

Installation & Maintenance Manual

Series NG fully automatic gas burner Model NG3/NG5 (On/Off Only)

Gas Burner

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IMPORTANT - SAFETY

It is essential that the following instructions and adjustments are carried out by qualified engineers that are experienced in blown gas burner commissioning. In the U.K. it is a legal requirement that these engineers should also be CORGI registered. The manufacturer cannot be held responsible for any consequential damage, loss or personal injury as a result of customers failing to follow these instructions, or as a result of misuse.

EUROPEAN BOILER EFFICIENCY DIRECTIVE (B.E.D.)

All burners and boiler bodies marked separately should comply with EN267 (oil burners) or EN676 (gas burners) and EN303-1 (boiler bodies).

Burner adjustments must be made in accordance with boiler manufacturer's instructions, and these must include flue gas temperatures, average water temperature, and CO₂ or O₂ concentration.

FEATURES

Burner Capacity

NGN3 62kW to 121kW

NGN5 73kW to 174kW

(Based on a gross C.V. for Natural Gas 38.56 MJ/m³)

The NG Series

Developed from field experiences in the UK and overseas markets, the NG series sets new standards in efficient and reliable operation, having been developed to current and future test authority requirements in UK and overseas markets. Delivered ready to install with prewired packaged control system and simple plug in gas train arrangement with multiblock gas valve.

Air Regulation

Air for combustion can be adjusted to give maximum efficiency. A patented air control device produces smooth start conditions.

Controls

Flame supervision is by ionisation probe and automatic sequence control.

Operation

Single stage (On/Off). Two stage and modulating speed control variations are offered; refer to the Speed Control handbook for further details.

Fuel

Natural Gas at 20.0 mbar. Special requirements on request, e.g. Liquid Petroleum Gas / Town Gas.

Electrical Data

Mains Supply 230V±15%

Frequency 50Hz

Burner Motor 75W

Start Current 1.0A

Main Fuse 5A

Optional Extras

Fully Closing Air Damper

Approx. Weight

22.5 kg.

GENERAL

This manual is structured to enable the user to proceed from the delivery of the burner to its commissioning and use. The conditions to be fulfilled and the controls and adjustments to be used are dealt with in the sequence that should be followed for the correct assembly installation and use. *Pre-commissioning Dry Run* and *Commissioning - Live Run* are described and the location of necessary controls and adjustments to undertake these runs are illustrated and supported by appropriate tabular matter and graphs. *Commissioning & Routine Safety Checks, Fault Finding, Spare Parts Identification* and *Wiring Diagrams* complete the manual; literature on proprietary components is available on request. *Check and identify that the burner type is appropriate for the appliance rating and fuel type. Detailed burner performance data is given in the Technical Specifications section at the back of this handbook. Under no circumstances attempt to install or commission a burner of the incorrect fuel type. If in doubt please contact the manufacturer for assistance.*

Flue and Chimney Requirements

The top of the chimney/flue should be above all roofs within a radius of 10m. Check that it is suitable for use with gas fired appliances. Reference should be made to Local Authority and other regulations governing such installations. Ensure that the flue pipe from the appliance does not protrude into the chimney beyond the wall thickness. If more than one appliance is connected to a common flue/chimney, ensure that the cross section of the flue/chimney is adequate for the total volume of flue gases from all the appliances.

Plant Room Ventilation

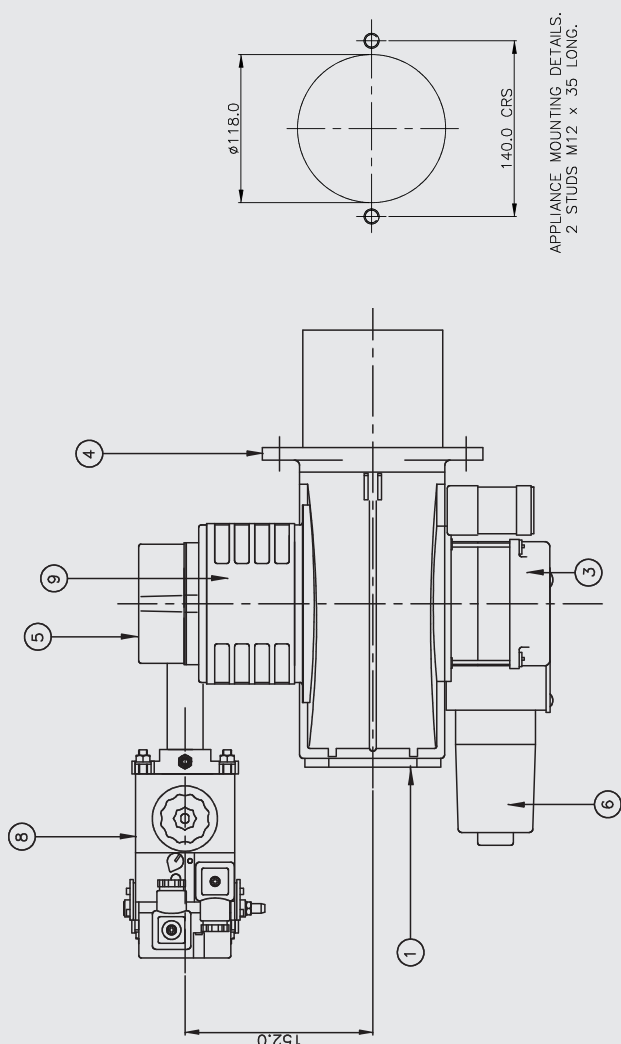
An adequate dust free supply of fresh air is required for the burner at both high and low level in accordance with the appropriate standards.

Existing Appliances

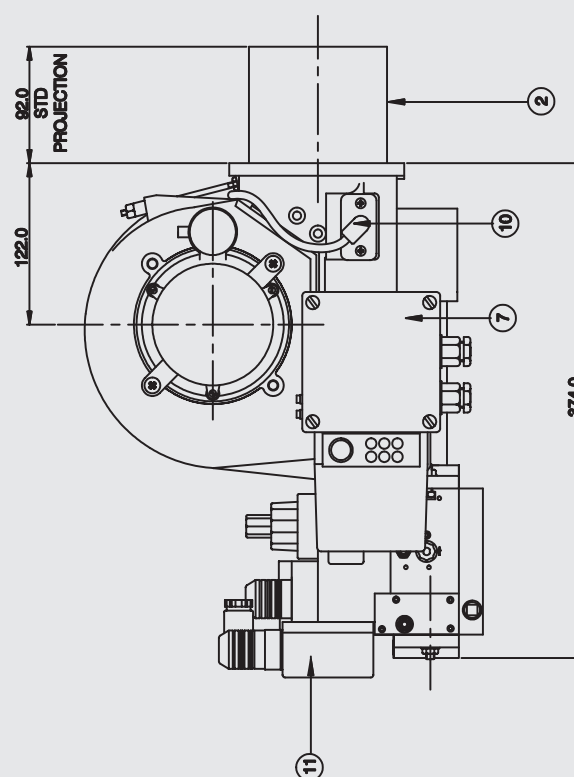
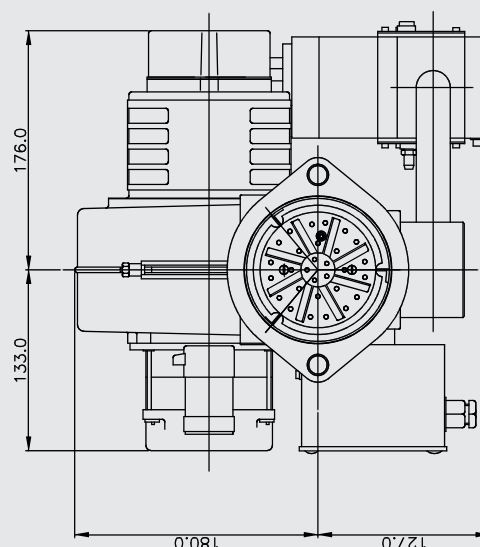
In preparing the appliance to receive the NG gas burner, a careful inspection should be made of its condition. If in doubt as to its suitability for gas firing refer to the appliance manufacturer. In preparing the appliance for gas firing it should be cleaned thoroughly removing all adhering tars, scale and dirt.

BURNER & COMPONENT IDENTIFICATION

Item	Description
1	Burner Body
2	Draught Tube
3	Fan Motor
4	Mounting Flange
5	Air Pressure Switch
6	Sequence Control Box
7	Terminal & Connection Box
8	Gas Multibloc Valve
9	Adjustable Air Inlet
10	Air Sensing Probe
11	Gas Inlet Pressure Switch



APPLIANCE MOUNTING DETAILS.
2 STUDS M12 x 35 LONG.



Combustion Chamber Conditions

When the burner is fitted to an appliance designed to work under balanced or negative combustion chamber conditions, the over fire draught must not exceed 0.25 mbar. Should the over fire draught exceed this figure, then steps should be taken to reduce it to this level.

PACKAGING FOR TRANSIT

To safeguard against transit damage, the NGN3 & 5 burner will be despatched in cartons in an assembled form.

SERVICES AND SITE CONDITIONS

Gas Supply

The piped gas supply to the burner must be constructed and installed to comply with local conditions and appropriate codes and standards. All pipe-work must be firmly supported. It should be of sufficient size to satisfy the pressure/volume requirements of the burner to ensure its operation.

It is essential that a 90° manual shut-off is fitted upstream of the burner connection for the isolation of the burner during servicing and maintenance.

The valve size must not be less than the NG burner valve train or create restriction to gas flow.

Electrical Power Supply

A single phase electrical supply to all applicable codes and standards is required for the burner.

INSTALLATION

General

Check and identify the burner type is appropriate for the appliance rating. Detailed burner performance data is given in the *Technical Specifications* section at the back of this handbook.

Fitting To Appliance

If the burner is to be fitted to a new packaged unit, refer to the manufacturer's recommendations. The appliance should be prepared for mounting the burner, using the flange provided (refer to the Burner Fixing Details in the *Burner & Component Identification* section on page 4).

The draught tube should be flush with the inner combustion chamber wall face, or in accordance with the appliance manufacturers requirements. If the burner is to be used with an existing appliance, prepare the burner mounting plate. Ensure that the joint between the appliance and the burner is effectively sealed by using the gasket provided.

Connecting The Electrical Supply

NGN3 & 5 burners are currently available for use with a 220V (-10%) 240V (+15%) / 1ph / 50Hz or 110-120V / 1ph / 50Hz supply.

Connect the electrical supply to the burner observing all applicable IEE Regulations. The incoming live supply must be fused, not exceeding 5 amps.

Connect L, N, E and external auxiliary control circuits with reference to the connection diagram at the back of this manual.

Connecting The Gas Supply

Connect the gas supply to the gas valve inlet, observing all relevant regulations and standards.

The connection for NGN3 & 5 is 3/4" BSP female.

BURNER AIR CONTROLS & ADJUSTMENTS

Air Controls

The air control is by means of a rotary air strap located on the left hand side of the burner viewed from the rear. Its purpose is to regulate the volume of combustion air flowing through the burner. To increase the flow of combustion air turn the air strap clockwise, viewed from the left hand side of the burner. To decrease the flow of combustion air, turn the air strap anticlockwise, viewed from the same side.

Air Diffuser

The air diffuser is fitted to the front end of the inner assembly and located within the flame tube. The function of the air diffuser is to control the volume of combustion air to create a pressure drop over the burner head to ensure good fuel/air mixing.

Air Pressure Switch

The air pressure switch is located on the left side of the burner casing viewed from the rear. It is required to prove adequate air flow throughout the burner operating cycle. Air flow failure at any stage will result in safety shutdown. Final adjustment of this switch is described in the section *Commissioning The Burner*.

BURNER GAS CONTROLS & ADJUSTMENTS

Gas Nozzle

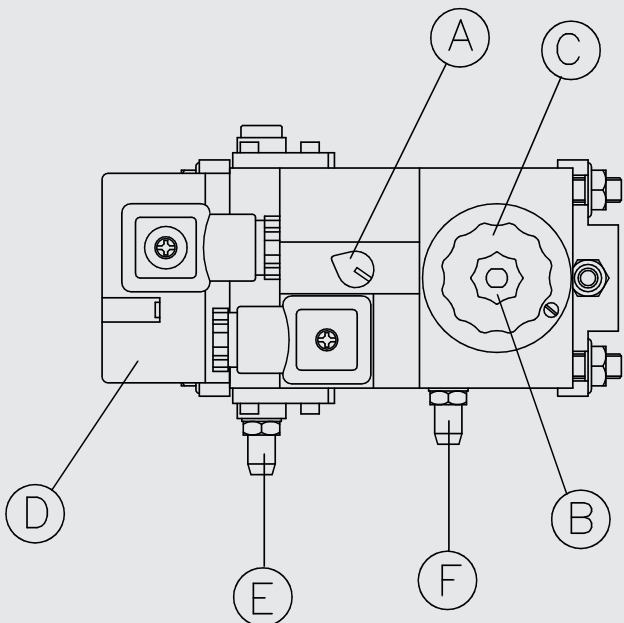
The five hole side and end nozzle is fitted to the front end of the inner assembly and located in the flame tube. The holes in the gas nozzle are designed to suit the output of the particular burner model and gas type being used.

Low Gas Pressure Switch

The low gas pressure switch is located on the inlet side of the gas valve block on the left hand side of the burner, viewed from the rear. It is required to monitor inlet gas pressure during the burner operating cycle. Gas pressure failure at any stage will result in safety shutdown of the burner. Final adjustment of this switch is described in the section *Commissioning The Burner*.

Gas Valve Multibloc

The gas valve is of the multibloc type incorporating safety and main valves and pressure governor. Valve adjustments are detailed in the diagram *Valve Adjustment Diagram*.



Adjustments	Description
A	Governed Pressure Adjuster
B	Main Valve Fast Initial Lift Adjuster
C	Main Gas Adjustment
D	Low Gas Pressure Switch
E	Upstream Pressure Test Point
F	Downstream Pressure Test Point

Valve Adjustment Diagram

COMMISSIONING THE BURNER

Pre-commissioning Checks

Before proceeding further, check that the appliance is in a proper state to be fired. (For instance, is there water in the boiler?). Re-check that both gas and electrical supplies to the burner are turned off.

IMPORTANT - SAFETY

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EMERGENCY INSTRUCTIONS

This product has been designed and constructed to meet all of the essential requirements of the GAS APPLIANCE DIRECTIVE 90/396/EEC and under normal circumstances should not give occasion to any hazardous conditions. If such a condition should occur during commissioning or subsequent use of this product, be it a fault of the burner, the appliance or of any instrument, machine or service in the proximity of the burner, then the GAS and ELECTRICITY supply to the burner should be **IMMEDIATELY ISOLATED** until such time that the fault has been investigated and rectified.

Pre-Commissioning Dry Run

NGN3 & 5 burners covered by this handbook are supplied for single stage (On/Off) operation only. Please refer to the appropriate alternative handbook or handbook supplement for Two stage (High/Low) or Modulating speed control variants.

Flame supervision is provided by flame rectification probe. The operating sequence begins with an air pre-purge followed by ignition and then main gas flame, the off position is reached when the appliance has reached its operating temperature or pressure.



Air Control

Note: The initial settings are for general guidance at this stage. Certain final adjustments may be required later to suit appliance requirements and variable site conditions.

Air Strap

Unlock the air strap, and set it to the position shown in the *Initial Settings Table* for the burner rating. Re-lock the air strap.

Model	kW	kcal/h	BTU/h	Strap Setting No.
NG3	62	53000	211000	2
	100	85300	341000	8
NG5	88	75000	300000	4
	146	125000	500000	6
	174	148700	595263	10

Initial Settings Table

Control

The control package fixed on the right side, viewed from the rear of the burners, contains two neon amber lights. One indicates "Burner On", the second is illuminated when the burner stops as a result of "Excess Temperature" in the appliance, if wired in accordance with wiring diagram. A further light indicating burner "Lock-Out" is an integral part of the control box.

Set appliance control and limit instruments to the "Call for Heat" condition. Momentarily switch on the electricity supply to the burner. Check the rotation of the burner motor which should be clockwise, viewed from the air inlet side of the burner. If the direction of rotation is wrong, see the *Fault Finding* section for the procedure to correct it.

Switch On Electricity Supply

Depending on the control box fitted, the burner will go through its operating sequence: (a) immediately, if it has been switched off during its normal sequence of operation, (b) on pressing the 'Reset' button if the burner is at lockout. Check that ignition spark is present. For the actual times refer to the *Control Sequence Diagram*. The ignition spark ceases and burner goes to lockout.

Note: The Satronic control will not operate if the main valve is not connected or is open-circuit.

If at this stage the burner locks out without an ignition spark, then the air pressure switch is not changing over (see *Fault Finding*). If all is well, then the safety lockout is proved, and the burner is in a safe condition to proceed.

Switch off the electricity supply at the mains isolator.

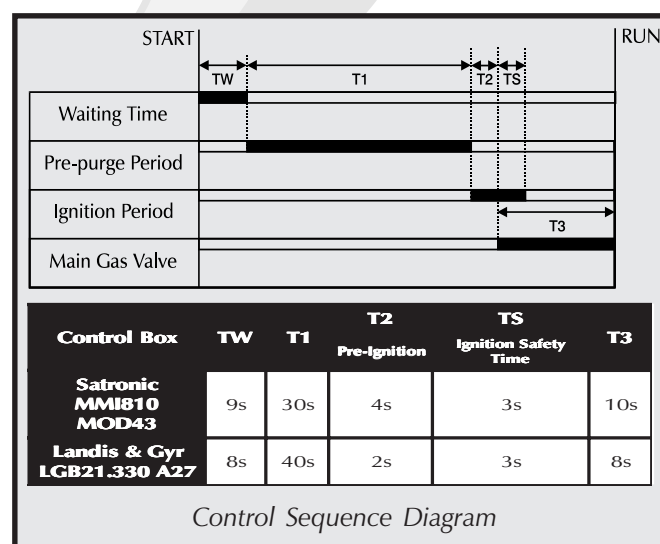
Main Gas Pressure Governor

With a screwdriver, turn the adjusting screw fully anticlockwise to give a minimum gas flow rate. Maximum allowable gas inlet pressure is 50.0mb.

Commissioning - Live Run

The capacity of Nu-Way NGN burners using natural gas have been determined at supply pressure of up to 20.0 mbar. NGN burners will operate satisfactorily on gas supply pressures lower than that quoted above, but the burner capacity will be reduced accordingly. Detailed information regarding burner performance against gas supply pressure is given in the *Technical Specifications* section at the back of this manual.

Turn off the gas supply at the manual shut-off valve upstream of the NG burner inlet. Fit a manometer or other approved pressure measuring instrument at the pressure test point on the upstream side of the burner multibloc valve. Turn on the gas supply. Check the gas pressure. This will record static pressure which will be higher than running pressure, which should not be less than 17.5mbar when on main flame. Check the gas supply pipework for external leaks using a soap solution.



Check For Valve Closure.

Fit a manometer to the downstream pressure test point on the gas valve body. If the reading indicates positive pressure the gas valve is not closing correctly and must be replaced. If the reading remains at zero the valve is closed correctly.

Testing Main Flame.

NGN3 & 5 burners are configured for main gas ignition, i.e. the gas valve multibloc does not include a pilot (start gas) valve. Check that the low gas pressure switch is set to minimum. Initial setting of the gas multibloc valve should be as follows:

- Governor adjuster: fully clockwise.
- Main valve fast initial lift adjuster fully clockwise.
- Main valve adjuster turn fully clockwise and back off 3 turns.

Fit a manometer or other approved pressure measuring instrument to the test point on the downstream side of the gas valve. Open the upstream manual isolating valve and switch on the burner. Note that it may be necessary to recycle the burner a few times to purge air from the pipework. The burner should establish ignition and continue to run on main flame. Should it fail to do so, then slowly increase the main valve and/or governor settings until main flame is established. Make a quick visual check on flame stability and if it is OK, then slowly adjust the main gas valve to its fully anticlockwise (open) position whilst checking for excessive CO. Adjust the combustion air setting if necessary to maintain the combustion figures within acceptable limits.

Model	Gas Input Rate			Gas Pressure At Burner Head (mm)
	kW	kcal/hr	BTU/hr	Natural Gas Only
NG3	62	50000	200000	45 + Appliance Resistance
	100	85300	341000	95 + Appliance Resistance
	88	75000	300000	42 + Appliance Resistance
NG5	117	100000	400000	68 + Appliance Resistance
	146	125000	500000	95 + Appliance Resistance
	174	148700	595260	100 + Appliance Resistance

Burner Head Gas Pressure Table

Setting Main Flame Gas Rate.

With the manometer still attached, the main flame gas rate can be set. Adjust the governed pressure to that shown in the gas governor settings table. Check the gas flow rate at the meter. Ensure that other appliances served by the same meter are isolated when the flow tests are carried out. Adjustments to the governor setting can now be made to obtain the required flow rate.

Combustion Air Settings.

With the gas flow rate set and the burner running with stable flame, the flue gases can be checked for CO₂ and O₂ with suitable combustion testing instruments. Figures of 9.0 to 9.5% CO₂ and 3.5 to 5.0% O₂ are acceptable. For reasons of safety, the CO (Carbon Monoxide) should be checked and should not exceed 93 ppm. To achieve good combustion efficiency, or if the CO content is exceeded, adjustments to air and gas can now be made whilst the burner is running on main flame.

Adjusting the Main Valve Fast Initial Lift.

This adjuster acts as a damper to the main valve, to slow its rate of opening after its initial lift. On NGN3 & 5 burners this adjustment is utilised to reduce the amount of gas that the valve passes during the 3 second ignition safety phase. Switch off and restart the burner. Note the quality of the light up during the ignition stage. If the light up is weak, then increase the amount of fast initial lift by turning the adjuster anticlockwise. Turn the adjuster clockwise if a heavy light up is encountered. Repeat until a satisfactory setting is achieved.

Important

After each adjustment, gas flow rate and flue gas analysis should be re-checked.

Always

Use approved test equipment (Continually monitoring electronic equipment is recommended).

Never

Rely on a visual inspection of the flame as a guide to combustion quality.

Check Flame Signal

Switch off the burner. Connect a DC microammeter (range 0-50 μ A) as shown on the wiring diagram in this manual.

Refer only to the wiring diagram appropriate to the control fitted on the burner.

Switch on the burner and observe on the microammeter the flame response signal. A steady reading in excess of 7 μ A indicates the burner is in a reliable run situation. If the current recorded is too low, it may be due to some maladjustment of the flame and intermittent lockout may occur. Check and reset if necessary. Refer to *Fault Finding* section. Switch off the burner and disconnect the microammeter.

Air Pressure Switch Setting

Isolate the burner and remove the air pressure switch cover. Switch on the electrical supply and allow the burner to establish main flame. Slowly turn the adjustment dial on the air pressure switch clockwise until the flame is extinguished and the burner locks out. Turn the dial one division anticlockwise and reset the burner control. The burner will restart and continue its cycle to the main flame condition or lock out. If the burner locks out repeat the adjustment procedure once per burner cycle until main flame is established. Recheck the performance and then turn the dial a further two divisions anticlockwise. Switch off the burner and replace the air pressure switch cover.

Low Gas Pressure Switch Setting

The low gas pressure switch is wired in series with the appliance controlling instruments and will cause the burner to effect a 'safety shut down' if a loss of inlet gas pressure is detected.

Isolate the burner and remove the gas pressure switch cover. Switch on the electrical supply and allow the burner to establish main flame. Slowly turn the adjustment dial on the gas pressure switch clockwise until the flame is extinguished and the burner shuts down. Turn the dial slowly anticlockwise one division at a time until the burner restarts and establishes main flame. Recheck the performance and then turn the dial a further two divisions anticlockwise. Switch off the burner and replace the gas pressure switch cover.

Final Check

Check that all covers to components have been replaced and locking devices are properly secured, in particular the rotary air strap. Check that appliance control instruments are set to safe limits.

Commissioning Is Now Complete

Switch on the electrical supply. The burner will now operate until switched off:

- a) by controlling instruments of the appliance.
- b) Manually.
- c) by power failure. Upon restoration of power, the burner will restart automatically and follow sequence.

COMMISSIONING & ROUTINE SAFETY CHECKS

To be carried out only by qualified and experienced personnel.

Check that the Plant Room is well ventilated at all times. Frequently inspect the air inlet of the burner and ensure there are no obstructions to air flow.

Flame Detection System

Flame detection is by a flame probe (flame rectification rod). Switch off the electrical supply at the mains isolator. Open the burner at the hinged assembly. Remove the connecting lead from the probe. Close the hinged assembly and secure. Switch on the electrical supply to the burner. Check that the burner locks at the end of the ignition cycle. Switch off the electrical supply. Open the burner at the hinged assembly. Reconnect the lead to the flame probe. Close the hinged assembly and secure. Switch on the electrical supply. Reset lock-out.

Routine Maintenance

Switch off the electrical and gas supply to the burner.

Combustion Air Fan

Clean the blades regularly with stiff brush. Access is obtained through the hinged assembly. Care should be taken to avoid damaging the fan blades. Check that the air inlet into the fan is clean.

Inner Assembly

To remove the burner inner assembly, first open the the hinged assembly.

Disconnect the ignition electrode lead. Disconnect the probe lead.

Remove the cap head screw securing the inner assembly gas pipe to the inside of the burner body. Carefully withdraw the inner assembly from the burner body.

Air Diffuser & Gas Nozzle

Clean using a stiff brush.

Ignition Electrode & Probe

Clean and check that they are not cracked or worn. Renew if necessary.

Check settings of ignition electrode and probe, re-set if necessary (see *Combustion Head Details* in the *Appendix*) .

Replace all components and covers and secure all fittings. Burner is now ready for operation.

Switch on the burner.

Multibloc Valve

If the multibloc valve does not function in any of the operating stages then the complete valve must be changed through our spares division or distributor/stockist network.

FAULT FINDING

Any modifications to the installation or component settings resulting from actions suggested below may require the re-establishment of the various settings as indicated earlier in this manual.

Burner Motor Fails To Start

Check the electrical supply is available and the burner is correctly wired.

Check all fuses for continuity and size. Check that all control instruments are "calling for heat". Check that the control box is not locked out (e.g. the signal lamp may be faulty). If the control box is locked out press the reset button.

Check that the burner probe is not grounded to earth. Check the motor capacitor. Check that the air centrifugal switch or the air pressure switch is in the "start" position. The following procedure will assist in this check.

Switch off the electrical supply. Remove the plug-in assembly from the control box base. Using a suitable instrument, check for open circuit (no continuity) between the appropriate terminals. If this condition is fulfilled the air centrifugal switch is in order. However, if continuity is obtained, the air centrifugal switch is faulty and must be renewed.

Incorrect Rotation Of Burner Motor

If there is incorrect rotation of the burner motor, the motor should be renewed.

SPARE PARTS IDENTIFICATION

Separate illustrated lists, containing an item number, description and code number, are available from Nu-way spares division.

The variations on a component are included and care must be taken when making any reference to a component to use the correct description and code number.



COMMISSIONING SHEET

The details below are to be completed by the Commissioning Engineer

Installer's Name : _____

Address : _____

Site Address : _____

Appliance : Type : _____ Size : _____ Serial No. : _____

Burner : Type : _____ Size : _____ Serial No. : _____

Commissioning date : _____

Guarantee Expiry date : _____

Gas type : _____

Gas Pressure upstream of main gas governor :

a) Standing : _____ mbar b) Running : _____ mbar

Gas pressure at burner head _____ mbar _____ in.w.g.

Gas rate _____ m³ _____ ft³/ht

Heat input _____ MJ/hr _____ Btu/h

CO _____ % _____ %

CO₂ _____ % _____ %

Gross flue gas temperature _____ °C _____ °F

Ambient temperature _____ °C _____ °F

Nett flue gas temperature _____ °C _____ °F

Efficiency _____ % _____ %



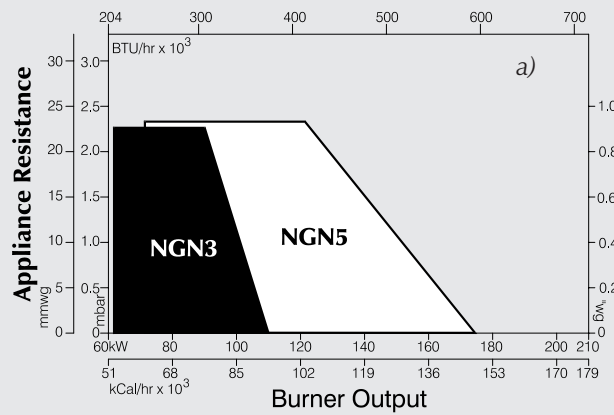
BURNER MODIFICATION RECORD

Date	Details of Modification



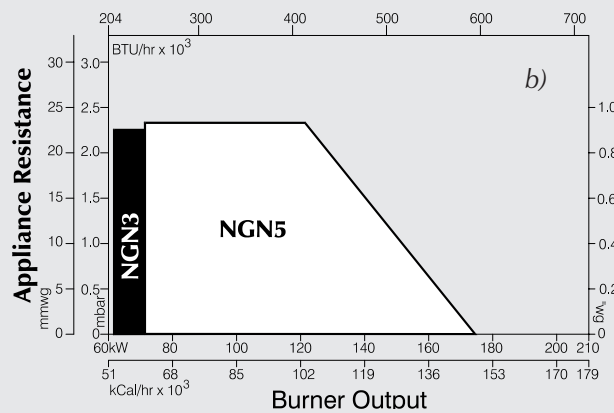
APPENDIX

Technical Specifications



Burner Performance Range - a) Ascending Range Overlap, b) Descending Range Overlap

Burner	NGN3	NGN5
Diffuser ØA	95	85
Nozzle Holes ØB	5x3	5x4
Nozzle Holes ØC	5x3	5x4

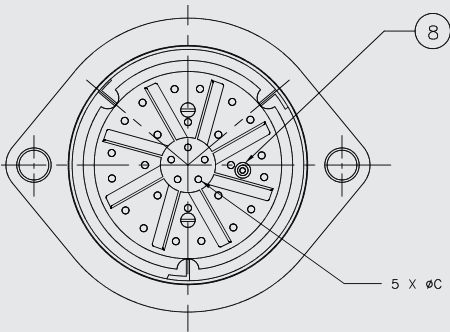
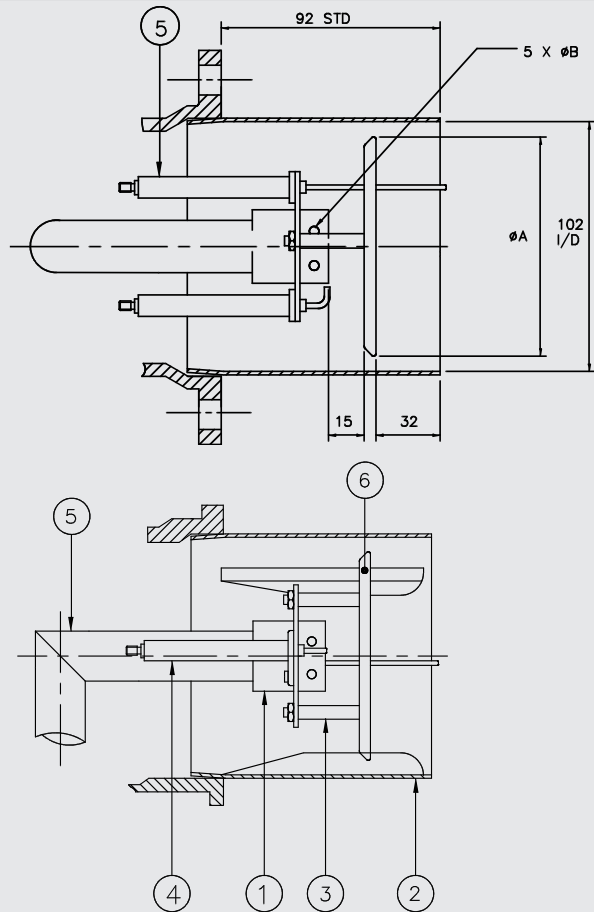


Burner Selection Chart & Table, based on a gross C.V. for Natural Gas of 38.56 MJ/m³ and Liquid Petroleum Gas of 92.6 MJ/m³. Outputs quoted are achieved @ 500 Mtr A.S.L. within an ambient air temperature of 20°C

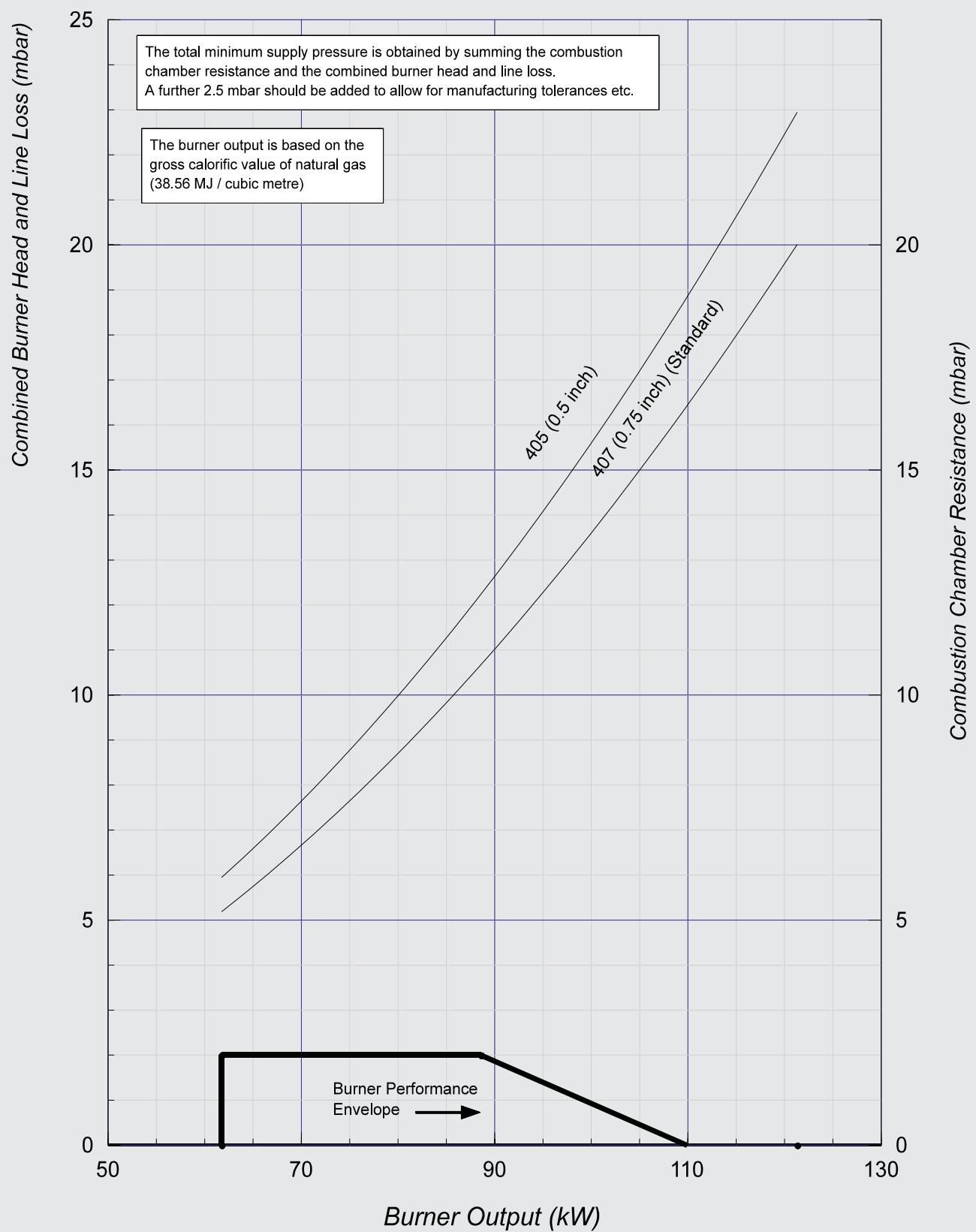
Key for Head Diagrams

Item	Description
1	Nozzle
2	Draught Tube
3	Mount Stud
4	Electrode
5	Inner Elbow Assembly
6	Diffuser
7	Probe
8	Insulation Piece

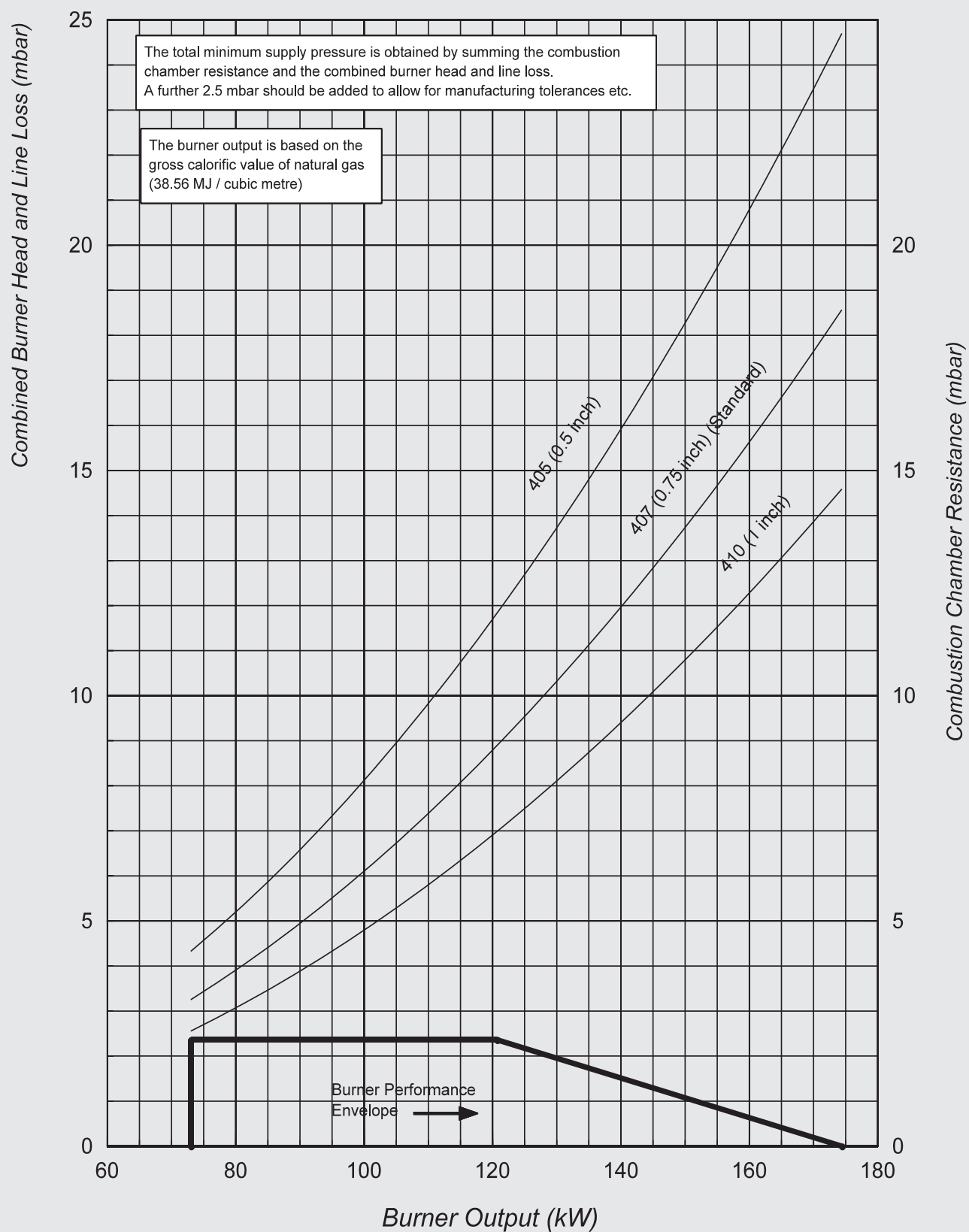
Combustion Head Details



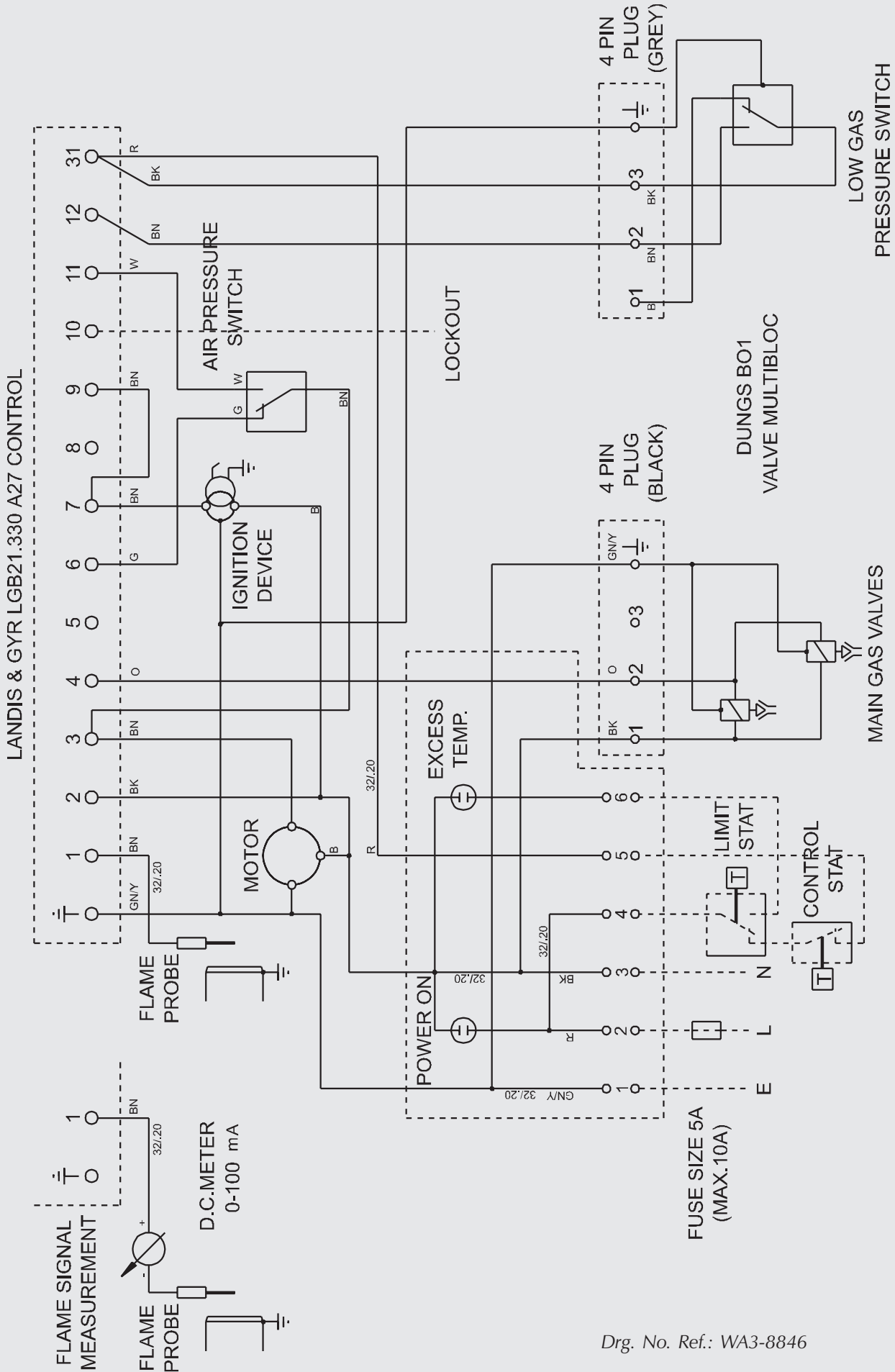
Gas Supply Pressure Graph for NGN3



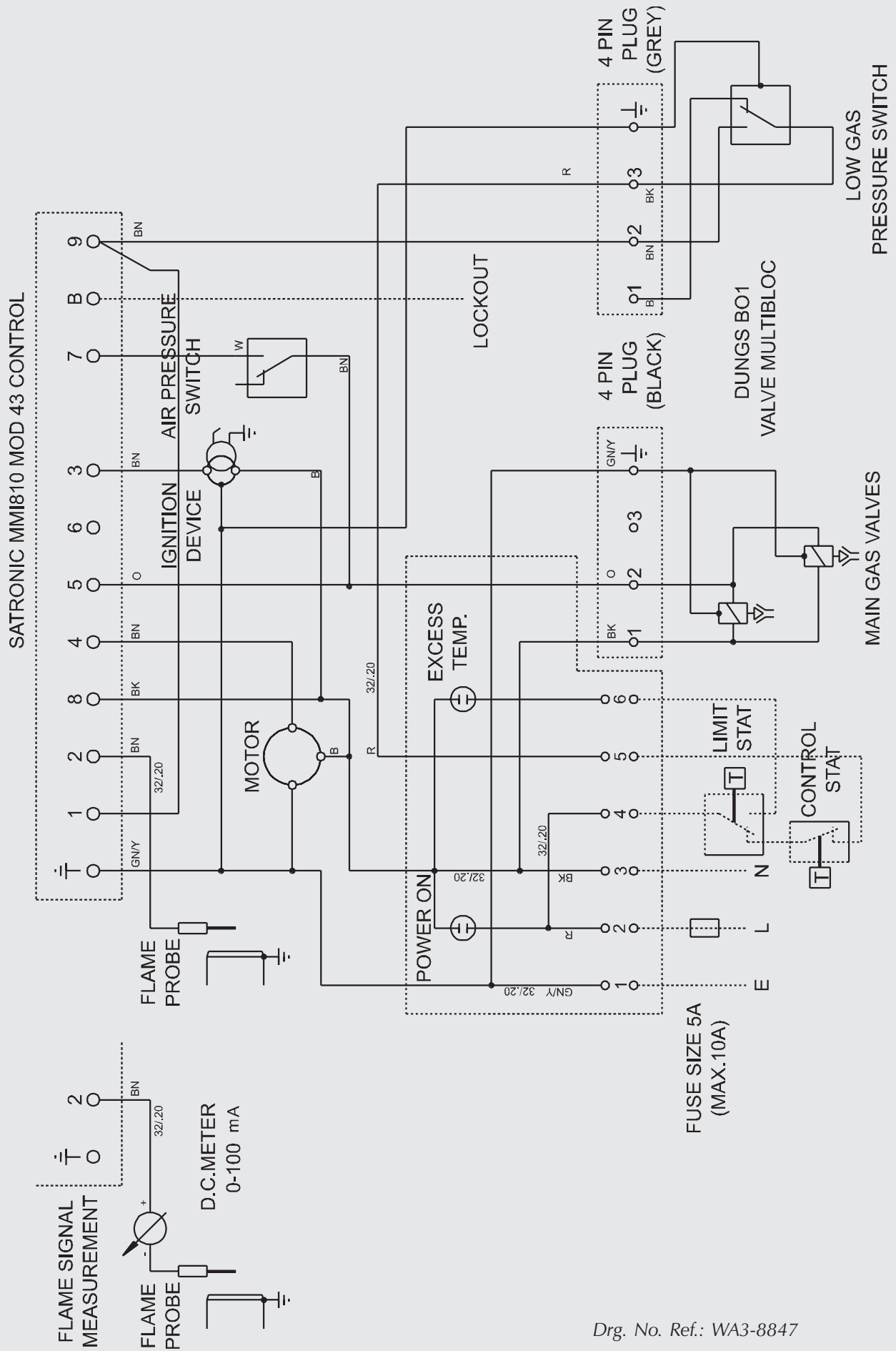
Gas Supply Pressure Graph for NGN5



Landis & Staefa Control Wiring Diagram



Satronic Control Wiring Diagram



NOTES



NOTES



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