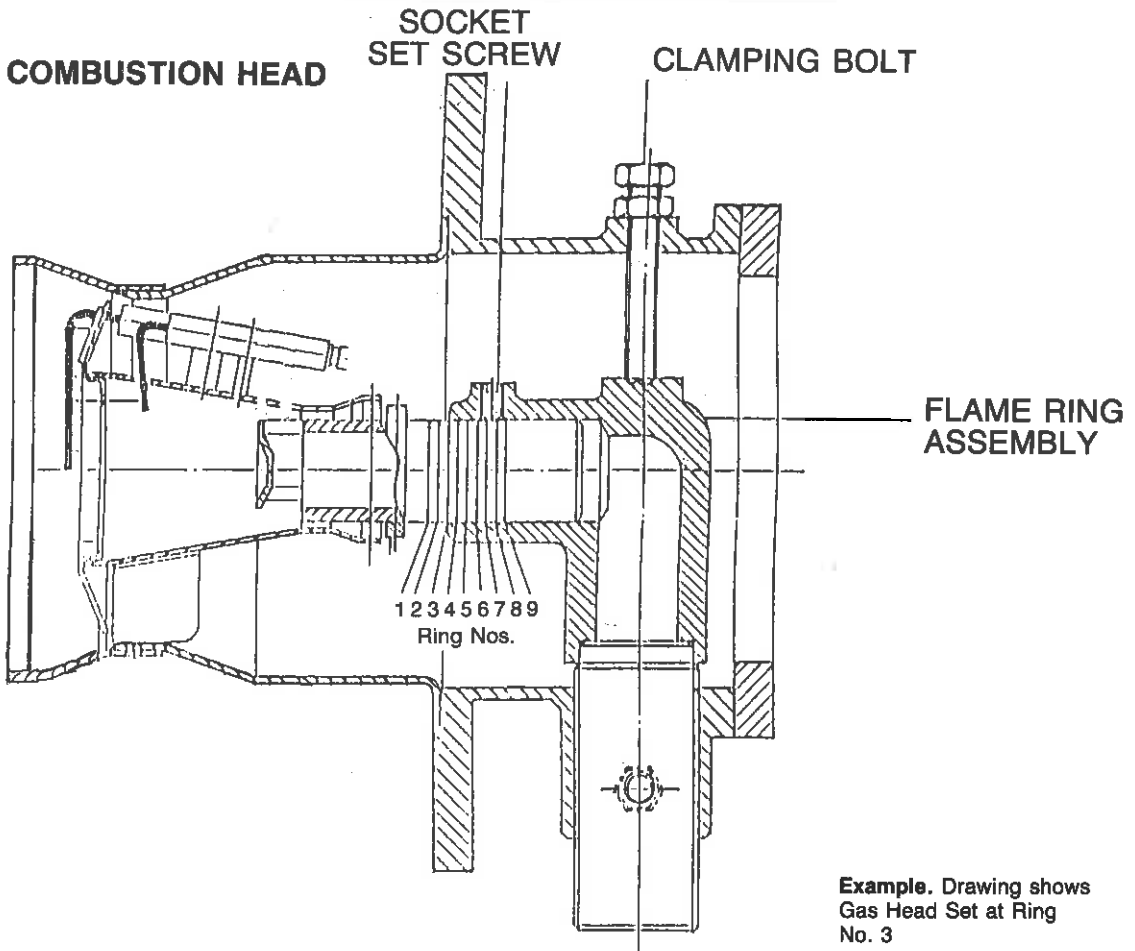


FIG. 2. SG18C COMBUSTION HEAD

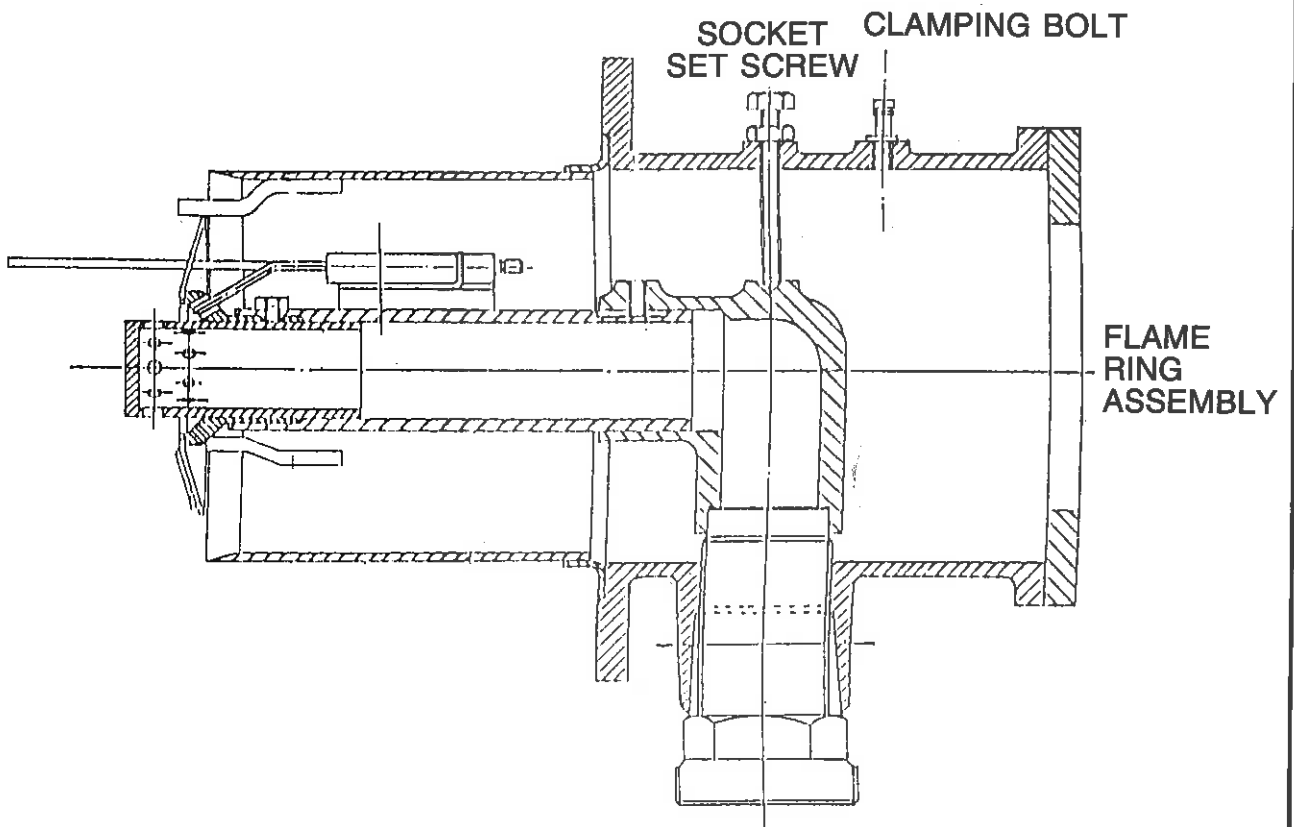


FIG. 3.

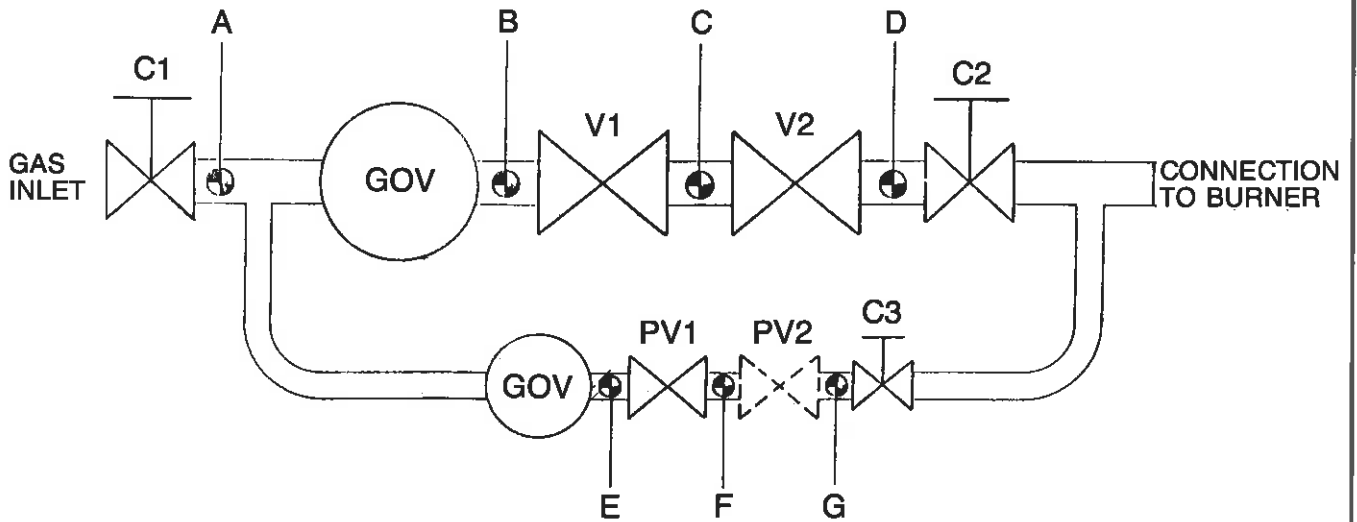


FIG. 4. SG18A GAS CONTROL LINE

Flexible Leads To Be Plugged Into Burner Junction Box

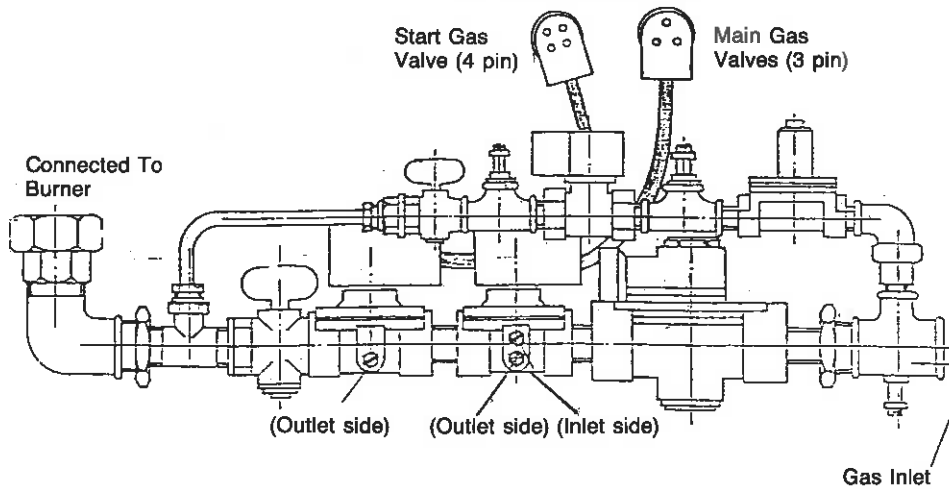


FIG. 5. SG18C GAS CONTROL LINE

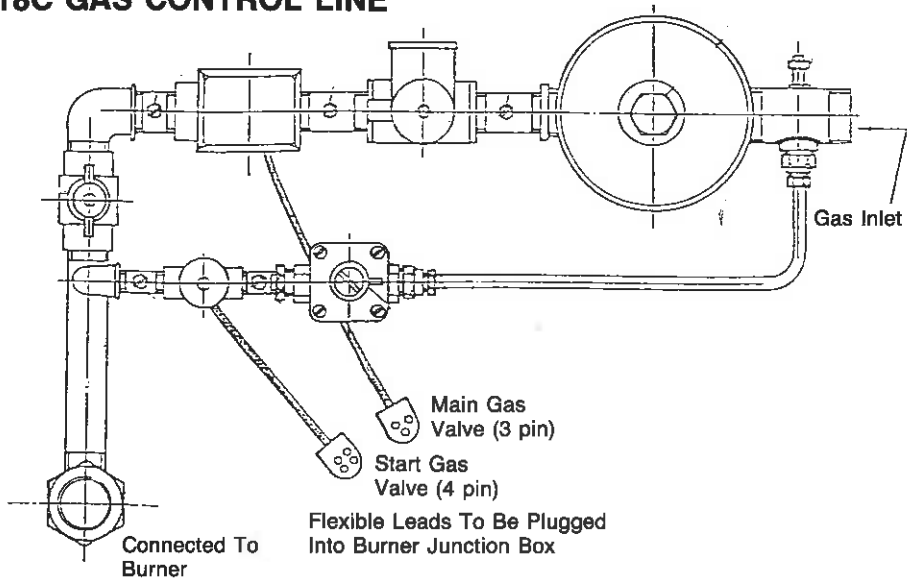
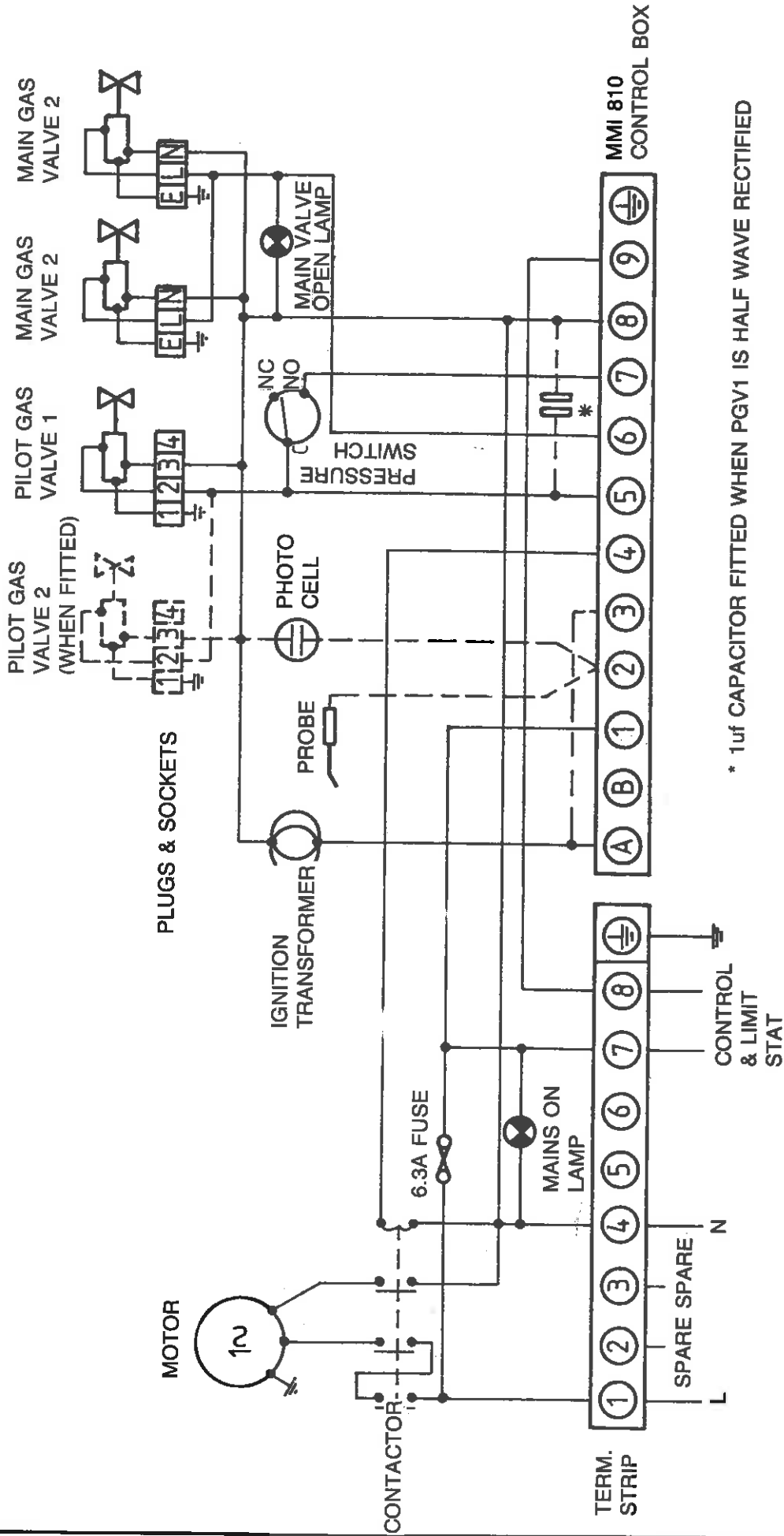


FIG. 6. SG18 ON/OFF IPH MMI 810 WIRING DIAGRAM

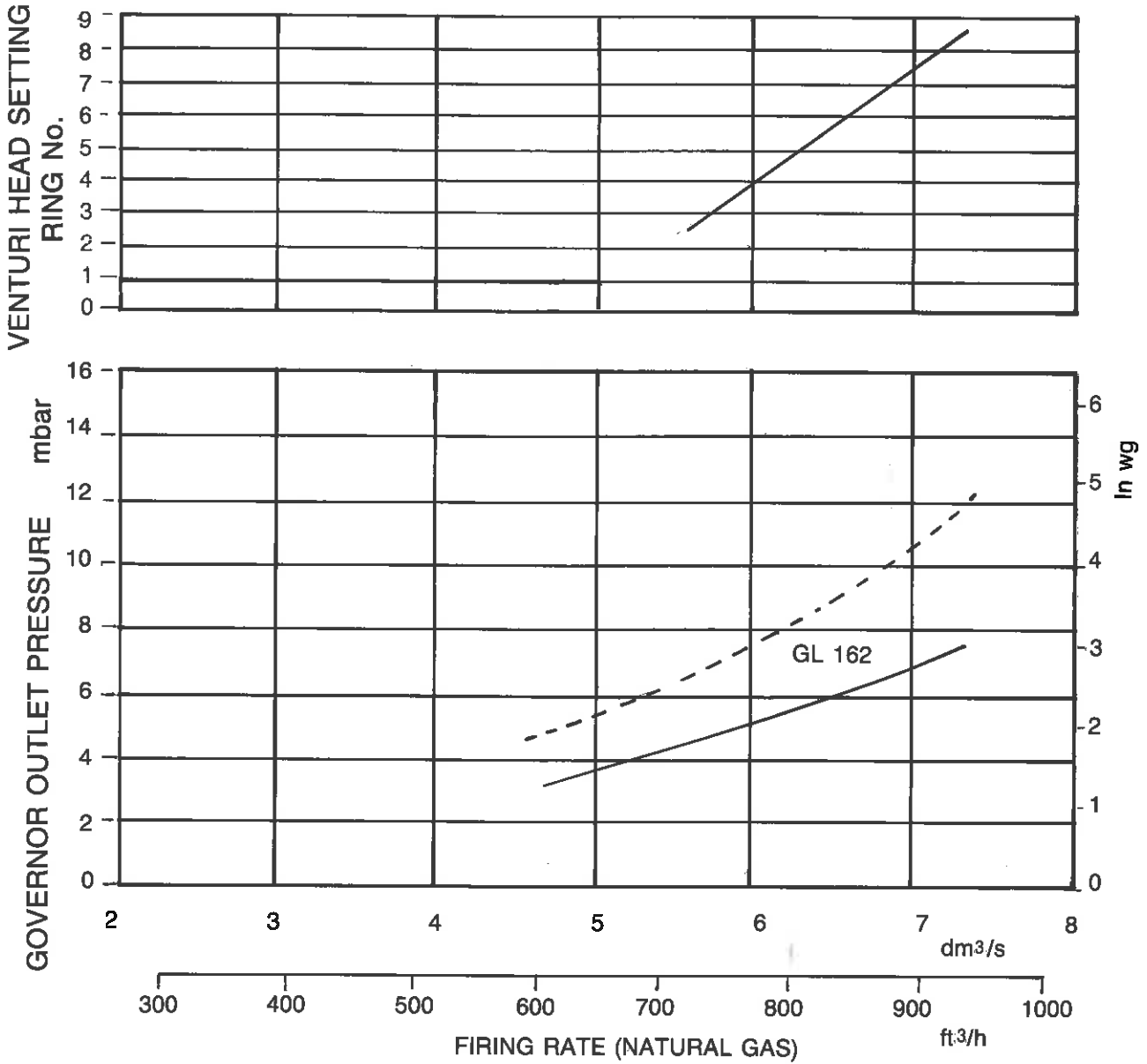


* 1uf CAPACITOR FITTED WHEN PGV1 IS HALF WAVE RECTIFIED

FIG. 7. GAS RATE v. GOVERNOR OUTLET PRESSURE

Notes:

- 1) Gas rates should be checked by meter wherever possible.
- 2) The settings below are approximate and for near zero firebox pressure. Where there is positive pressure in the firebox the governor outlet pressure required will be higher and also it may be necessary to set the venturi head one or two Ring Nos. higher than shown.



(The dotted lines show the corresponding start gas governor outlet pressures to give 12% of the full gas rates shown, as in section 4.4.2.)

FIG. 8. RELATIONSHIP BETWEEN CO & EXCESS AIR

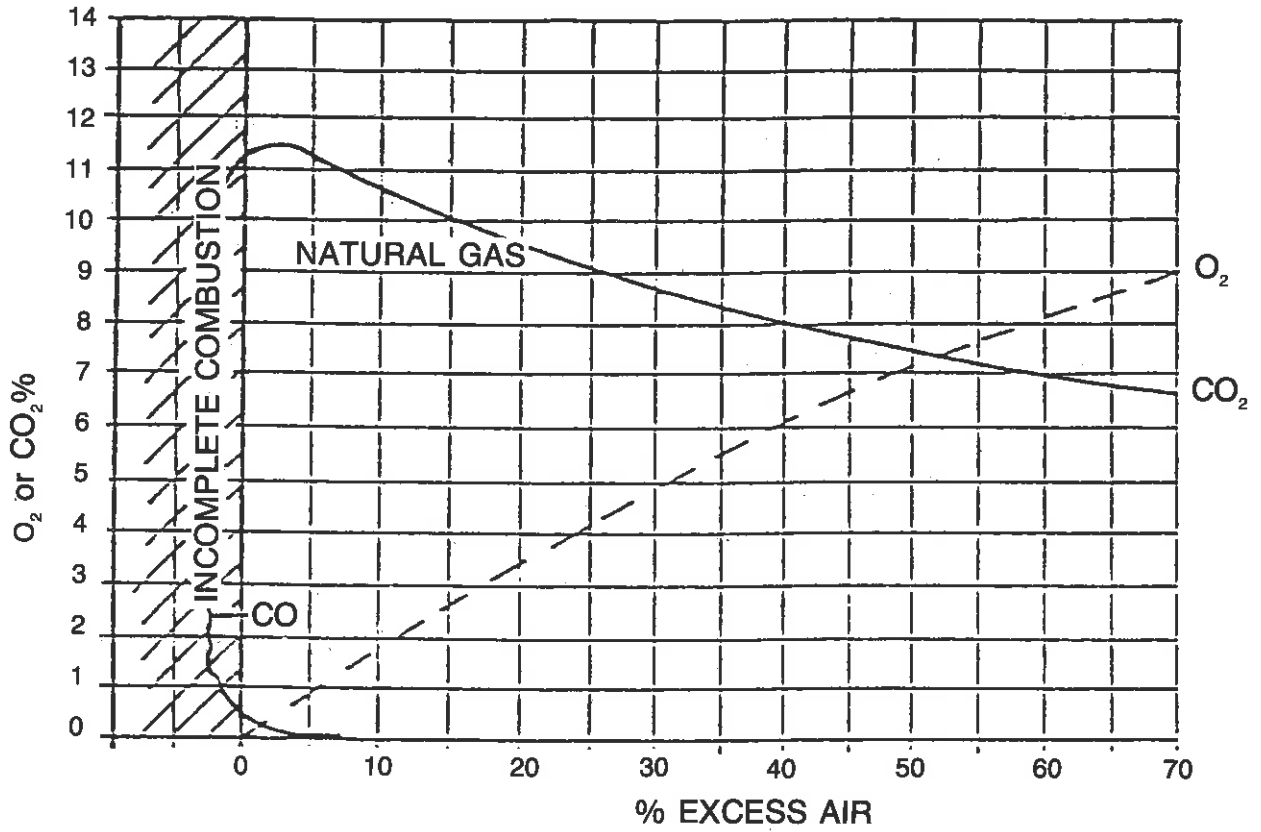


FIG. 9. CHART FOR ESTIMATION OF NET FLUE LOSS

