NU-WAY®

Enertech Group

Installation & Maintenance Manual

Series NG fully automatic gas burner
Models NGN40 to NGN100

Gas Burner

11/12

Tel: +44 (0) 1905 794331 **Fax:** +44 (0) 1905 794017 **Email:** info@nu-way.co.uk **Web:** www.nu-way.co.uk

Contents

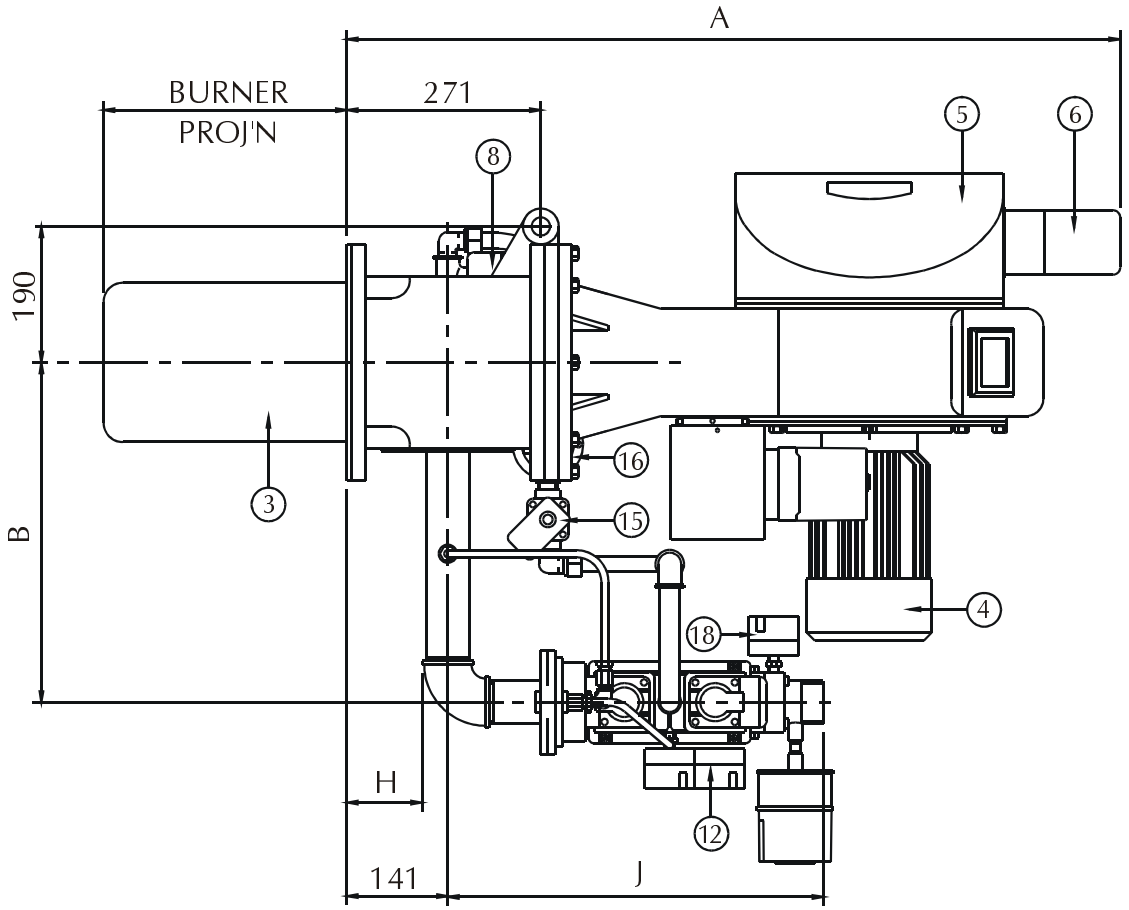
Important - Safety

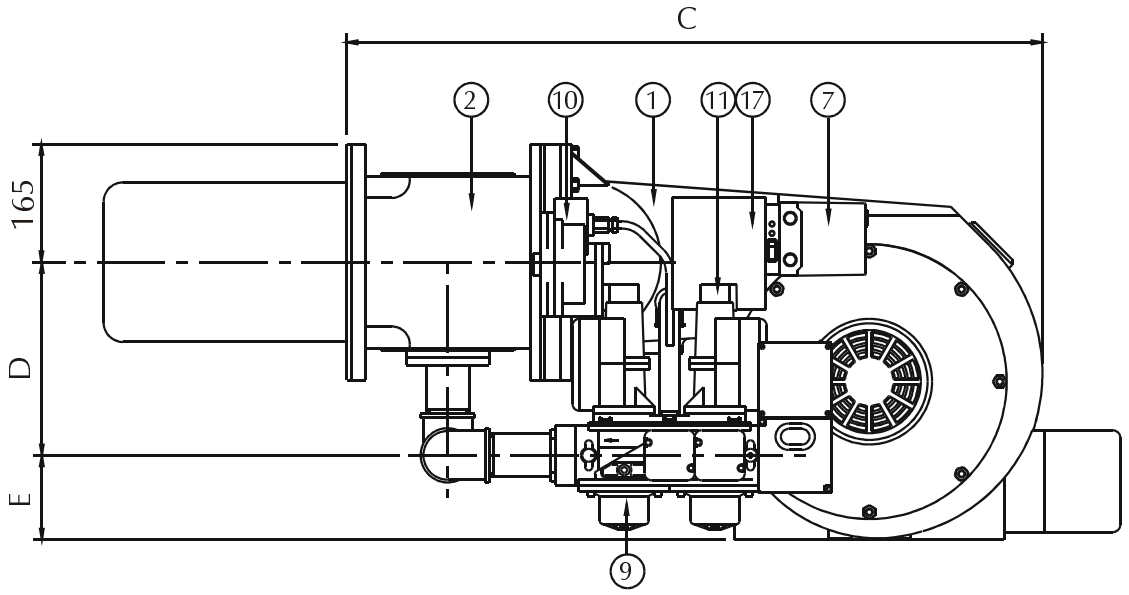
It is essential that the following instructions and adjustments are carried out by qualified engineers that are experienced in blown gas burner commissioning. In the U.K. it is a legal requirement that anyone working on gas installation, as defined in the "Gas Safety (Installation & Use) Regulations 1994" is CORGI registered. The manufacturer cannot be held responsible for any consequential damage, loss or personal injury as a result of failure to follow these instructions, or as a result of misuse. **Your attention is drawn to the Emergency Instructions on Page 17.**

European Boiler Efficiency Directive (B.E.D.)

All burners and boiler bodies marketed seperately should comply with EN676 (gas burners) and EN303 (Heating Boilers). Burner adjustments must be made in accordance with boiler manufacturers' instructions, and these must include flue gas temperatures, average water temperature, and CO_2 or O_2 concentration.

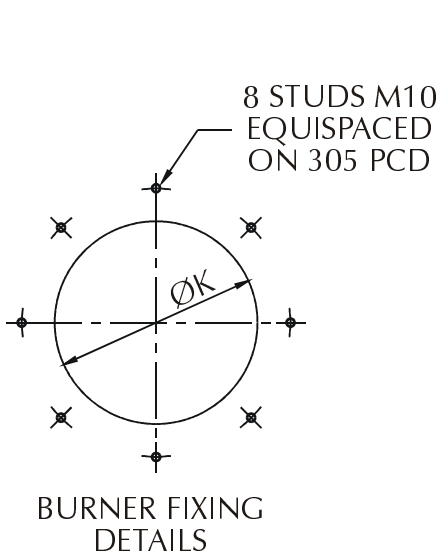
Burner & Component Identification



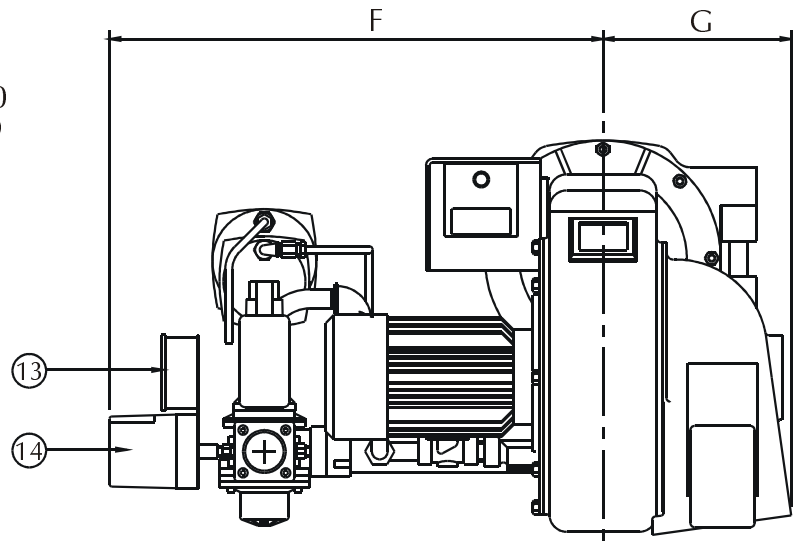


Burner	A	B	C	D	E	F	G	H	J	K	Gas Train Connection
NGN40	1097	475	1015	270	105	725	295	105	525	230	2" BSP
NGN45	1065	475	972	270	105	725	265	105	525	230	2" BSP
NGN55	1065	475	972	270	105	725	265	105	525	230	2" BSP
NGN60	1097	475	1015	270	105	725	295	105	525	265	2" BSP
NGN65	1065	475	972	270	105	725	265	105	525	230	2" BSP
NGN75	1065	870	972	270	163	1120	265	79	540	265	PN65
NGN80	1097	870	1015	270	163	1120	295	79	540	265	PN65
NGN85	1065	870	972	270	163	1120	265	79	540	265	PN65
NGN100	1097	840	1015	315	163	1090	295	48	540	265	PN65

Item	Description	Item	Description
1	Burner Fan casing	**10**	Gas Control Valve & Regulator
2	Burner Hinged Extension	**11**	Gas Main Safety Valve
3	Burner Flame Tube	**12**	Valve Proving Pressure Switches
4	Combustion Fan Motor	**13**	Electrical Connection Box
5	Combustion Air Inlet	**14**	Valve Proving Control Box
6	Combustion Air Damper Motor	**15**	Pilot Gas Solenoid Valve
7	Burner Sequence Control	**16**	Pilot Gas Pressure Governor
8	High Gas Pressure Switch	**17**	Burner Control Panel
9	Gas Valve Body	**18**	Low Gas Pressure Switch



BURNER FIXING DETAILS



Features

Burner Capacity

Burner Model	Rating (kW)		Weight (kg)
	Min	Max	
NGN40	550	1090	133
NGN45	280	1260	107
NGN55	470	2137	118
NGN60	1180	1760	136
NGN65	940	1760	120
NGN75	750	2320	142
NGN80	1750	2350	171
NGN85	890	2410	149
NGN100	2350	3050	198

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 test authority requirements in UK and overseas markets. It is delivered ready to install with pre-wired packaged control system and simple plug in gas train arrangements.

Air Regulation

Air for combustion can be adjusted to give maximum efficiency. A air control device produces smooth start conditions. A fully closing air control is fitted as standard.

Controls

Flame supervision is by UV cell, and automatic sequence control.

Operation

Two stage (high/low) and fully modulating operation.

Fuel

Natural Gas. Special requirements on request - i.e. Liquid Petroleum Gas / Town Gas.

General

The NG40-NG100 burner is supplied for two stage (High/Low) or fully modulating operation and for use with a three phase electrical supply.

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* and *commissioning* are described and the location of necessary controls and adjustments to undertake these runs are illustrated and supported by appropriate tabular matter and graphs.

Routine Maintenance, *Fault Finding* and *Spare Parts Identification* complete the manual; literature on proprietary components is available on request.

Flue And Chimney Requirements

It is important that:

a) the flue pipe from the appliance and the joint between this flue and the chimney are sealed to prevent leakage of combustion products.

b) the flue pipe from the appliance does not protrude into the chimney beyond the inside wall.

c) the top of the flue or chimney shall be higher than any roof within a radius of 10 metres.

d) checks are made to ensure that the chimney is suitable for gas fired appliances and that the proposed installation complies with all Local Authority and other regulations covering such installations.

e) if more than one appliance is connected to a common flue or chimney the cross-section of this flue or chimney should be adequate for the total volume of combustion products from 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.

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 and for Export shipment, the burner may be despatched in partly assembled form in one of two modes.

Mode One: Comprising Two Units

a) Burner Body, complete with Control Package, Hinged Extension and Flame Tube Assembly.

b) Gas train complete.

Mode Two: Comprising Three Units

a) Burner Body complete with Control Package.

b) Gas Train Complete.

c) Hinged Extension and Flame Tube Assembly.

Assembly

Mode One

Fit the gas valve train to the burner body using the gasket provided. Ensure that the gasket is fitted correctly with all holes corresponding with those on the burner flange. Connect the combustion air impulse pipe from SKP70 gas valve to left hand side of the hinged extension.

Mode Two

Fit the hinged extension and flame tube assembly to the burner body with the eight studs provided. Ensure the gas inlet flange is at the bottom. Fit the gas valve train to the burner body, with the four studs and using the gasket provided. Ensure that the gasket is fitted correctly with all holes corresponding with those on the burner flange. Connect the combustion air impulse pipe from SKP70 gas valve to left hand side of the hinged extension.

Modes One & Two

Open the hinged extension and connect the Ignition cable to the electrode. Close hinged extension.

Connect the multi-pin plug from the gas valve train to the socket located on the rear of the control package on the left of the burner body.

Services & Site Conditions

Gas Supply

The gas supply pipework to the burner must be appropriate to local conditions and must be constructed and installed in compliance with appropriate Codes and Standards. It shall be of sufficient size to satisfy the pressure and volume flow requirements of the burner under all firing conditions. Checks should be made to ensure that all meters and other components are appropriately rated for the maximum gas flow rate anticipated.

It is essential that a 90° manual isolation valve is fitted upstream of the gas control train to allow the burner to be isolated for maintenance. The size of this valve should not be less than that of the burner control train in order to avoid any restriction in gas flow.

Gas Boosters

When a gas booster is used the gas pressure at the booster inlet must not fall below 10 mbar under any conditions. A low gas pressure switch must be fitted on the upstream side of the booster to prevent it starting if the supply pressure is insufficient. An additional pressure switch can be used to monitor the pressure downstream of the booster to prevent the burner operating if the pressure is insufficient.

The booster should be installed as near to the burner as possible. It should be positioned on a firm, flat, horizontal surface using anti-vibration mountings. All connecting pipework should be well supported and accurately positioned in order to avoid stressing the booster casing. The use of flexible connectors, which reduce both pipework stresses and transmitted noise, is strongly recommended. The gas supplier should be asked to recommend the size of pipework between the meter and the booster to ensure that the required pressure and flow are available.

INSTALLATION

General

Check that the burner is appropriate for appliance rating. Detailed burner performance data is given at the back of this handbook.

Fitting To The Appliance

If the burner is to be fitted to a new packaged unit, refer to the manufacturers recommendations.

If the burner is to be used with an existing appliance prepare the mounting flange as detailed in the *Burner And Components Identification* section. Ensure the joint between appliance and burner is effectively sealed with the gasket provided. The flame tube should be flush with the inner face of the appliance combustion chamber except where extensions are specified by the appliance manufacturer (i.e. reverse flame boilers).

Electrical Power Supply

Connect a three phase 50 Hz electrical supply to the burner observing all applicable IEE Regulations. Refer to the connection diagrams on pages 9-11 or the wiring diagram contained in the instruction pack attached to the burners. If supplied as a packaged appliance/burner unit refer to the manufacturers instructions.

Connect the external auxiliary controls by reference to the appropriate connection/wiring diagram.

BURNER AIR CONTROLS

The air for combustion is controlled by an adjustable air flap located inside the air inlet on the right hand side of the burner viewed from the rear. Its purpose is to regulate and control the volume of combustion air flowing through the burner. Combustion air is controlled by a three position servo motor. Positions for high and low flame air are adjustable. A fully closed position is incorporated for when the appliance temperature/ pressure is satisfied.

Air Diffuser

The air diffuser is fitted to the front end of the inner assembly and located within the flame tube.

Its function is to control the volume of combustion air and create a pressure drop over the burner head to ensure good fuel/air mixing and flame stability.

Air Pressure Switch

The air pressure switch is located on the right 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 burner lockout.

BURNER GAS CONTROLS

Gas Nozzle

The gas 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.

High Gas Pressure Switch

A high gas pressure switch is fitted and pre-wired to the gas train to ensure that if the gas pressure at the burner head increases above the gas pressure at maximum continuous running, then the burner will shut down to a safe condition, thus indicating a fault on the governing valve (air/gas ratio valve). The switch is factory set to the maximum position.

Final adjustment of this switch is described in the *Commissioning* section on page 20.

Low Gas Pressure Switch

The low gas pressure switch is located on the inlet side of the gas valve block on the left of the burner, viewed from the rear. It is required to monitor inlet gas pressure during the burner operating cycle. Gas pressure failure will result in safe shutdown of the burner. Final adjustment of this switch is described in the *Commissioning* section on page 20.

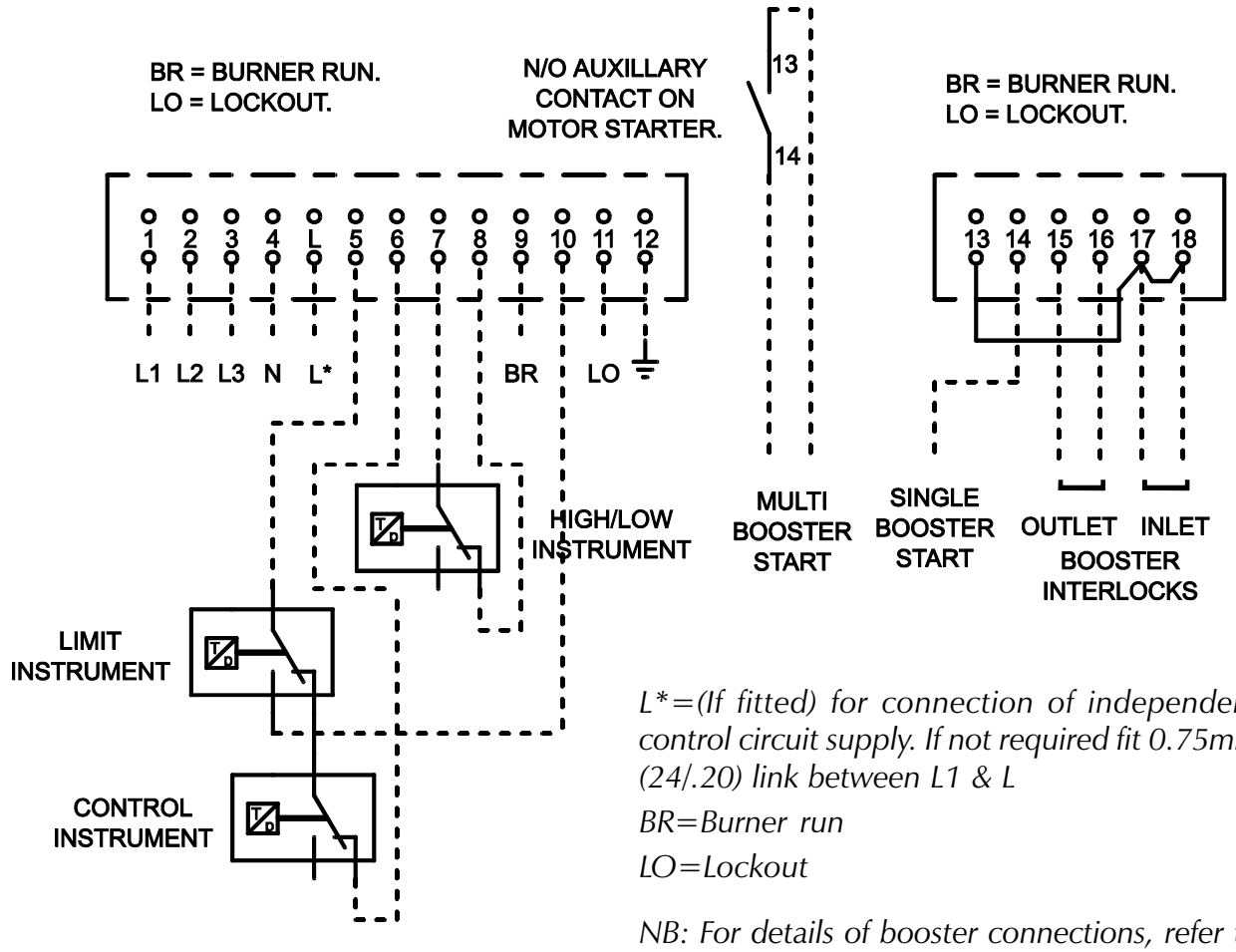
Gas Valve Train

The gas valve train system includes an air/gas ratio controller, safety shut-off valve, and gas regulator in the start rate line. Three impulse pipes are connected to the air/gas ratio controller. All are factory supplied. One pipe is connected to the burner hinged extension and supplies combustion air pressure to the ratio controller. A second pipe is connected downstream of the valve set and supplies gas pressure to the ratio controller. The third pipe is vented to atmosphere. Valve adjustments are detailed in *Valve Adjustment Diagram* on page 14.

Electrical Data Table

3 Phase 400V/50Hz					
Burner Model	**Motor (kW/rpm)**	**Start Current (A)**	**Full Load Current (A)**	**Main Fuse (A)**	**Cable Size (mm^2)**
NGN40	3.0/2800	35	6.6	20	1.5
NGN45	2.2/2800	25	5.0	16	1.5
NGN55	3.0/2800	35	6.6	20	1.5
NGN60	4.0/2800	45	8.5	25	2.5
NGN65	2.2/2800	25	5.0	16	1.5
NGN75	3.0/2800	35	6.6	20	1.5
NGN80	5.5/2800	40	11.3	32	2.5
NGN85	4.0/2800	45	8.5	25	2.5
NGN100	7.5/2800	57	15.2	40	4.0

Terminal Connections - High/Low Burner



L=(If fitted) for connection of independent control circuit supply. If not required fit 0.75mm (24/.20) link between L1 & L*

BR=Burner run

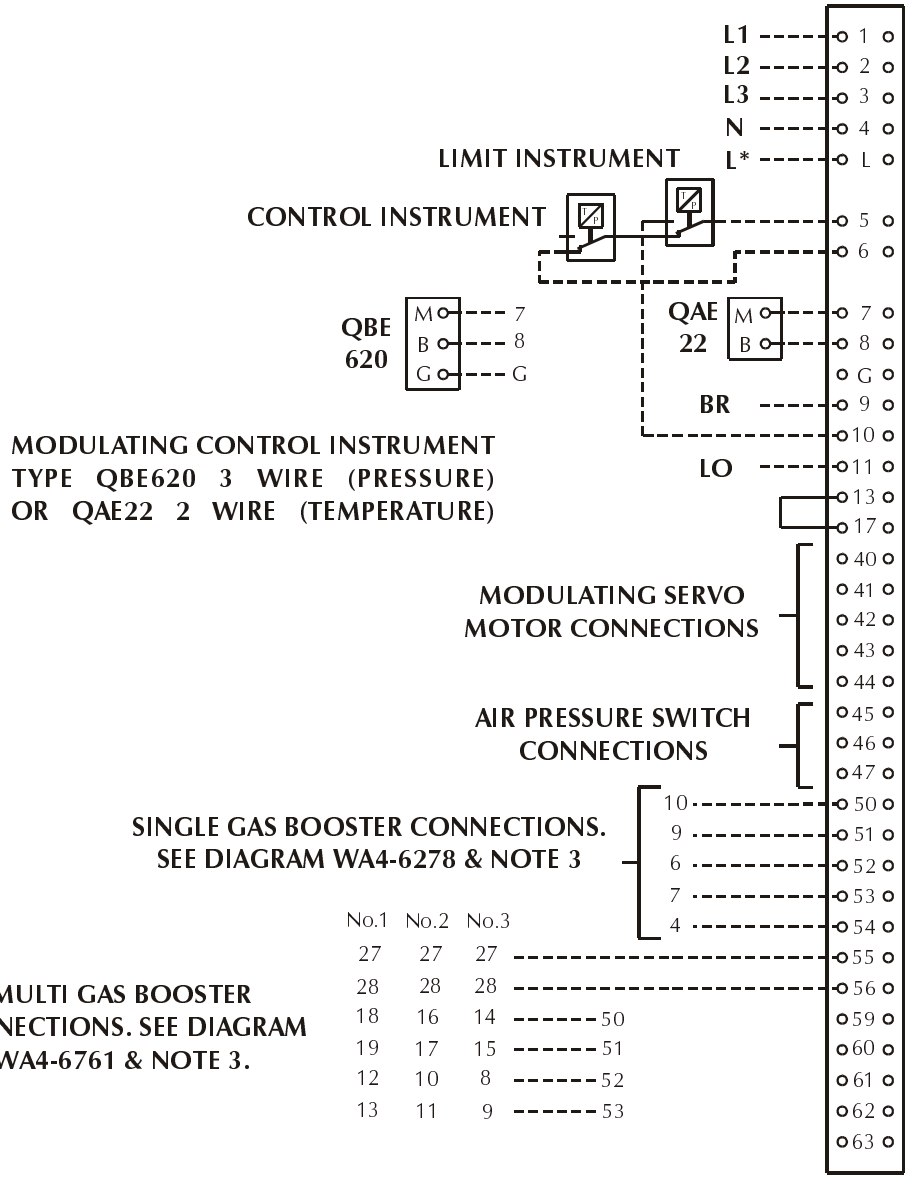
LO=Lockout

NB: For details of booster connections, refer to the instruction pack provided with the booster.

Wiring diagram for connection of burner to power supply for NG40-100 with DOL fan motor starter

TERMINAL CONNECTIONS - MODULATING BURNER

L1 =(if fitted) for connection of an independant control circuit supply. If not required fit a 0.75mm (24/.20) link between L1&L.*



BURNER MOUNTED CONTROL PANEL

Notes:

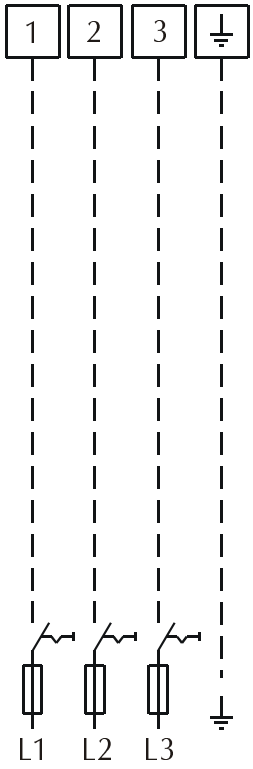
1. *For temperature control use Landis & Staefa detector type QAE22 and for pressure control type QBE61*
2. *Any interlock designed to switch or control the burner such as a time switch, damper or I.D. Fan interlock etc. Is to be wired in series with the Control and Limit instruments.*
3. *On boosted gas supply wire inlet gas pressure interlock to terminals 52 & 53 and outlet gas pressure interlocks to 50 & 51. If no booster is used link 50-51 and 52-53.*
4. *If the burner is used on a steam boiler, the water level interlocks must be wired between terminals 13 & 17 and the link removed.*
5. *A remote 'Run' indication (BR) can be wired from terminal 9.*
6. *A remote 'Excess Temperature or Pressure' alarm can be wired from terminal 10.*
7. *A remote 'Lockout' alarm can be wired from terminal 11.*

Wieland Plug & Socket Connections

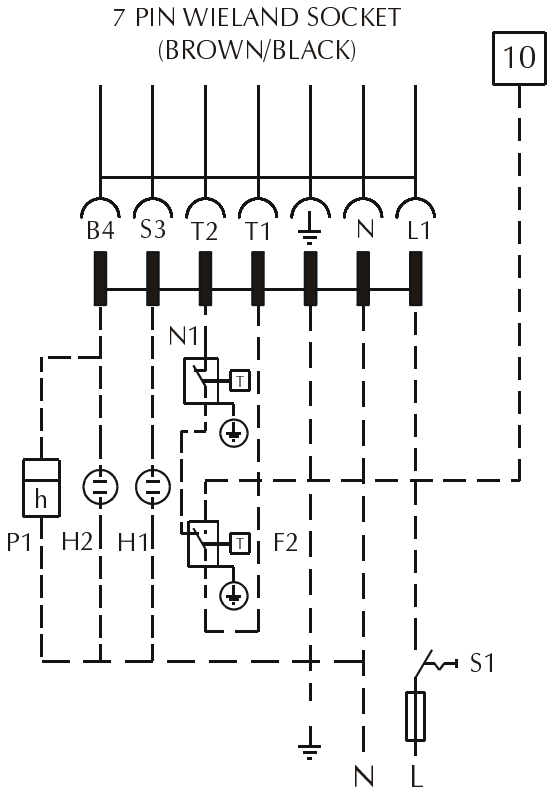
Control circuit connections using Wieland plugs and sockets. If not required remove socket and harness and wire to terminals as shown on pages 9 & 10.

High/Low burners = 7 & 4 pin sockets.

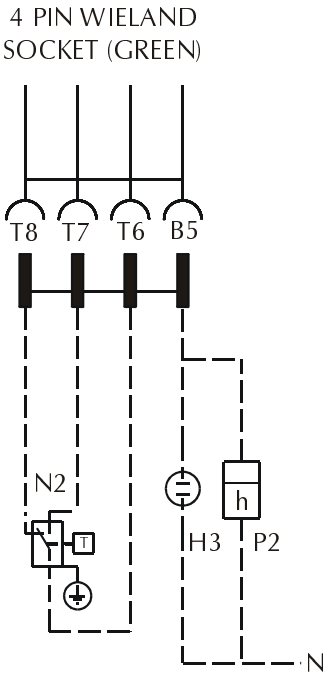
Modulating burners = 7 & 6 pin sockets.



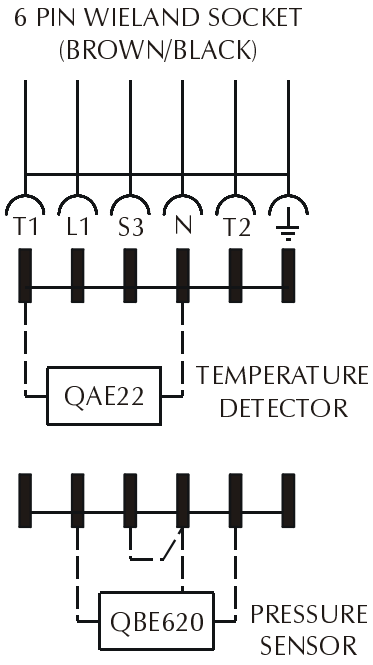
3 PHASE FUSED & ISOLATED SUPPLY



1 PHASE FUSED & ISOLATED SUPPLY



4 PIN HIGH/LOW BURNER CONNECTIONS



6 PIN MODULATING BURNER CONNECTIONS

Item	Description
F2	Appliance Limit Instrument
H1	Burner Fault Signal
H2	Burner Operating Signal
H3	Burner High Flame Signal
N1	Appliance On/Off Instrument
N2	Appliance High/Low Instrument
P1	Burner Operating Hours Run Counter
P2	Burner High Flame Hours Run Counter
S1	Supply On/Off Switch

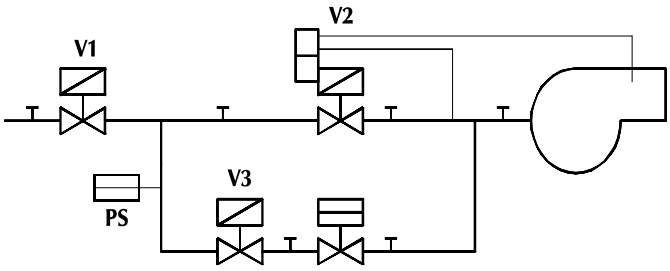
Air/Gas Ratio Controller

The air/gas ratio controller varies the gas pressure in response to changes in combustion air pressure to ensure that the air/gas ratio remains constant over the operating range of the burner. A separate gas pressure governor is not necessary. Three impulse pipes (all factory supplied) are connected to the air/gas ratio controller. The first is connected to the burner body and supplies air pressure to the ratio controller. Note that in installations with negative air pressure in the combustion chamber, this pipe must always be under positive pressure. A second pipe connected to the gas line downstream of the valve set provides gas pressure to the ratio controller whilst the third pipe is vented to atmosphere.

Valve Proving Systems

A valve proving system, as shown schematically below, is standard on all burners with outputs greater than 1200kW (net) or 1325 kW (gross).

Landis & Staefa LDU11



When the burner operating sequence is initiated, the burner control box energises the proving system, which then carries out the following checks.

a) Valves V1, V2 and V3 are initially closed. The proving system then opens V3 (in the start gas line) and then closes it after 2 seconds.

b) V1, V2 and V3 remain closed for 23 seconds while the minimum side of the gas pressure switch (PS) checks for an increase in pressure. If no increase occurs there is no leakage past V1 and the sequence continues.

c) V1 is opened for 2 seconds and then closed. V1, V2 and V3 again remain closed for 23 seconds while the maximum side of the gas pressure switch checks for a decrease in pressure. If no decrease occurs there is no leakage past V2 or V3 and the burner operating sequence will continue.

Dungs VPS 504

The VPS 504 is a self contained unit that operates on the pressure build up principle.

The programmer starts functioning when the burner control circuit is made. With valves **V1, V2, & V3** in the closed position, the internal pump increases the gas pressure within the test section approximately 20 mbar above the pressure at the inlet to **V1**. During this time an integral differential pressure switch monitors the test section for leaks. When the test pressure is reached, the pump is switched off. If the proving check has been successful (max 30 secs), the control circuit is released accompanied by illumination of the yellow indicator light on the unit.

If the proving check has been unsuccessful or if a pressure rise of +20 mbar has not been reached during the test time (max 26 secs), the unit will switch to the fault condition accompanied by illumination of the red indicator light. This condition will remain until the unit is manually reset or the control circuit is broken.

If there is a short power failure during test or burner operation, reset is automatic.

CONTROLS

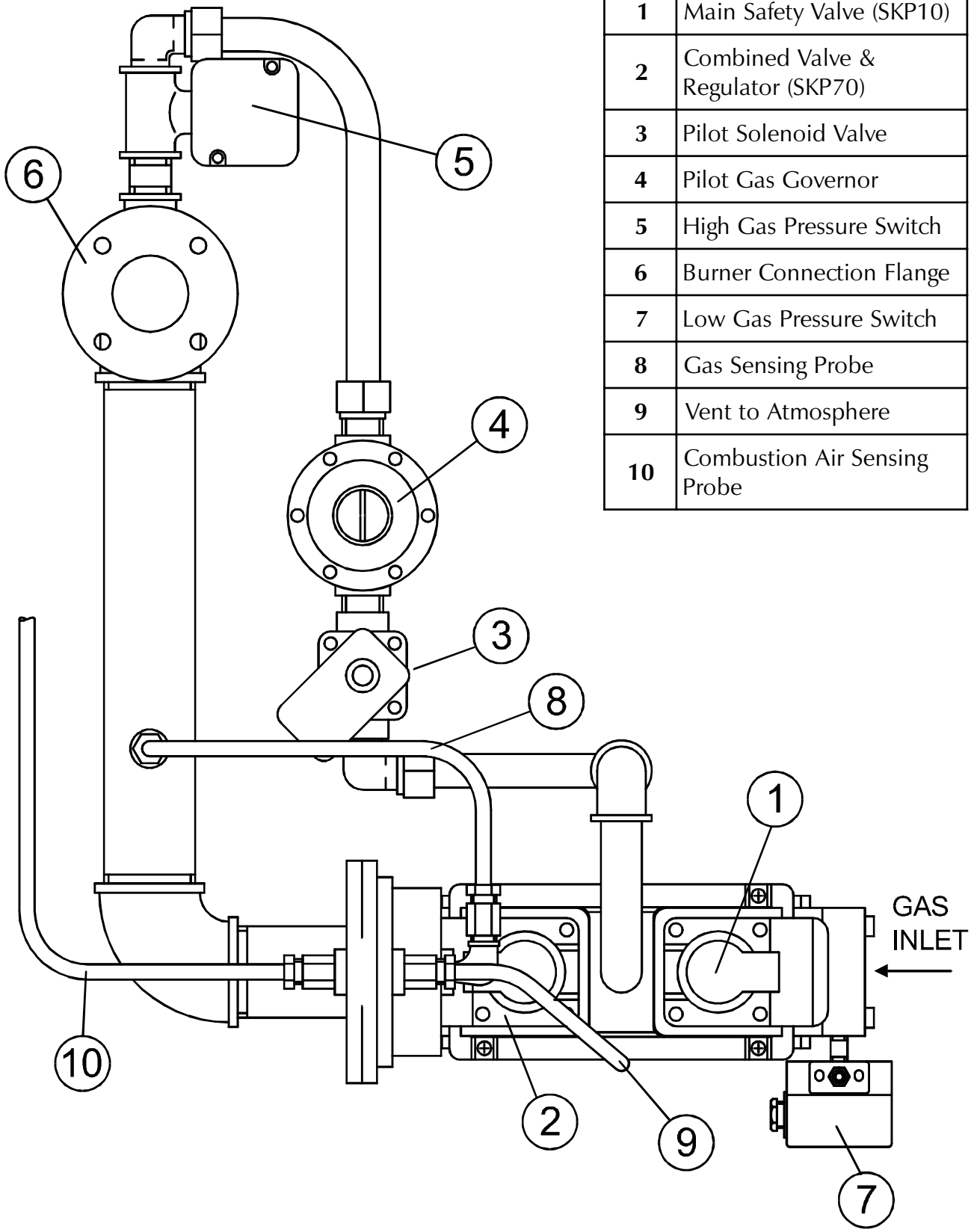
The control package is fitted on the left hand side of the burner viewed from the rear. It includes a sequence control box of the cyclic type, ignition transformer and all necessary contactors, terminal strip, motor starter, On/Off switch and two neon lights. The amber light indicates “BURNER ON” and the red light is illuminated when the burner stops as a result of “EXCESS TEMPERATURE” in the appliance.

FLAME MONITOR

An ultraviolet cell is fitted as standard on all burners.

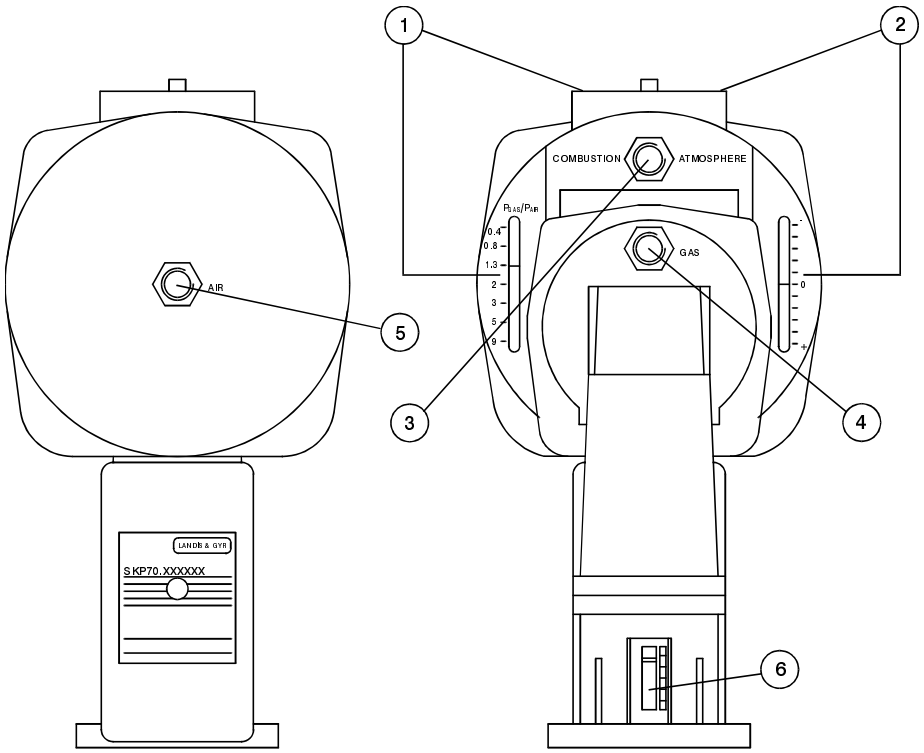
Gas Valve Train - Landis & Staefa SKP70 / SKP10

Item	Description
1	Main Safety Valve (SKP10)
2	Combined Valve & Regulator (SKP70)
3	Pilot Solenoid Valve
4	Pilot Gas Governor
5	High Gas Pressure Switch
6	Burner Connection Flange
7	Low Gas Pressure Switch
8	Gas Sensing Probe
9	Vent to Atmosphere
10	Combustion Air Sensing Probe



Typical Gas Valve Arrangement with Landis & Gyr Control Valves

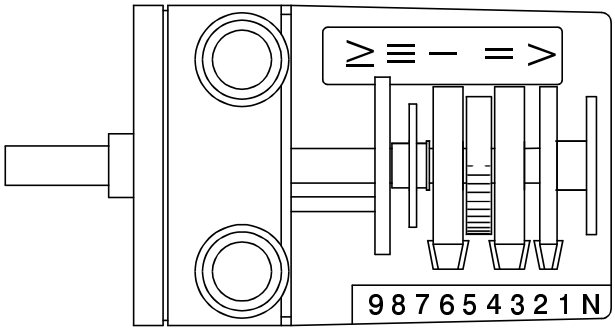
Landis & Staefa SKP70 Valve Actuator



Valve Adjustment Diagram
(air/gas ratio valve and regulator)

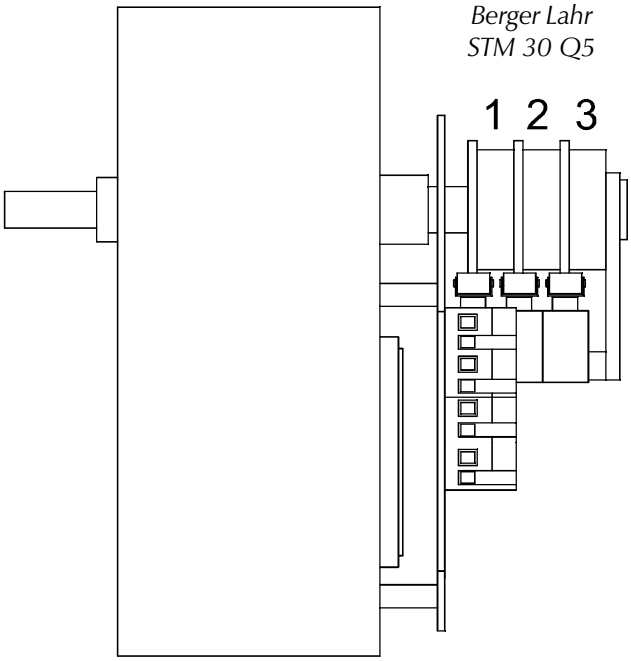
Adjustment	Description
1	Adjustment and indication of the gas/air ratio (Main Flame setting)
2	Adjustment and indication of the parallel diplacement of the characteristic (Low Flame setting)
3	Vented to atmosphere
4	Connection to the gas line
5	Connection to the combustion air supply at the burner head
6	Valve stroke indicator

Air Damper Motors - H/L



Berger Lahr STM 30 B2

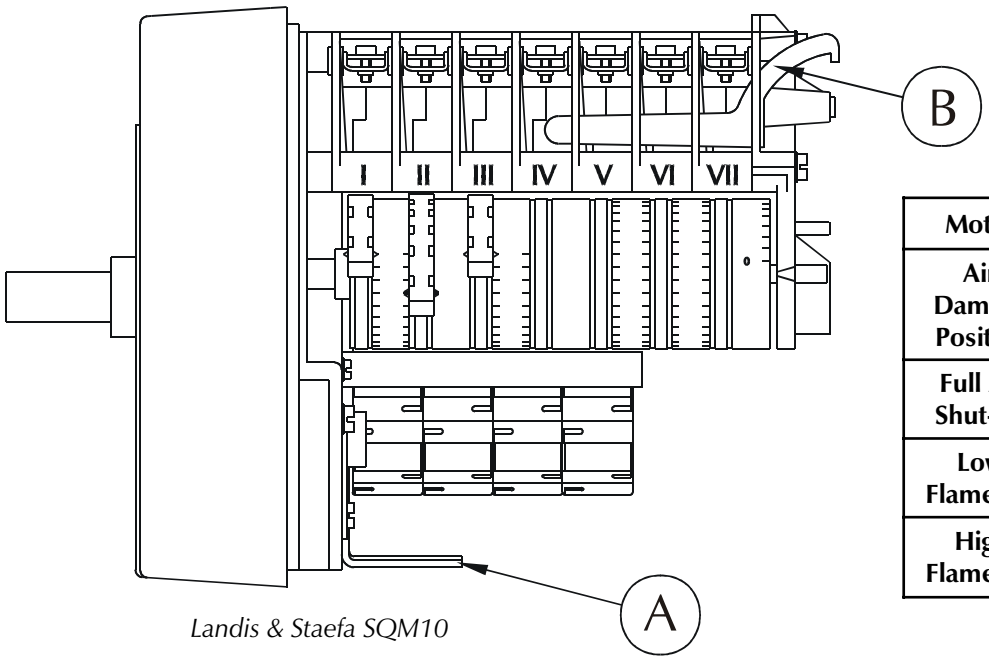
Berger Lahr
STM 30 Q5



Motor	STM30 B2		STM30 Q5	
Air Damper Position	**Cam**	**Factory Setting**	**Cam**	**Factory Setting**
Full Air Shut-off	II	0°	1	0°
Low Flame Air	V	15°	2	15°
High Flame Air	I	60°	3	60°

Note: The fully closed cam is factory set, and under normal circumstances should not require further adjustment. Operation of the low and high flame air switches is made by manually adjustable cams. A setting scale is provided at the end of the cam stack for guidance, while adjustments are made using the screw adjusters situated within the cam disk body (STM30 Q5), or with levers and fine setting screw adjusters (STM30 B2).

Air Damper Motor - Modulating



Landis & Staefa SQM10

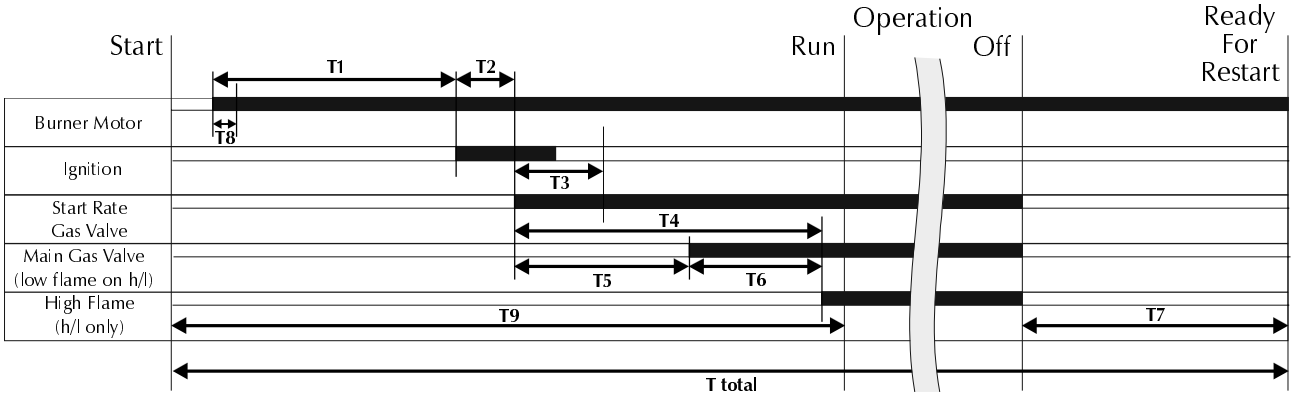
Motor	SQM10	
Air Damper Position	Cam	Factory Setting
Full Air Shut-off	2	0°
Low Flame Air	3	20°
High Flame Air	1	60°

The fully closed cam (2) is factory set and under normal circumstances should not require further adjustment.

Operation of the low and high flame air switches (cams 3&1) is made by manually adjustable cams. Setting scales provided between the cams simplify the adjustment. An additional scale at the end of the cam stack serves as a position indicator.

The air damper assembly can be rotated manually by disconnecting from the drive motor using the lever 'A'. The cams should be adjusted by using the special C spanner 'B'.

Control Box Sequence and Timing Chart



Timing Segment	TMG740-3	LFL1.3	Operating Mode	Timing Segment	TMG740-3	LFL1.3	Operating Mode
T1	40	40	Pre-purge	**T6**	6	12	Delay - Release to High Flame / Modulation
T2	4	6	Pre-ignition	**T7**	10	18	Post-purge
T3	3	3	Safety Lockout Time	**T8**	8	12	Air Proving Switch Interlock
T4			Delay - Start Rate to Main Flame	**T9**	80	91	Total Start Time
T5	9	12	Delay - Start Rate to Main Flame	**T total**	90	106	Total Cycle Time of Controller

Note: The pre-purge times shown above refers to the control box only. The air damper control will extend the total burner purge time up to a maximum of 127 seconds depending upon the firing rate and air requirements of the appliance.

MODULATING OPERATION

Nu-way NG modulating burners are similar in construction and operation to the 2 stage High/ Low versions, utilising identical fan blower, combustion head and gas train components.

The standard method of operation is based on the Landis & Staefa RWF40 Universal Controller, which provides temperature or pressure control of modulating burners with continuously adjustable fuel throughput.

The control output of the RWF40 is a potential free, 3-position switch, which is used to control the air damper motor.

When the boiler control calls for heat, the modulating servomotor will travel to the 'high flame' position and interlock the control circuit. An air pre-purge will take place at this position for a pre-determined period, at the end of which the burner sequence controller will stop until the modulating servo has travelled to the 'low flame' position and interlocked the control circuit again. The sequence control will now recommence its operational cycle and the burner will light and remain at low flame until the high flame release signal is given by the sequence control. The modulating servo will now move to high flame and remain at this position until the desired boiler temperature/pressure is attained. From this stage the modulating unit will commence to move towards the low flame position, but, depending on the temperature/pressure, will stop in any intermediate position between low and high flame.

Burner Control Panel.

The control panel is fitted to the rear left hand side of the burner fan casing. The panel is of the fully enclosed type containing the fan motor starter, relays, burner sequence control, RWF40 modulating controller. Access to the panel is gained by loosening the two crosshead screws on the right hand edge of the panel door. The door may then be swung open to the left and removed from its hinge pins if required.

Manual Operation

Check that the RWF40 controller is configured correctly (refer to page 21). Press and hold the 'EXIT' key until the 'manual operation' indicator illuminates. The modulating motor can now be inched using the 'increase' & 'reduce' buttons on the controller face. Press and hold the 'EXIT' key until the 'manual operation' indicator extinguishes to return to automatic mode.

Temperature detector.

The immersion temperature detector type QAE22 is used in all Hot Water boiler applications. The detector has a plastic casing to IP42 with a snap on cover and an immersion stem. The connection terminals can be accessed by removing the cover.

Cable entry is made via a cable entry gland Pg11. In all applications an immersion pocket with a flat seal is supplied.

The detector should be installed in an elbow such that the pocket points against the direction of flow. With all detector versions, the immersion length must be a minimum of 60mm.

Pressure detector.

The Pressure sensor type QBE620 is used in all Steam boiler applications. The sensor has an aluminium casing to IP65 and a 2 metre long, 3 core connecting cable. The mounting instructions supplied with the sensor are to be strictly adhered to.

Gas controls.

The gas train is of the same type and design as fitted to 2 stage high/low models.

SKP70 combustion chamber impulse connection.

The impulse connection to the combustion chamber is not required in the majority of applications and is therefore not supplied as part of the burner package. This is because the resistance of the combustion chamber / flue assembly is assumed to remain constant and that the pressure within this chamber will change in proportion to the burner gas and combustion air pressure. (As the burner output changes).

If, however, the pressure in the combustion chamber does not change in proportion to the burner gas or air pressure, i.e. the plant is fitted with a flue gas fan, continuously operating flue gas damper, or the chamber pressure changes from negative to positive whilst moving from Low to High flame, then a compensating circuit is required. This means that the pressure in the combustion chamber must be connected to the SKP70 so that the controller can automatically offset the pressure changes.

This compensating circuit should also be used if pressure shocks and vibrations, which adversely affect burner start up, develop in the combustion chamber during the start up phase.

Naturally, it must always be taken into consideration that the burner output decreases as the pressure in the combustion chamber increases, and visa versa.

Installation of the combustion chamber impulse pipe.

A minimum inside pipe diameter of 8mm is recommended.

The impulse pipe should be as short as possible so as to allow the controller to respond quickly to sudden burner output changes. It must be installed such that the gases will cool down in the area of the impulse pipe and condensing gases will not enter the controller but run back into the combustion chamber. If necessary, a water separator must be provided.

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.

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.

BURNER OPERATING SEQUENCE

The operating sequence begins with an air pre-purge on full air, followed by start rate gas flame which when proved allows the burner to operate on the High/Low/Off or Modulating principal. The sequence is determined by the demand of the appliance control instruments.

Initial Burner Setting

Remove the cover from the air damper motor on the end of the air inlet casing. Check the cam positions and adjust if necessary (refer to settings on pages 14 & 15).

Air/Gas Ratio Controller

Remove the small plate on top of the regulator and keep it in a safe place. Set the air/gas ratio at 0.8 on the visual scale by adjusting the screw (1) anticlockwise to increase, or clockwise to decrease.

Set the air/gas ratio on the visual scale, adjusting screw (2) to half a division on the '+' side of "0". Turn the adjusting screw clockwise to decrease, or anticlockwise to increase.

Start Rate Gas Governor

Remove the metal cap from the top and turn the adjusting screw until it is approximately halfway between maximum and minimum setting, clockwise to increase, and anticlockwise to decrease. Never adjust to its maximum limit.

BURNER PRE-COMMISSIONING

Check both gas and electricity supplies to the burner are turned off. Remove the cover and fit a link between terminals 2 & 3 of the low gas pressure switch. Remove the control panel cover and remove the low flame hold link (two stage burners). Set the air pressure switch to minimum. Replace the control panel cover. Momentarily switch on the burner and check the motor rotation, which should be anticlockwise, viewed from the motor end.

If the direction of rotation is incorrect, please refer to *Fault Finding* to correct it. Switch on the burner. Depending on the type of the control box, the burner will go through its operating sequence

a) Immediately if it has previously been working but switched off during a normal operating cycle.

b) On pressing the reset button on the control box.

The burner motor will run. If at this stage the burner goes to lockout, please refer the *Fault Finding* section (page 22).

Check that the ignition spark is present. For actual timings refer to the *Sequence Diagram and Timing Chart* on page 15.

If at this stage there is no ignition spark and the burner goes to lockout, the air pressure switch may require adjustment. Following the safety lockout time (T3) the ignition spark should cease and the burner go to lockout.

Switch off the electrical supply to the Burner. Remove the Control Panel cover and refit the Low Flame Hold link. Replace the Control Panel cover. Remove the temporary link between terminals 2 & 3 of the Low Gas pressure switch and refit and secure the cover.

Safety system proved. Burner commissioning can proceed. Switch off power to the burner.

Burner Commissioning

Check that the appliance is in a proper and safe state to be fired (for instance, is there water in the boiler?)

Set the appliance controls to call for heat.

Check For Valve Closure (Burners Without Valve Proving System)

All gas train assemblies are fully tested for function and valve security before despatch.

A soundness test of the gas valves is difficult without specialised pressure testing equipment. However, the following check can be performed to measure the security of the valve system.

Ensure that the gas supply pipework to the burner gas line inlet is sound and that gas is available at the required inlet pressure for the burner. Fit a manometer to the test point at the inlet to the upstream main safety valve. Open the main upstream manual valve for a few seconds and then close and secure the gas supply.

The space between the upstream manual valve and the gas train inlet should now be filled with gas at inlet pressure. If the pressure remains stable over one minute then this indicates that the valve train is secure, but not necessarily in the main valve. If the pressure decreases then this indicates that the main and one other valve is leaking or that there is a leak between the upstream manual valve and the main gas valve.

Secure the upstream test point and fit the manometer to the test point situated between the main and control valves.

Check the reading on the manometer, this should now show near atmospheric pressure. Open the upstream manual valve and look for an increase in pressure over one minute. If no rise is detected, this indicates that the main valve is closing correctly.

The next stage of the procedure requires the burner to be momentarily started. Open the upstream manual valve and switch the burner on. The burner will attempt to start and will either establish a flame (in which case switch the burner off immediately) or 'lockout'. Isolate the electricity supply.

The space between the main and control valves should now be filled with gas at near inlet pressure. If the pressure remains stable over a period of one minute, this indicates that the valve system is secure.

If the pressure decreases, this indicates that there is a leak in the valve system and the valve train assembly should be returned to the factory for a full examination. Remove the manometer and close the test point.

Gas Supply Pressure

The main gas safety valve is capable of withstanding gas inlet pressures up to 200 mbar. For NG 40 and NG 100 burners it is essential that the inlet gas pressure shall not be less than 45 mbar and not be more than 100 mbar in order to maintain good control characteristics of the air/gas ratio controller. Before proceeding with commissioning:

a) Fit a manometer or other approved pressure measuring instrument to the pressure test point on the upstream side of the first safety shut-off valve.

b) Open the manual gas isolation valve at the inlet to the gas train.

c) Check that the gas pressure is adequate.

Establishing Main Flame

General Notes

In the following sections, reference is made to checking gas flow rates at the gas meter. This is the most accurate method of determining throughputs and should always be used whenever possible. Information regarding the burner head gas pressures is included in the appendix at the back of this manual. These may be used as a guide to initial burner settings, but should not be relied upon to offer proof of actual throughputs.

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

ALWAYS use approved test equipment.

NEVER rely on a visual inspection of the flame as a guide to combustion quality.

Landis & Staefa SKP70

Refer to the *Valve Adjustment Diagram* on page 14. Set up the air damper for initial firing as follows. Low flame air 15 °: High flame air 60°. Close the upstream manual valve until it reaches an opening of approximately 20%.

Set the gas inlet pressure switch to minimum. Remove the low flame check link. Switch the burner on and allow it to establish low flame. Gradually open the upstream manual valve to the fully open position keeping a watchful eye on the CO level.

If the CO content is excessive, adjust the low fire adjustment screw (2) on the SKP70 valve to achieve acceptable figures. In extreme cases it is possible to run out of adjustment on the low fire screw without achieving the desired results. If this happens adjust the High Fire setting screw (1) to bring the CO content down to an acceptable level.

Switch the burner off and refit the low flame link. Restart the burner. Low flame will be established, expanding to main flame after the expiry of period T6 on the control box timing chart.

It is important to monitor the flame visually during the change from low to high. If the flame becomes more compact, this indicates an excess of combustion air. If the flame becomes large and shapeless, this indicates an excess of fuel. Both conditions are acceptable at this stage providing that the burner remains stable and immediate actions are taken to correct the situation. If in doubt SWITCH OFF the burner and adjust the High Flame screw (1) on the SKP70 in the appropriate direction.

With the burner stable on high flame, adjust the High Flame screw (1) to bring the CO_2 to an acceptable level. It is possible at this stage that the burner may be overfiring the appliance with a resultant excess of CO.

With the burner firing at low flame, adjust the Low Flame screw (2) on the SKP70 valve to bring the CO_2 content within an acceptable range.

Adjustment of the Low Flame setting will have marginal effect on High Flame. To achieve optimal results repeat the above procedures on High and Low flame several times until acceptable figures are obtained without any further adjustment.

It should not be necessary to make any further adjustments to the gas valve.

With the burner now running on high flame, the gas throughput should be checked at the gas meter. Ensure that any other appliances served by the meter are isolated during the checks. The gas rate can be altered by adjusting the air damper opening in the appropriate direction. Similarly the low flame throughput can be adjusted by altering the low flame position of the air damper. Care should be taken so as not to exceed the limits of the burner performance envelope as shown on pages 25-29.

With the gas flow rate set for both Low & High flame a final check should be made on the flue gases. For reasons of safety, the CO (carbon monoxide) level should be checked and should not exceed a maximum of 93 ppm (dry air free).

Burner Start Gas Rate

Switch off the electrical supply to the burner, close the main manual gas valve, remove the control panel cover, disconnect the pilot check link, and replace control panel cover.

Switch on the electrical supply to the burner and allow the burner to establish start rate flame.

The start gas rate can now be adjusted by turning the adjusting screw in the start gas pressure governor clockwise to increase and anticlockwise to decrease. A start rate of approximately 30% and not more than a maximum of 33% of main flame is required.

Too small a start gas rate results in burner lockout on changeover during the initial and final running.

Never exceed the stated percentage start gas rate.

Switch off the electrical supply, remove the control panel cover, reconnect the pilot check link, replace the control panel cover. Open the main manual gas valve.

Switch on the electrical supply to the burner.

Check Flame Signal

Switch off the burner. Remove the control panel cover and disconnect the flame signal check link.

Connect a DC. microammeter, range as shown in the wiring diagram section 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 micro-ammeter the flame response signal. A steady reading in excess of 7μA 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 the *Fault Finding* section. Switch off the burner and disconnect the microammeter. Refit the link and control panel cover.

Air Pressure Switch Setting

Switch off the electrical supply to the burner.

Remove the air pressure switch cover. Fit a manometer to the pressure switch to check the actual air pressure against the pressure switch dial setting.

Remove the control panel cover and disconnect the low flame hold link to hold the burner in the low flame position.

Switch on the electrical supply and allow the burners to establish main flame.

Slowly turn the adjusting dial clockwise until the flame is extinguished. The burner will go to lockout. Turn the dial one division anticlockwise and reset burner lockout. The burner will then continue through its cycle until either the start rate flame is established or the burner goes to its lockout position. If the burner goes to lockout repeat the procedure once per burner cycle until the start rate flame is established. Allow the burner to cycle to low flame and then turn the adjusting dial a further two divisions anticlockwise.

Switch off the electrical supply to the burner, reconnect the low flame hold link, replace the control panel cover and also the air pressure switch cover, and remove the manometer.

High Gas Pressure Switch Setting

When the burner is finally commissioned, the gas switch must be adjusted with the burner running. Remove the cover, and move the dial in an anticlockwise direction until the switch trips and the pressure switch indicating light is illuminated (the burner will shut down). Move the pressure switch dial in a clockwise direction one division, fit the cover, and reset the pressure switch via the button situated on the pressure switch cover. The burner will now restart.

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 the covers to components have been replaced and that locking devices are properly secured. Check that the 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.

RWF40 Modulating Control

Basic display

The diagram opposite shows the RWF40 after switching on the supply voltage. This condition is called the basic display. The actual operating value and the currently active set-point will be shown. Manual operation, self-optimization, the operating parameter and the configuration levels can be activated from this display.

To change the working set point.

The basic display shows the actual pressure/ temperature of the boiler in red and the required set point pressure/temperature beneath in smaller green digits.

One quick press of the PGM button, the display changes to show the set point as the larger red digits and the SPI in the lower small green digits.

Alter the red display using the up/down buttons to show the new required set point, press exit or let the unit time out to return to the basic display which should be the new set point figure.

To enter a new parameter

The parameters dictate the way in which the burner firing rate alters in response to changes in the pressure/temperature of the boiler.

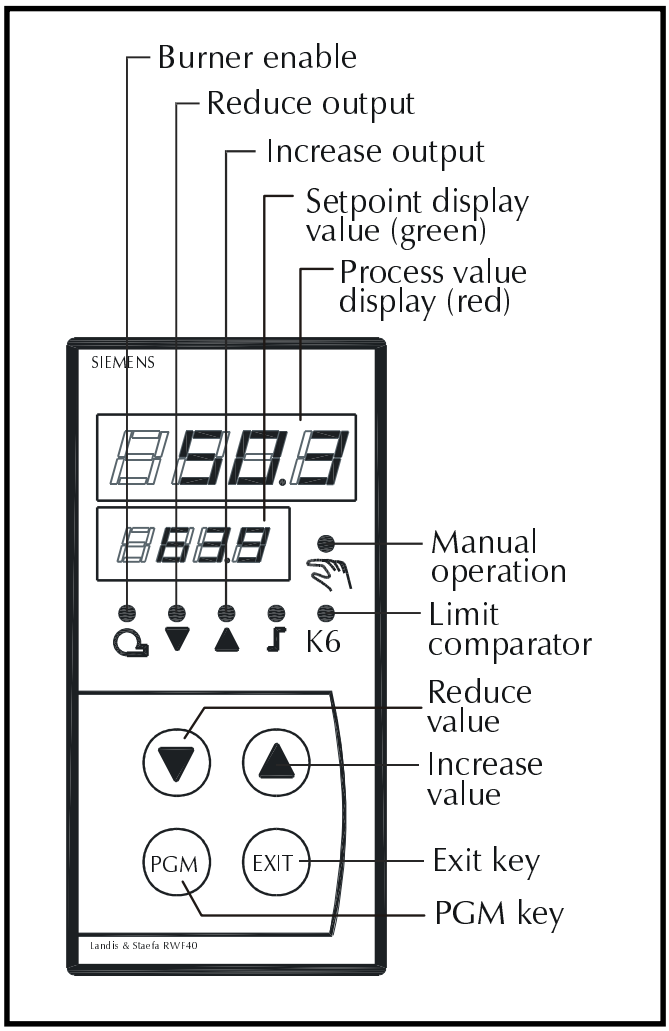
A major factor that determines the need to change the parameters is if the burner is fitted to a steam or hot water boiler. The table below indicates the parameter and its setting for steam and hot water boilers. It must be emphasised that it is only an indication and any departure from these settings should be made in small increments, with time given to see how the burner is reacting to the changed parameter.

Press and hold the PGM button down until the green set point figure changes to an AL, the larger upper figures show the value. Use the up/down buttons to set the new value, press the PGM button to enter the value and change to the next screen. To cancel an entry press exit. Scroll through the screens, (PGM button) modifying any value found to be in error (up/down buttons). At the last screen the PGM button will return the controller to the original operating display.

At any point in the procedure the original operating display can be obtained by letting the unit time out, the value in the display at the time out will be accepted.

A value can only be altered within the permitted range of that parameter. All other parametrs must remain as supplied.

Note: The detector range parameters SCL & SCH are given as °C for Hot Water (temperature) and bar for Steam (pressure).



RWF40 Recommended Settings

Parameter	Display	Hot Water	Steam
Proportional band	**Pb1**	10	1
Derivative time	**Dt**	10	5
Reset time	**Rt**	50	20
Actuator time	**Tt**	Set to the Air Damper running time between low & high flame	
Switch on threshold	**Hys 1**	0	0
Upper off threshold	**Hyst 3**	999.9	999.9
Detector: range start	**SCL**	0	0
Detector: range end	**SCH**	100	25

Routine Safety Checks

THESE CHECKS SHOULD BE CARRIED OUT ONLY BY APPROPRIATELY QUALIFIED AND EXPERIENCED PERSONNEL.

Combustion Air

Check that the plant room is well ventilated at all times and inspect the burner air inlet frequently to ensure that there is no obstruction to the air flow.

Flame Detector

a) Remove the UV cell from the burner casing and cover the quartz glass envelope to exclude light. Care should be taken not to touch the glass.

b) Establish the electrical supply to the burner and switch on the burner. The burner should go to lockout at the end of the ignition cycle.

c) Switch off the burner and the electrical supply to the burner. Replace the UV cell. Establish the electrical supply to the burner and switch on the burner. Reset the lockout.

Valve Proving System

a) Introduce a gas leak by slackening the screw in the pressure test point between the main valves.

b) Establish the electrical supply to the burner and switch on the burner. The valve proving system should lock out through falling gas pressure as the burner runs through its start cycle.

c) Re-tighten the screw in the pressure test point and reset the lockout button on the valve proving system.

Routine Maintenance

Switch off electrical supply and gas supply to the burner.

Combustion Air Fan

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

Inner Assembly

To open the hinged extension, first remove the gas train multi pin plug form its socket on the control package, and remove the locking nut securing the hinged extension. Open the hinged extension, disconnect the ignition electrode lead. Remove the cap head screw securing the inner assembly gas pipe to the inside of the hinged extension. Carefully withdraw the inner assembly from the hinged extension.

Air Diffuser And Gas Nozzle

Clean using a stiff brush.

Ignition Electrode

Clean and check the electrode is not cracked or worn. Renew if necessary.

Check the settings of the ignition electrode and flame rectification probe, and reset if necessary. Replace all components and covers, and secure all fittings. The burner is now ready for operation. Switch on the electricity supply and gas supply to the burner.

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:

- that the electrical supply is available and the burner is correctly wired.
- all fuses for continuity and size.
- all control instruments are “calling for heat”.
- the gas train is electrically connected.
- the control box is not locked out (e.g. signal lamp faulty). (If the control box is locked out, press the reset button).
- there is sufficient gas pressure.
- the air pressure switch is in the “start” position, as follows: -

Switch off the electrical supply. Remove the plug-in assembly from the control box base. Check for continuity between the following terminals:

Satronic TMG 740 - Terminals 17 & 16

Landis & Staefa LFL 1.3 - Terminals 4 & 13

If the air pressure switch is not in the start position, turn the setting dial clockwise. If no continuity is obtained, the air pressure switch is faulty and must be renewed.

Starting Flame Failure Without Ignition

Check:

- The glass envelope of the U.V. cell is clean and correctly positioned.
- The U.V. cell and its wiring.
- The air pressure switch is set correctly.
- The electrode is correctly set and the porcelain is not cracked.
- The ignition transformer is not faulty.
- The control box is not faulty.

Starting Flame Failure Without Flame

If the start rate flame is not properly established, the safety circuit of the sequence controller will cause lockout in one second.

The cause may be insufficient signal to the flame detection device. Alternatively the flame signal check link has been removed, or insufficient gas to allow the flame monitoring device to take over and signal the sequence controller to continue its cycle.

Burner Fails To Establish Main Flame

Check:

- The low flame hold link has been refitted.
- The gas valves are operating correctly.
- The combustion air is set correctly.
- There is sufficient gas.
- The control box is not faulty.

Burner Motor Only Runs Continuously

Check:

- That the air damper motor is correctly wired.
- That the air damper motor is not faulty.

Replacement Of Air/Gas Ratio Controller

Should the above valve require replacing due to mechanical or electrical failure, then the burner will require re-commissioning to restore the proper combustion and performance values. It is essential that replacement of this component and re-commissioning of the burner be undertaken only by qualified combustion engineers.

Incorrect Rotation Of Burner Motor

The fan motor rotates anti-clockwise viewed from the cooling fan end. If the burner motor rotation is incorrect interchange any two phases. In normal circumstances, this will correct the rotation.

Motor & Fan - Removal

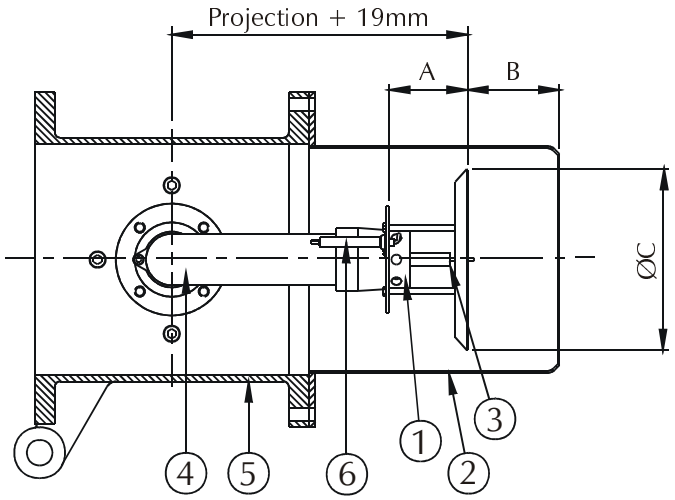
Should the motor or combustion air fan need replacing the following procedure can be followed. Disconnect the gas valve train multi-pin plug from the socket on the control package. Remove the retaining screw securing the control package to its mounting bracket. Lift the complete control package from the mounting bracket and rest it on the gas valve train. All securing studs, fixing nuts, and bolts on the motor mounting flange are readily and easily accessible.

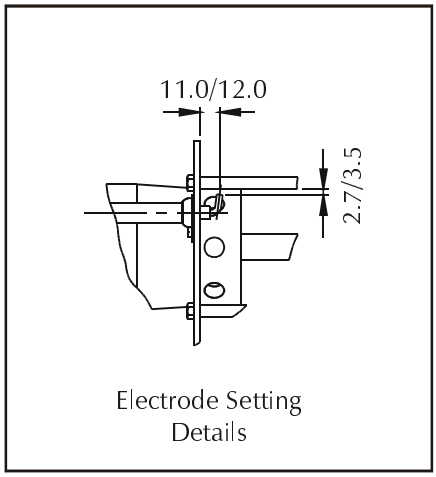
Service & Replacement

Nu-way Ltd Parts & Components Division carry a comprehensive stock making up the burner systems described in this handbook. Should it become necessary to order replacement parts, it is important to quote the burner model, specification and serial numbers to ensure correct expedition of your order.

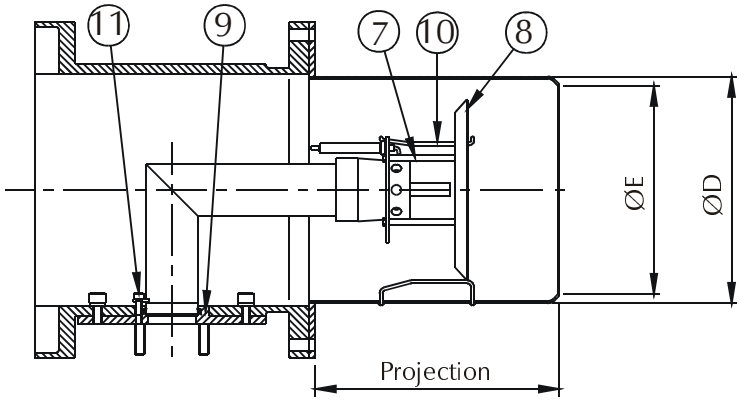
Nu-way Ltd is able to offer 'on site' Commissioning, Service and Repair through its wordwide network of authorised distributors and sales offices. Please contact the Nu-way Service Department for further information.

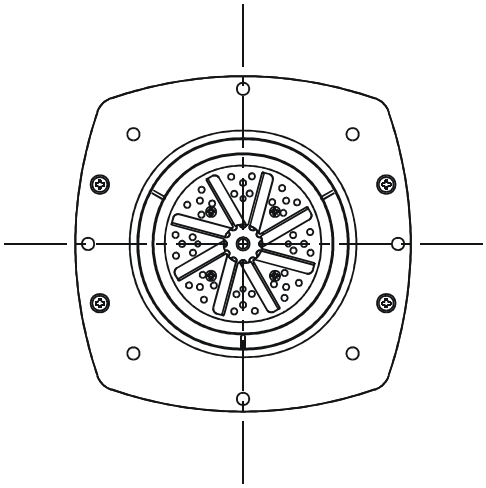
Burner Head Details





Electrode Setting Details





Burner	A	B	C	D	E	F	G	Nozzle Side	Nozzle End
								Ports	Ports
NGN40	77	90	190	223	206	230	45	8 x Ø9.5	12 x Ø6.4
NGN45	77	90	190	223	206	230	45	8 x Ø9.5	12 x Ø6.4
NGN55	77	90	178	223	206	230	45	8 x Ø11.0	12 x Ø7.0
NGN60	77	90	204	255	234	265	45	8 x Ø11.0	12 x Ø7.0
NGN65	77	90	178	223	206	230	45	8 x Ø11.0	12 x Ø7.0
NGN75	77	90	204	255	234	265	45	8 x Ø11.0	12 x Ø7.0
NGN80	77	90	204	255	234	265	45	8 x Ø12.7	12 x Ø8.0
NGN85	77	90	204	255	234	265	45	8 x Ø12.7	12 x Ø8.0
NGN100	77	90	204	255	234	265	45	8 x Ø14.0	12 x Ø8.0

Item	Description
1	Inner Assembly Elbow
2	Hinged Extension
3	Ignition Electrode
4	Gas Nozzle
5	Flame Tube
6	Pilot Gas Tube
7	Inner Assy Fixing Screw
8	Gas Train Adaptor
9	Diffuser Mounting Stud
10	Inner Assy Centralising Rail
11	Diffuser Plate

Burner Performance Curves

The following pages 25 to 29 contain detailed operating data for the individual burners of the NGN range.

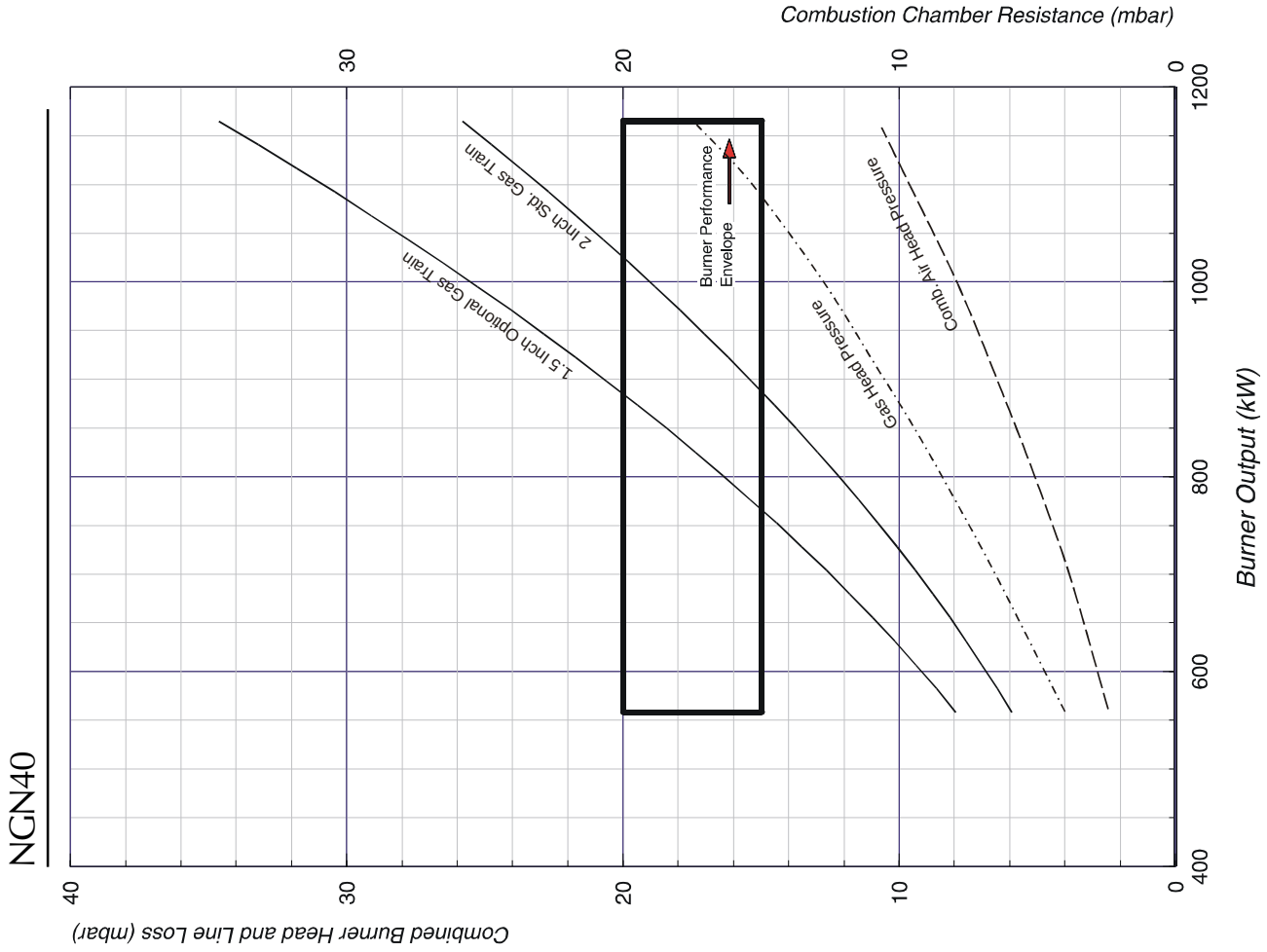
The graphs contain the following:

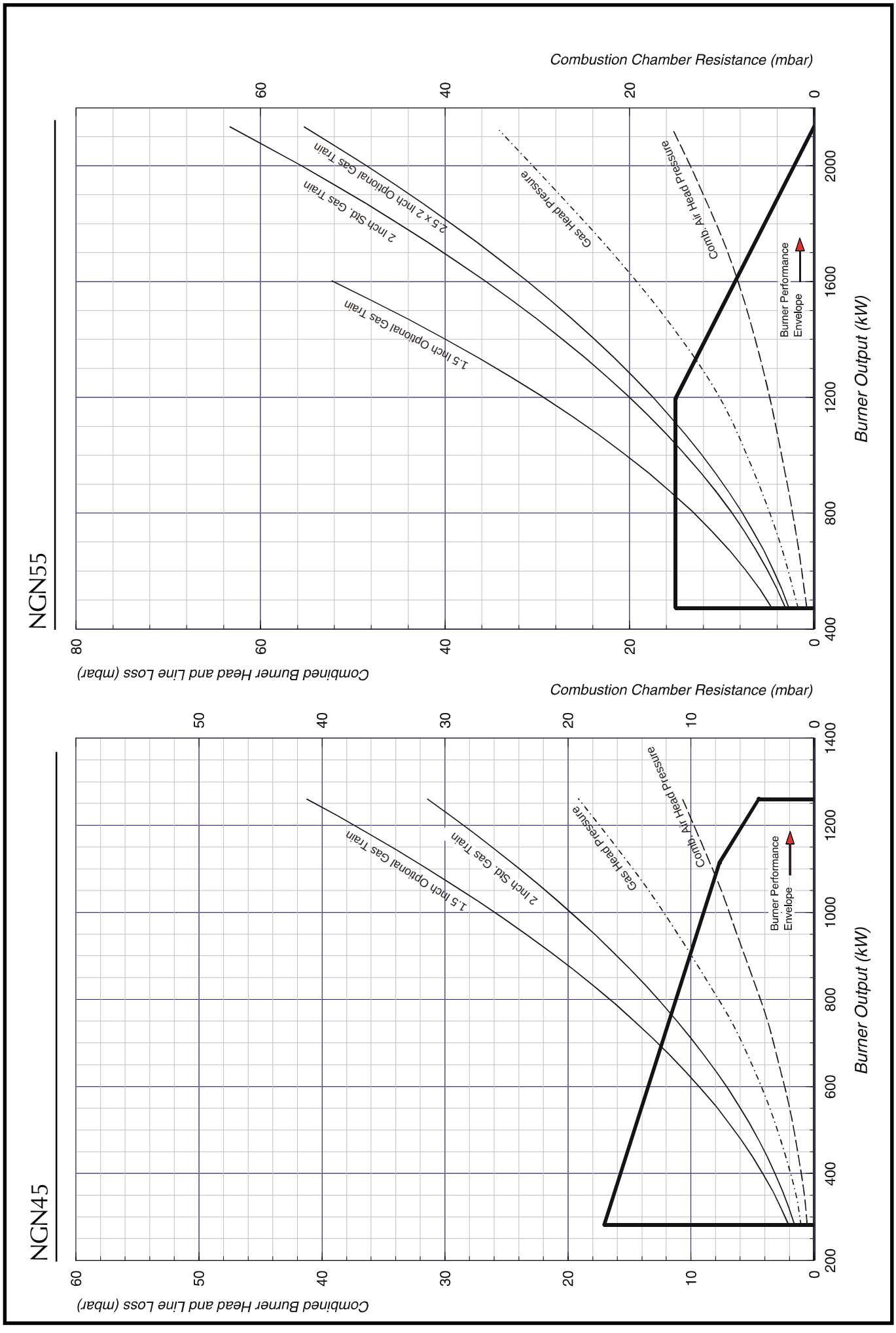
- The certified burner performance envelope
- The gas head pressure curve
- The combustion air head pressure curve
- Gas train inlet pressure curves

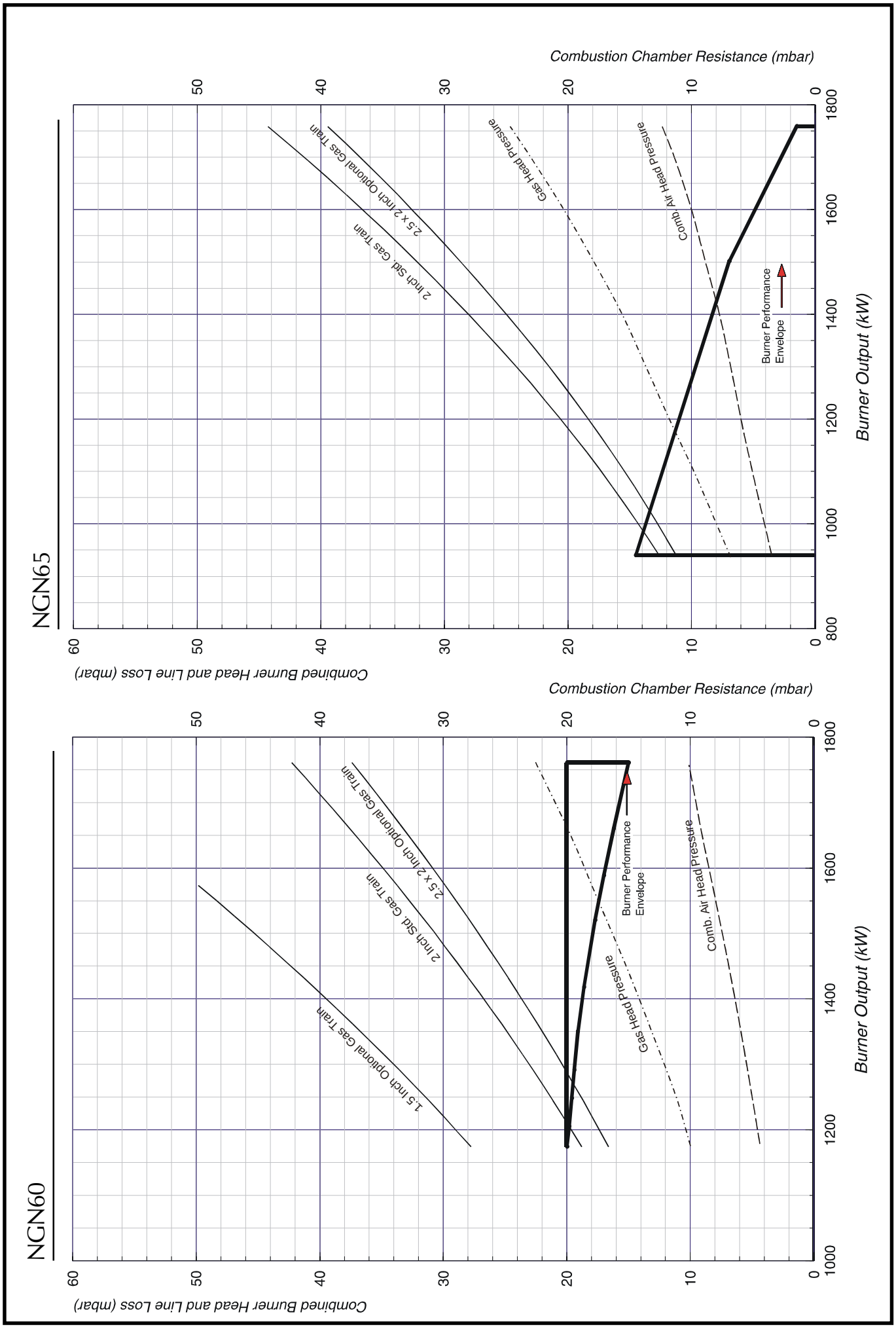
The total minimum gas supply pressure is obtained by summing the combustion chamber resistance and combined burner head and line loss (shown as solid lines). A further 2.5 mbar should be added to allow for manufacturing tolerances etc.

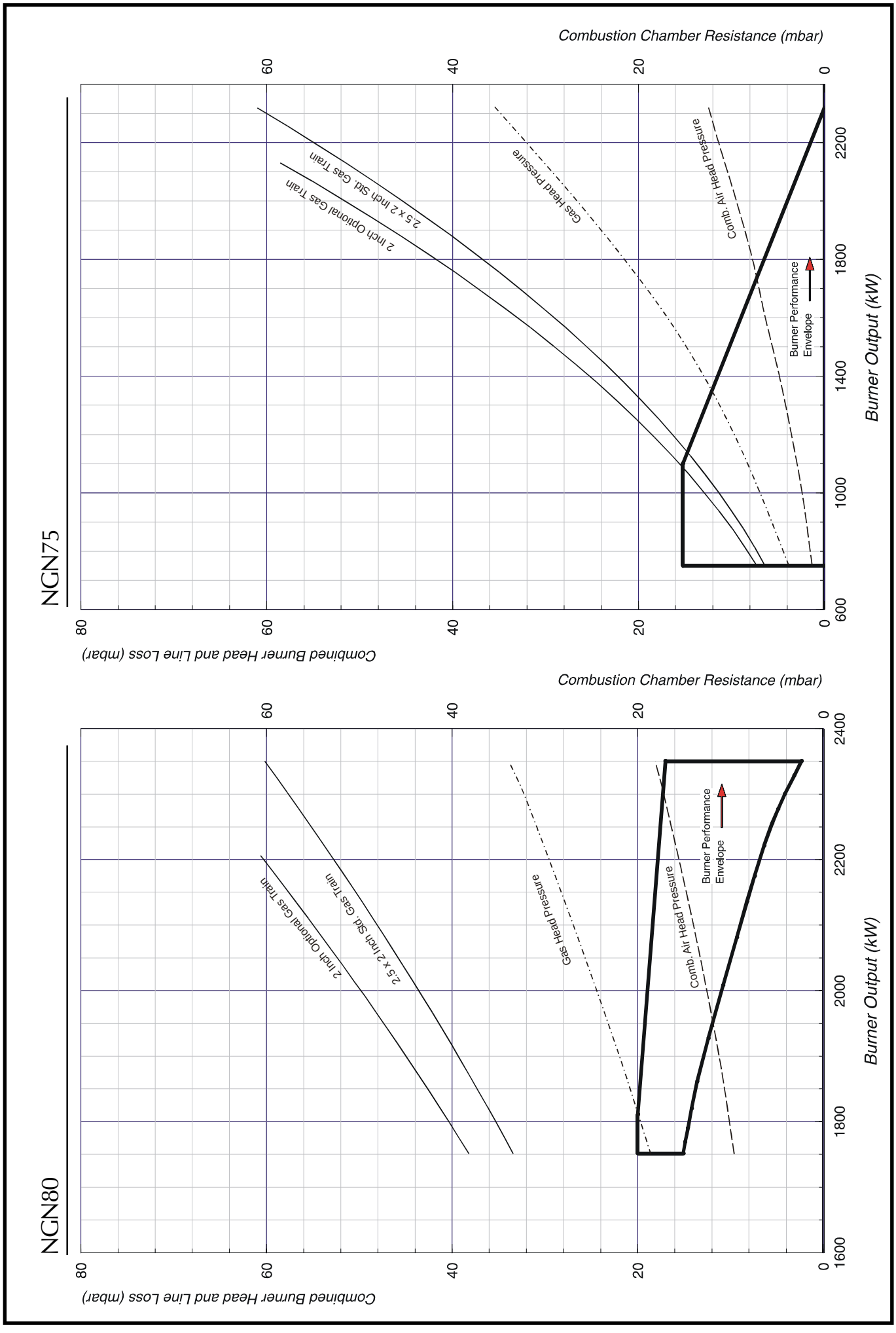
The gas and combustion air head pressure curves are supplied as a guide only, and are not intended to replace a full burner commissioning procedure using certified test equipment.

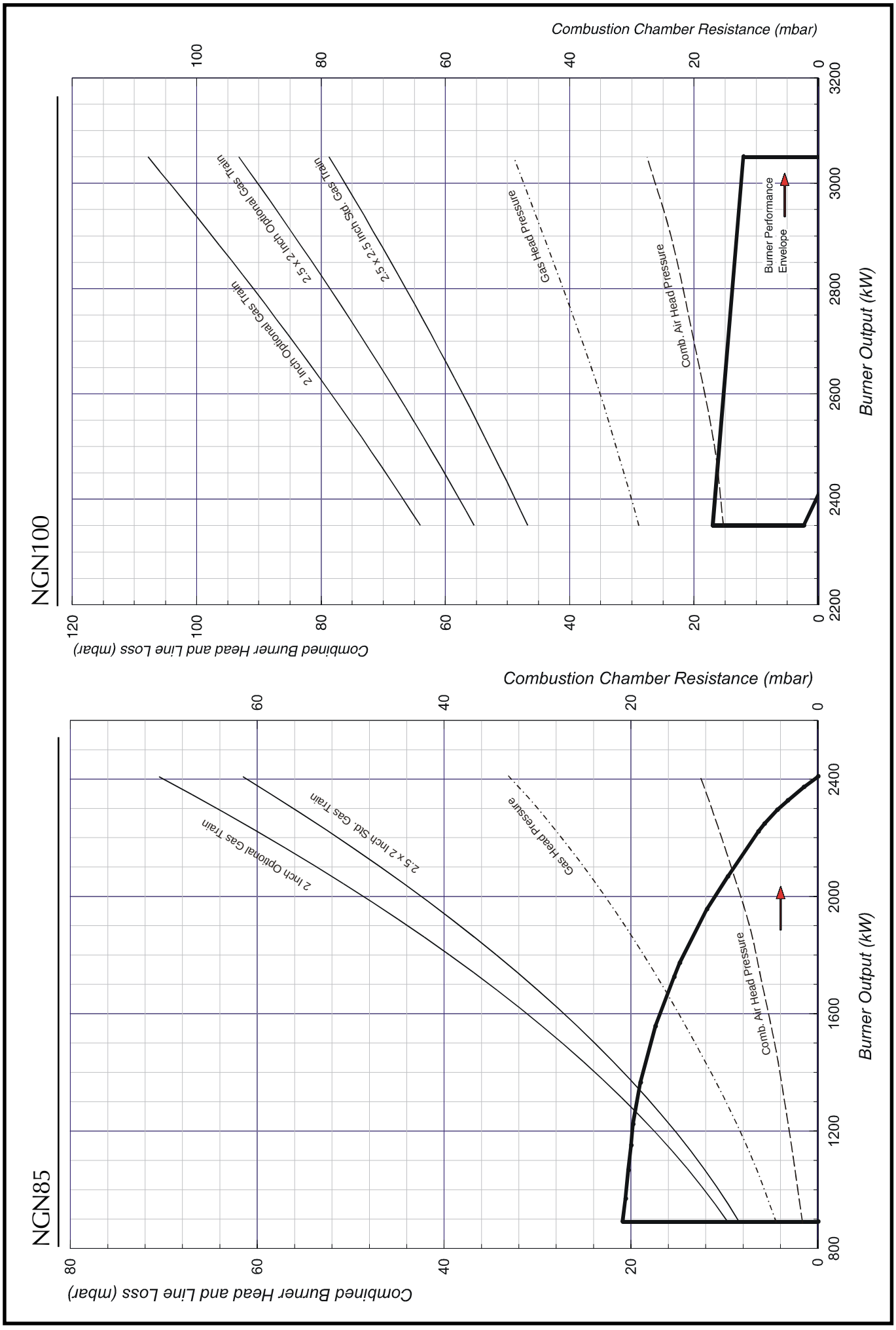
The burner outputs are based on the gross calorific value of natural gas (38.56MJ/m^3).




NGN55
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
Comb. Air Head Pressure
Gas Head Pressure
2.5 x 2 Inch Optional Gas Train
2 Inch Std. Gas Train
1.5 Inch Optional Gas Train
Burner Performance Envelope
NGN45
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
Comb. Air Head Pressure
Gas Head Pressure
2 Inch Std. Gas Train
1.5 Inch Optional Gas Train
Burner Performance Envelope


NGN65
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
2 Inch Std. Gas Train
2.5 x 2 Inch Optional Gas Train
Gas Head Pressure
Comb. Air Head Pressure
Burner Performance Envelope
NGN60
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
1.5 Inch Optional Gas Train
2 Inch Std. Gas Train
2.5 x 2 Inch Optional Gas Train
Gas Head Pressure
Comb. Air Head Pressure
Burner Performance Envelope


NGN75
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
2 Inch Optional Gas Train
2.5 x 2 Inch Std. Gas Train
Gas Head Pressure
Comb. Air Head Pressure
Burner Performance Envelope
NGN80
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
2 Inch Optional Gas Train
2.5 x 2 Inch Std. Gas Train
Gas Head Pressure
Comb. Air Head Pressure
Burner Performance Envelope


NGN100
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
2 inch Optional Gas Train
2.5 x 2 inch Optional Gas Train
2.5 x 2.5 inch Std. Gas Train
Gas Head Pressure
Comb. Air Head Pressure
Burner Performance Envelope
NGN85
Combustion Chamber Resistance (mbar)
Combined Burner Head and Line Loss (mbar)
Burner Output (kW)
2 inch Optional Gas Train
2.5 x 2 inch Std. Gas Train
Gas Head Pressure
Comb. Air Head Pressure

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	_____	m^3	_____	ft^3/ht
Heat input	_____	MJ/hr	_____	Btu/h
CO	_____	%	_____	%
CO_2	_____	%	_____	%
Gross flue gas temperature	_____	°C	_____	°F
Ambient temperature	_____	°C	_____	°F
Nett flue gas temperature	_____	°C	_____	°F
Efficiency	_____	%	_____	%

BURNER SERVICE RECORD

The details below are to be completed by the Servicing Engineer

This sheet to be completed and signed following each service / adjustment

Date	Details Of Service	Signature

Enertech Limited,
P O Box 1,
Vines Lane
Droitwich,
Worcestershire,
WR9 8NA

Tel: +44 (0) 1905 794331 **Fax:** +44 (0) 1905 794017
Email: info@nu-way.co.uk **Web:** www.nu-way.co.uk

NU-WAY®
Enertech Group