



## INSTALLATION/COMMISSIONING/SERVICE/USER MANUAL NORDAIR NICHE DIRECT FIRED UNIT

**These appliances meet the following directives:-**

Machinery Directive (2006/42/EC)

Low Voltage Directive (2014/35/EU)

Electromagnetic Compatibility Directive: (2014/30/EU) Regulation (EU) 2016/2281

Gas Appliance Regulations (EU) 2016/426

Please read this document carefully before commencing installation, commissioning and/or servicing.  
Leave it with the end user/site agent to be placed in their premises technical file after installation.

### **WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death.

All work must be carried out by appropriately qualified persons.

The manufacturer does not take any responsibility in the event of non-observance of the regulations concerning the connection of the apparatus causing a dangerous operation possibly resulting in damage to the apparatus and/or environment in which the unit is installed.

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## Nordair Niche Heater Models:

### NATURAL GAS HEATERS

WMGD	Ducted Direct Fired
WMGHD	Horizontal Direct Fired
WMGND	Ducted Nozzle Direct Fired
WMGDD	Downward discharge Direct Fired
WMGED	External Direct Fired
WMGFD	Duct Direct Fired with Fan
WMG VR	Variable Air Volume Fan

### LPG HEATERS

WMGDL	Ducted Direct Fired
WMGHDL	Horizontal Direct Fired
WMGNDL	Ducted Nozzle Direct Fired
WMGDDL	Downward discharge Direct Fired
WMGEDL	External Direct Fired
WMGFDL	Duct Direct Fired with Fan
WMG VRL	Variable Air Volume Fan

# 1.0 Technical Data Chart

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## 2.0 – General Information

### 2.1 – Introduction

The Nordair Niche WM is a direct fired unit designed to give clean, healthy environmental conditions and constant even temperature within the heated space.

The direct fired heater can be either supplied with or without a supply fan and an option for side plate configuration. The gas burner package will consist of the fuel gas line and all necessary safety controls.

The direct fired heater can be connected to various control systems, more commonly a BMS system or Reznor control package. The controls supplied by Reznor can be sent separately or built into the heater section.

A sight glass is fitted on the heater casing to view the burner during commissioning and general observation.

The heaters are CE and UKCA certified to EN17082 for use in non-domestic installations.

Various burner options are available for each size of air heater.

The Nordair Niche heaters are suitable for use with Natural gas (G20) & LPG (G31). The input rate and the electrical supply requirement is shown on the heater rating plate.

Check the rating plate to determine if the heater is appropriate for the intended installation.

This installation manual is shipped with the unit. Verify that the literature is correct for the model being installed. If the manual is incorrect for the heater, contact the supplier before beginning installation.

The instructions in this manual apply only to the models listed.

Installation should be carried out by a suitably qualified installer in accordance with these instructions and the current rules and regulations in force. The installer is responsible for the safe installation of the heater.

### 2.2 – Gas Burner Overview

The Nordair Niche incorporates the Midco, Maxon NP-II burner or a Maxon RG burner for Variable air volume.

These Direct Fired burners are specially designed for heating fresh air and are mounted such that

a proportion of the incoming air is forced into contact with the flame to ensure rapid mixing and combustion within the code requirements. The burner assembly is built up from modular components to give the required heat duty.

Each burner assembly is fitted with an integral pilot, spark igniter and UV detector or flame rectification. The flame detector is used for scanning both the pilot and main flame. Note that the pilot burner operates in interrupted mode when fitted.

The burner module fitted is identified in the Technical Data Section of this manual, and on the Valve and Instrument list. See figures below for the general probe layouts.

Maxon Burner: Figure 1

Midco Burner: Figure 2

### 2.3 - STATUTORY REQUIREMENTS

In accordance with the Gas Safety (Installation and Use) Regulations 1984, installation of this Genco Heater should only be undertaken by competent personnel who are fully aware of their responsibilities under the Health and Safety at Work Act 1974.

The installation of this Heater must comply with current:

BS6230, Installation of gas-fired forced convection Heaters for commercial and industrial Space Heating of rated input exceeding 60kW.

The IEE Regulations for Electrical Installations Gas Safety (Installation and Use) Regulations 1998

Health and Safety at Work Act 1974

Building Regulations 1986

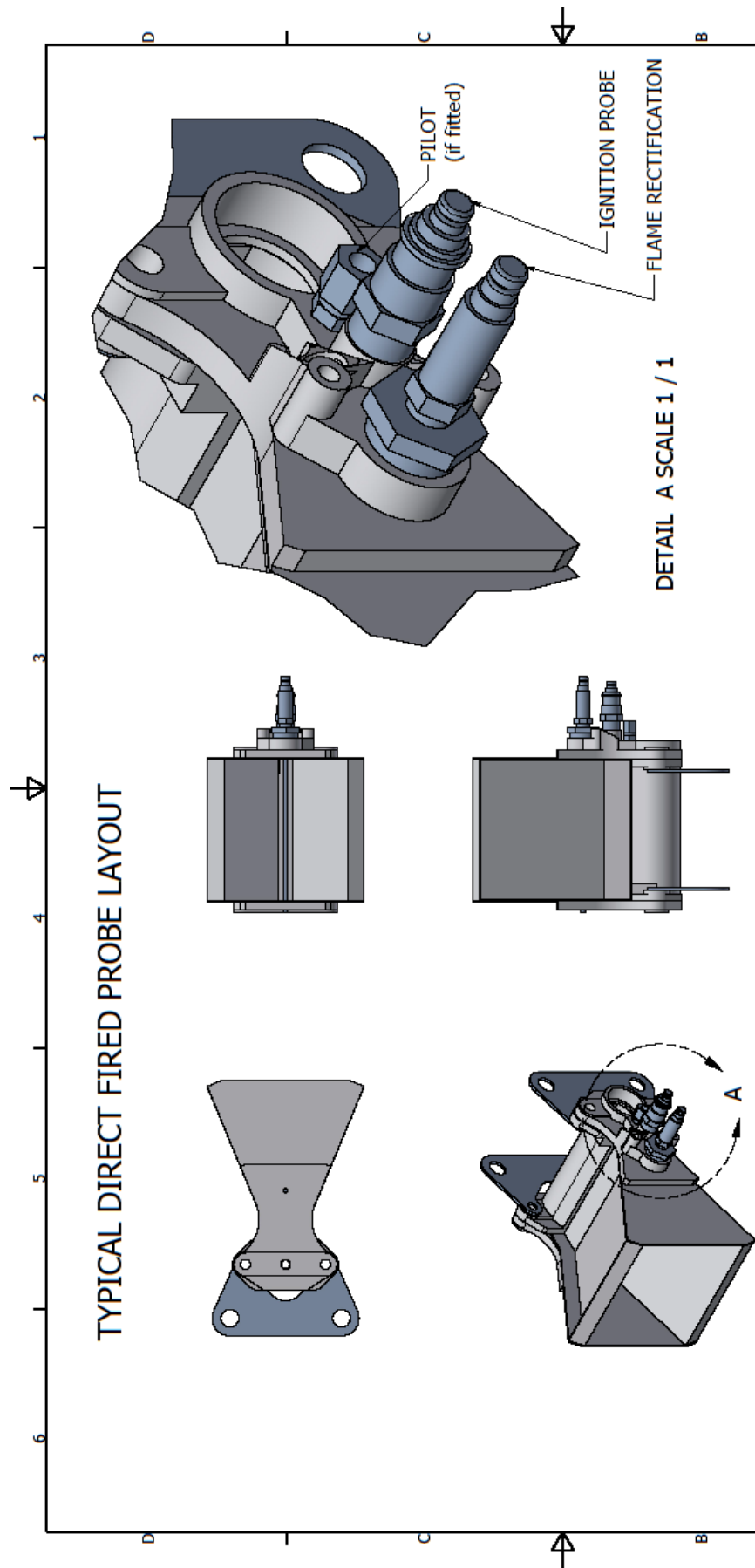
Building Standards (Scotland Only)

The Institution of Gas Engineers Codes of Practice:

IGE/UP/1 Soundness Testing Procedures for Industrial and Commercial Gas Installations.


IGE/UP/2 Gas Installation Pipe work, Boosters and Compressors on Industrial and Commercial Premises.

IGE/UP/4 Commissioning Of Gas Fired Plant On Industrial and Commercial Premises



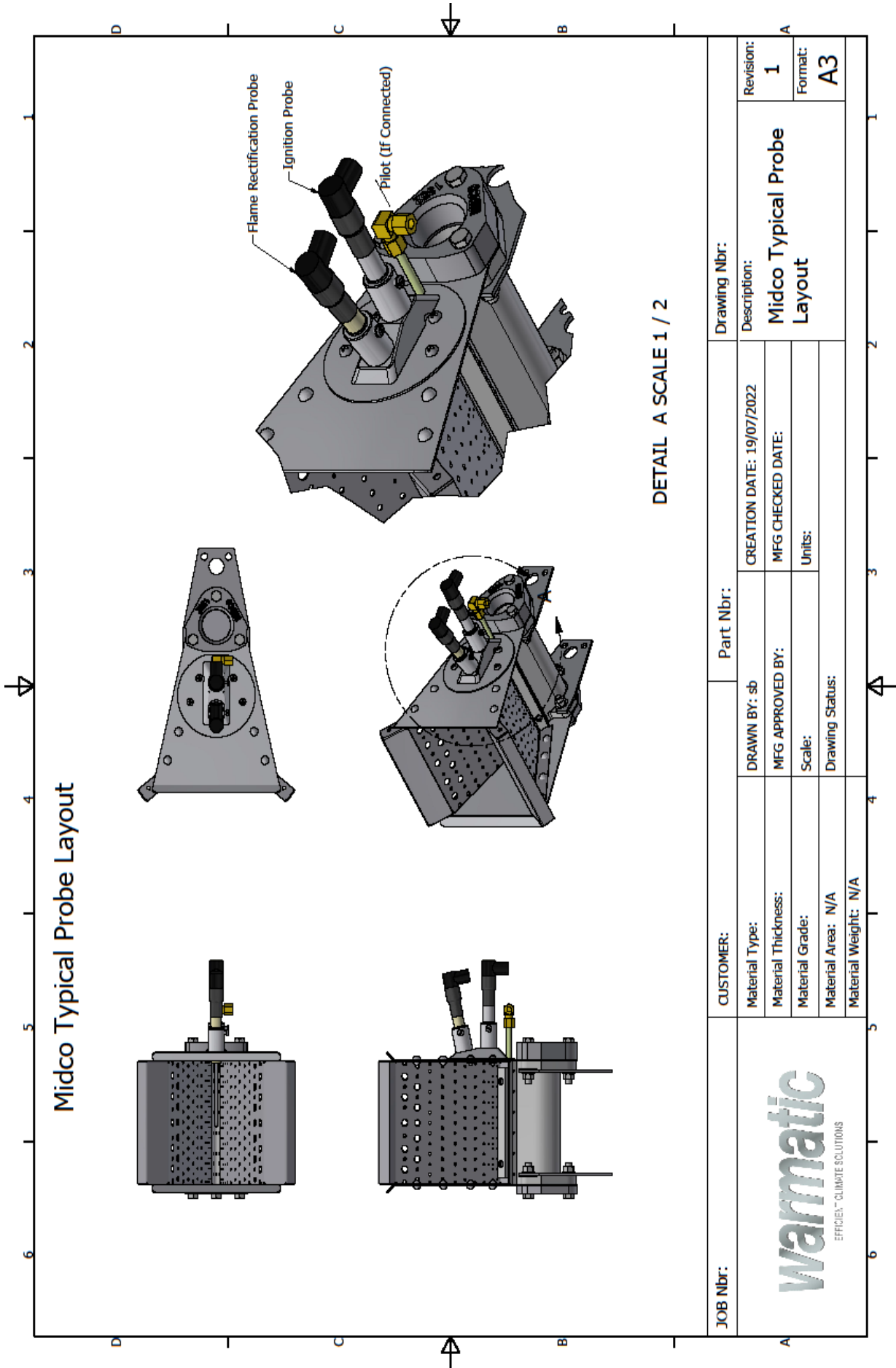
TYPICAL DIRECT FIRED PROBE LAYOUT

DETAIL A SCALE 1 / 1

<div>JOB Nbr:</div> <div> EFFICIENT • QUANTITE SOLUTIONS</div>	CUSTOMER:		Part Nbr: NP2- 0.5ft	Drawing Nbr:	
	Material Type:	DRAWN BY: sb	CREATION DATE: 19/07/2022	Description: TYPICAL DIRECT FIRED PROBE LAYOUT	
	Material Thickness:	MFG APPROVED BY:	MFG CHECKED DATE:		
	Material Grade:	Scale:	Units:		
	Material Area: N/A	Drawing Status:			
	Material Weight: N/A				
	Revision: 1				
Format: A3					







## 2.0 – General Information

### 2.4 - General Health and Safety

#### WARNING

Warning is used when failure to heed or implement the instruction(s) can lead to not only component damage, but also to a hazardous situation being created where there is a risk of personal injury.

#### CAUTION

Caution is used when failure to follow or implement the instruction(s) can lead to premature failure or damage to the heater or its component parts

#### GAS LEAK EMERGENCY

If you can smell gas from or near the heater:

- Do not try to light any appliance
- Do not smoke or light matches
- Do not turn electrical switches on or off
- Open doors and windows, to air the room
- Close the fuel control to the device
- if you still smell gas turn off the supply at the meter unless the meter is in the cellar
- Raise the alarm and evacuate all personnel to a safe place
- Promptly Call your Gas Emergency number
- Do not store or use petrol or other flammable vapours and liquids in the vicinity of the appliance.
- In case of persisting problems, contact your distributor

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death.

Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

Do not use this appliance if any part has been immersed in water. Immediately call a qualified service technician to inspect the appliance and replace any gas control that has been immersed in water.

Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapours

or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons or in applications with airborne silicone substances.

Should overheating occur, or the gas supply fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.

This appliance is not intended for use by persons (including children) with reduced sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance. Carry out a risk assessment for the task to be carried out and ensure the correct use of any Personal Protective Equipment.

This manual should be kept in a safe place for future reference.

#### 2.5 Before using this appliance:

- Carefully read these instructions and follow the processes explained by the manufacturer. These instructions are only valid for appliances designed to operate in Europe.
- Check that the voltage indicated on the type plate corresponds to the mains supply voltage. If the country code and gas category on the appliance data label does not match the country of installation, or the country codes and gas categories as shown in this instruction manual, it will be necessary to contact the distributor or manufacturer to provide the necessary information for the modification of the appliance to the conditions of use for the country of installation
- Ensure that the heater has been securely fastened in its final mounting position.
- Installation, commissioning, testing, programming and maintenance of these products must only be carried out by suitably qualified and trained technicians and in full compliance with all applicable regulations and current best practices.

## 2.0 – General Information

- Check if the appliance as described on the packaging label is in accordance with the correct type and model as specified on the data plate and complies with your customer order.
- Check that the temperature ranges given and those of the location match. The appliance must be powered with a voltage corresponding to the value shown on the rating plate.
- These units must be installed in accordance with the rules in force and local regulations / legislation as appropriate plus all local building codes.
- Installers should satisfy themselves that the gas pipework installation is carried out in accordance with all current legislation, Codes of Practice and recommendations.

### 2.6 - Location/Positioning

Under no circumstances should any item be placed on or above any part of the heater, whether it is being used or not.

All basic criteria must be satisfied prior to commencing the installation and commissioning process.

The heater must be positioned and installed to comply with all relevant standards and guidelines.

And should also meet the local and national fire regulations and insurance criteria, this is critical if the heater is to be installed within a special risk area (e.g., being within close proximity to where petrol engine vehicles are stored or parked, where cellulose spraying takes place, where woodworking machinery is being operated, etc.).

The heater must not be installed within an area with unsuitable conditions, e.g. where the atmosphere is highly corrosive, has a high degree of salinity, or where high wind velocities may affect burner operation.

Suitable protection should be provided for the appliance when it is located in a position where it may

be susceptible to external mechanical damage; for example, fork lift trucks, overhead cranes etc.

Direct heaters must not be located in hazardous areas, however, it is permissible for the heater to supply air to such areas.

The heater must not be installed within an environment where there is a high concentration of chlorides, fluorides, salts, or other aggressive or volatile chemicals/compounds. Nor should the heater be positioned where the burner could be adversely affected by high winds or draughts.

The location chosen for the heater must allow for the fitting of an effective flue system.

The location must also allow for adequate clearance for the air supply, return air circulation, gas supply and electrical supply, whilst also providing good and safe working access.

The heater must be installed on a flat and level surface made from non-combustible material, which is sufficiently robust to withstand the weight of the heater and any ancillary equipment.

Check the proposed location for level and load bearing strength. Ensure that there is adequate clearance, around the unit for access for maintenance purposes.

If the Heater is to be installed above floor level, a suitably designed service platform should be provided.

Such a platform must have 100mm minimum raised edges around the perimeter. If this is not possible, all Heater access panels must be fitted with hinged restraints.

This is a factory standard option which should be specified at the time of ordering - check the restraints are fitted before proceeding with installation.

### 2.7 - General requirements

Unauthorised modifications to the appliance, or departure from the manufacturer's guidance on intended use, on recommended practices may constitute a hazard.

## 2.0 – General Information

To ignore the warning and caution notices, and advice from the manufacturer on installation, commissioning, servicing, or use, will jeopardise any applicable warranty.

Moreover, such a situation could also compromise the safe and efficient running of the appliance itself, and thereby constitute a hazard.

All heaters must be earthed.

The installation of the appliance must meet all the relevant European, national, and local criteria.

Prior to installation the following points should be considered.

- The position of the heater for the optimum efficient distribution and circulation of warm air.
- The position of the heater relative to the route of the flue.
- The position of the heater relative to the supply of fuel.
- The position of the heater relative to the electrical services, and if appropriate, any additional controls.
- The position of the heater relative to the supply of fresh combustion air.
- The position of the heater relative to service and maintenance requirements.

The appliance is designed to work in a maximum ambient temperature of 40°C.

The Air Heaters are designed for mounting directly on the floor and do not need any fixing.

### 2.8 - Electrical supply

Ensure the supply is in accordance with the manufacturer's recommendations and is as stated on the appliance data plate.

The main electrical supply must not be switched off or disconnected as a method for stopping the heater, the exception to this is in an emergency, or during servicing, where the heat exchanger has been given sufficient cooling time to prevent damage from occurring.

Claims for damage will not be considered if they resulted from incorrect wiring or incorrect use of the heater. Wiring external to the heater must be installed in accordance with any local, national, and European regulations.

The means of connection to the main electrical supply must allow for complete electrical isolation of the heater, furthermore, in the case of a unit wired for a three-phase supply, the supply should only be used to serve the heater itself and no other plant or equipment.

The position of the isolation switch must be such that it is adjacent to the heater and easily accessible at all times.

In addition, the isolator itself must have a contact separation of not less than 3mm.

The Control fuse ratings are detailed on the appliance data plate.

Ensure that the electric and gas supplies are turned off before any electrical work is carried out on the heater.

Ensure that wiring cannot contact any surfaces liable to be subject to high temperatures or where the insulation of the wiring could be impaired because of such contact.

### 2.9 - LIMITATIONS OF USE

The Nordair Niche must not be installed in the following locations:

In hazardous areas, in areas where flammable vapours can be present in excess of their threshold limit values, as defined in BS5925.

In accordance with BS6230, Clause 5.1.3, where there are any flued appliances in the heated area, and where air is supplied mechanically and there is mechanical extraction, the design extract rate must be 5% to 10% less than the design inlet rate so that the room will not be at a lower pressure than the outside air.

## 2.0 – General Information

If the Heater is the only source of mechanically supplied air, the extract rate must not exceed 95% of the nominal air flow specified in Section 1.1 of this manual.

Note: If it proposed to install the Nordair Niche Heater to supply heated air to a hazardous area or in areas where flammable vapours are present, the installation must first be approved by Reznor.

This manual is an integral part of the heater, therefore it should always be carefully kept and it should always be provided together with the heater, if it is transferred to another owner or user.

If this manual is damaged or lost, a new one should be requested from the installer or from the manufacturer. After unpacking the product, please check the contents to ensure all components are present. If not, please contact your supplier.

Before installation, carefully read these instructions and follow the processes explained by the manufacturer.

These instructions are only valid for appliances designed to operate in Europe. If the country code and gas category on the appliance data label does not match the country of installation or the country codes and gas categories as shown in this instruction manual, it will be necessary to contact the distributor or manufacturer to provide the necessary information for the modification of the appliance to the conditions of use for the country of installation.

Installing, commissioning, testing, programming, and maintenance of these products must only be carried out by suitably qualified and trained technicians and in full compliance with all applicable regulations and current best practices.

The installation must be carried out by suitably qualified personnel who, at the end of the work, will commission the appliance and issue to the owner a copy of the commissioning report, which also confirms that the installation has been carried out in accordance with regulations & standards applicable to the country of use and in accordance with the manufacturers instructions.

This appliance has been manufactured specifically for air rotation and room heating and must be used for this purpose.

Contractual liability of the manufacturer in respect of damages caused to people, animal or premises by incorrect installation, settings, maintenance or by improper use of the heater is excluded.

Check if the appliance as described on the packaging label is in accordance with the correct type and model as specified on the data plate and complies with your customer order.

Check that the temperature ranges given and those of the location match. The appliance must be powered with a voltage corresponding to the value shown on the rating plate.

These units must be installed in accordance with the rules in force and local regulations / legislation as appropriate plus all local building codes. Installers should satisfy themselves that the gas or oil pipework installation is carried out in accordance with all current legislation, Codes of Practice, and recommendations.

Additionally, it may be necessary to protect the gas valves which form part of the heater or burner assembly from potential pipe contamination particularly, but not exclusively, where copper gas pipework is used.

If the appliance is to remain unused for long periods, it is recommended that the following operations are carried out:

- Turn the appliances' electrical supply off via the local isolator.
- Close the main gas supply valve

## 3.0 – Installation

### 3.1 - STATUTORY REQUIREMENTS

In accordance with the Gas Safety (Installation and Use) Regulations 1984, installation of this Nordair Niche Heater should only be undertaken by competent personnel who are fully aware of their responsibilities under the Health and Safety at Work Act 1974.

The installation of this Heater must comply with current:

BS6230, Installation of gas-fired forced convection Heaters for commercial and industrial Space Heating of rated input exceeding 60kW.

The IEE Regulations for Electrical Installations  
Gas Safety (Installation and Use) Regulations 1998  
Health and Safety at Work Act 1974  
Building Regulations 1986  
Building Standards (Scotland Only)

The Institution of Gas Engineers Codes of Practice: IGE/UP/1 Soundness Testing Procedures for Industrial and Commercial Gas Installations. IGE/UP/2 Gas Installation Pipe work, Boosters and Compressors on Industrial and Commercial Premises.

IGE/UP/4 Commissioning Of Gas Fired Plant On Industrial and Commercial Premises

### 3.2 - OFFLOADING

Heaters are supplied in modular form with flanged connections between each module. Lifting should be either by hand or by eyebolts connected to the flange corner holes. Alternatively, Heaters may be handled by a fork lift truck if supported from flange to flange and the module casing does not rest on the fork lift tines.

Note: The fan and motor sections will always be delivered to site pre-assembled and in the orientation in which they are to be installed. They should always be handled in this orientation.

#### 3.2.1 Installers responsibilities

It is the installers responsibility to:-

- Install the heater, as well as the gas and electrical supplies, in accordance with all applicable specifications and codes. The manufacturer recommends the installer contact a local Building Inspector, Fire Officer or Insurance Company for guidance.
- Use the information given in this manual together with the local and national codes to perform the installation.
- Install the heater in accordance with the clearances given.
- Plan for the installation of supports, flues and air intakes.
- Provide access to burners for servicing.
- Provide the owner with a copy of this installation, commissioning, operation and service manual.
- Provide a copy of the commissioning report for the heater.
- Ensure that there is sufficient ventilation in the area to comply with the requirements of the heater and all relevant local and national codes. Ignoring the warning and caution notices and the advice from the manufacturer on installation, commissioning, servicing or use, will jeopardise any applicable warranty. This could also compromise the safe and efficient running of the appliance itself and thereby constitute a hazard.

#### Compliance notices

The heater range detailed herewith are manufactured within a strictly controlled quality environment.

These instructions are only valid if the following country code is on the appliance GB. IE. If this code is not present on the appliance, it is necessary to refer to the technical instructions which will provide the necessary information



## 3.0 – Installation

concerning the modification of the appliance to the conditions of use for the country.

The manufacturer has taken reasonable and practical steps to ensure that all heaters are safe and without risk when properly used.

These heaters should therefore only be used in the manner and purpose for which they were intended, and in accordance with the recommendations detailed herewith.

The manufacturer supports all new products being supplied to their customers with a comprehensive information pack; this clearly defines mandatory instructions for the safe installation, use, and maintenance, of the appliance(s).

Where proprietary items are incorporated into any of the heaters, detailed information and instructions are also provided as part of the information pack.

It is the responsibility of the installer, owner, user, or hirer of the heater to ensure that they are familiar with the appropriate information/manuals supplied by the manufacturer and the safety instructions.

In addition, operators must be suitably trained in the use of the appliance to ensure its continued safe and efficient use.

The manufacturer has a commitment to continuous improvement and therefore reserve the right to amend or change the specification of Warm Air Heater subject to compliance with the appropriate European, national and local regulations.

### 3.2.2 Warranty

The heater is supplied with a 1 year parts and labour warranty and a further year on all parts excluding consumables.

The warranty commences from the date of dispatch from the manufacturer, and is subject to the terms detailed within the Manufacturers 'conditions of business' unless otherwise agreed at the time of order.

Note: The warranty may be invalidated if:

- The installation is not in accordance with these instructions.
- The heater has been installed without proper clearances wherever clearances are required.
- The ventilation/ combustion air supply for the heater are not in accordance with the manufacturers recommendations, and local and national codes of practice and similar standards.
- Air flow through the heater is not in accordance with the manufacturer's technical specifications.
- Internal wiring on the heater has been tampered with or unauthorised service or repairs undertaken.
- The main electrical supply input to the heater has been interrupted during the heating mode.
- The heater has been subject to and affected by the ingress of water in any form.
- The heater is not operated at the rating(s) laid down in the manufacturers technical specifications.
- The heater has not been operated or used within the normal scope of its intended application.
- The air delivery system is modified in any way.
- The manufacturer's recommended minimum service and maintenance requirements have not been complied with.

Note: All warranty claims must contain the following info to enable processing to take place.

## 3.0 – Installation

- Heater model
- Heater serial number
- Order reference/date of order, together with
- Full installation details (name and address Details or symptoms of fault)
- Installers name and address
- Commissioning and service records Faulty parts must be returned to the supplier, the address of which is provided at the rear of this manual. Any such parts will undergo inspection to verify the claim.

Replacement parts supplied prior to this may be charged, and a credit supplied upon subsequent validation of the warranty claim. Consumable items are specifically not included within the scope of the warranty.

Note: Notification is required the immediate moment a fault is suspected.

The manufacturer will not accept responsibility for any additional damage that has been caused, expense incurred, or consequential loss resulting from any failure of the heater(s).

The electrical isolator should only be used for maintenance purposes or in an emergency. It should not be used for closing down the main burner as it switches off the fan prematurely and may damage the heat exchanger, invalidating the warranty.

### 3.3 Fresh Air Intake

The Heater must be installed where it has a direct and unlimited supply of fresh air from outside the building. Ensure that the air intake is not located near exhausts from the building or from any process exhausts such as paint booth exhausts. Whenever possible protect the fresh air inlet from the prevailing wind and local wind effects from corners.

The fresh air inlet should be sized for an air velocity of 3m/s. The inlet duct area is detailed on the General Arrangement drawing.

Where the fresh air inlet is made in a load bearing wall, e.g. a brick wall, guidance should be obtained from Structural Engineers on the provision of a lintel in the wall over the fresh air opening.

A weather hood must be fitted when the Heater air inlet is at or within 1m of the outside wall.

Additionally, the weather hood should have negligible resistance to the airflow, maximum 0.1 mbar at the design air flow rate.

Do not install the Nordair Niche where long lengths of duct or bends of an angle greater than 30° are necessary to lead to the Heater from the fresh air opening. If ducting is unavoidable, ensure that the resulting pressure drop is negligible, i.e. less than 0.1 mbar for ductless Heaters, and has been accounted for in the original design for ducted Heaters.

Note: If the air intake is located in an area of unrestricted access, warning notices preventing the blockage of the air intake by temporary stacking should be displayed adjacent to the intake.

Air inlets shall be provided such that their lowest edge is at least 500 mm above the base of the appliance or will reach 500 mm above floor level when installed in accordance with these manufacturer's instructions.

#### 3.3.1 Ventilation

Where the Heater is in its own plant room or compartment, this shall be ventilated with openings communicating directly with the outside air to ventilate the room.

The openings shall be fitted with grilles of negligible resistance and shall be sited so that they cannot easily be blocked or flooded. They shall have a total minimum free area as follows:

Low Level (inlet): 350cm<sup>2</sup> + 2.5cm<sup>2</sup> per kilowatt in excess of 70kW total rated input.

High Level (outlet): 350cm<sup>2</sup> + 2.5cm<sup>2</sup> per kilowatt in excess of 70kW total rated input.



### 3.0 – Installation

The free area of the grilles shall be not less than the size of the recommended minimum ventilation opening. Grilles shall be designed to minimise high velocity air streams in the plant room. For exposed, i.e. free standing plant rooms, ventilation openings shall be provided on at least two sides, and preferably on all four sides.

Where mechanical ventilation is used, it shall be by mechanical inlet and either natural or mechanical extraction. Systems of ventilation employing mechanical extraction and natural air inlet shall not be used.

The minimum flow rates of air supplied shall be not less than 0.6 m<sup>3</sup>/s per megawatt of rated heat input.

#### 3.6 AIR DISCHARGE

The Heater should be located with the air discharge into the heated space at a minimum height of 3 metres. The air should not discharge directly onto any obstructions, and direct discharge on to working personnel should be avoided.

If the air discharge is located in an area of unrestricted access, warning notices preventing the blockage of the air discharge by temporary stacking should be displayed adjacent to the discharge.

Generally, it is not necessary to fit distribution ducting to the discharge of the Heater. If ducting is required or specified ensure that the resulting pressure drop has been accounted for in the original design specification.

#### 3.3.2 Assembly and Position of the heater

Unless specified at the time of order Heaters will be shipped in sections. Discharge heads, grilles, attenuators, duct connecting sections, filters, rain-hoods etc., will be supplied loose for site fitting to the Heater.

Horizontal Heaters must be supported on their steel angle support base. When the Heater is located check for level and adjust as necessary.

#### 3.3.3 Fuel Gas Supply

The Nordair Niche has been designed for use on Natural Gas & LPG (modifications will be required for LPG).

The gas type for the Heater supplied is clearly marked on the Heater data badge on the appliance.

Check the gas type is correct and that the supply pressure is within the range marked on the specification.

The local gas Authority should be consulted about the adequacy of the gas service and meter supplies for existing and proposed extensions to the installation and for any requirements for boosting the gas supply.

Connect the fuel gas supply to the inlet manual valve on the Heater gas train.

The connection size is detailed in figure 1 of this manual. A further isolation valve and union should be fitted immediately adjacent to the appliance which, when the valve is closed, allows the complete burner and control assembly to be disconnected for maintenance or repair.

Installation gas pipes should be installed and tested in accordance with the current IGEM technical standards.

Gas pressures at the inlet of the gas valve/heater must not be less than 17.5 mbar, under full fire conditions.

Gas Pressure with the main burner off must not exceed 100mbar, if the installer must fit a suitable gas regulator to the installation pipework

#### 3.3.3 Electrical supply

All external wiring shall be carried out and checked by a competent person. All components shall be checked for suitability for voltage range and frequency and must be installed in accordance with the current edition of IEE Wiring Regulations and any other local regulations in force.

Means for electric isolation, having a contact separation of at least 3mm in all poles, must be provided adjacent to the Heater and must facilitate

### 3.0 – Installation

complete electrical isolation of the heater. The electrical supply to the appliance shall incorporate suitable means of excess current protection.

The Nordair Niche requires a motor rated 3 phase 4 wire supply, which should be connected to the main control panel. Check the Heater data badge for the correct electrical supply.

The maximum supply requirement is specified in figure 1 of this manual.

Note that the 240 Volt Heater control circuit is taken from the 'U' phase to Neutral. Connection should be made as shown on the wiring diagram shipped inside this panel.

The Heater must be earthed in accordance with BS5986 and CP1013.

Check all terminal strip terminations for wires which have become loose during shipment.

### 3.4 – Clearances

(Generic picture for illustration purposes)

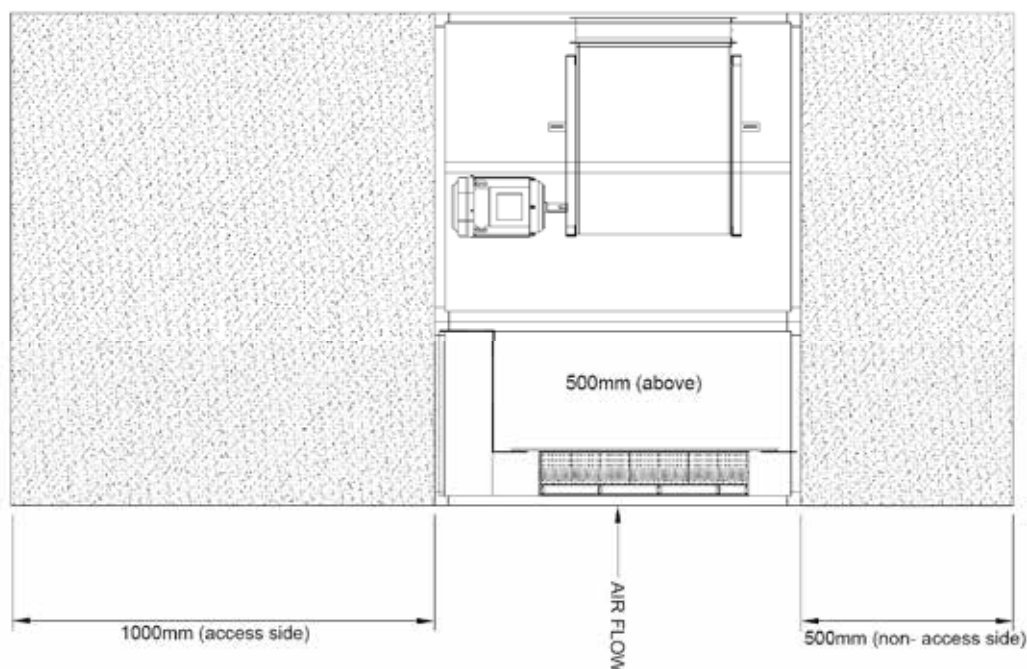
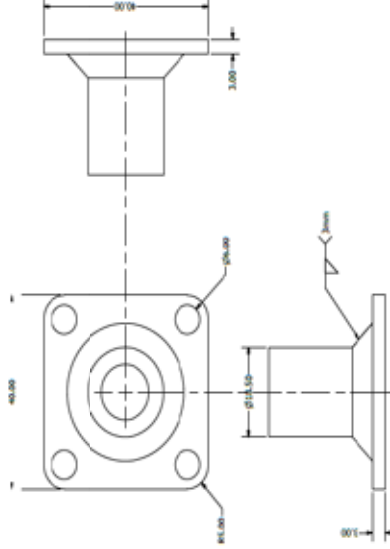
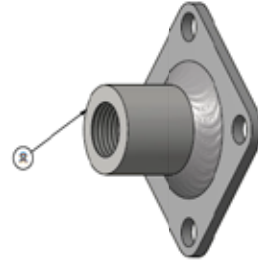
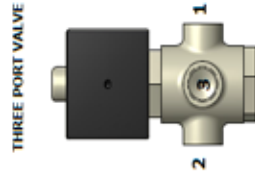


Figure 4

### Air Proving Device – For negative pressure sensing



## Air Proving Device – For Positive pressure sensing

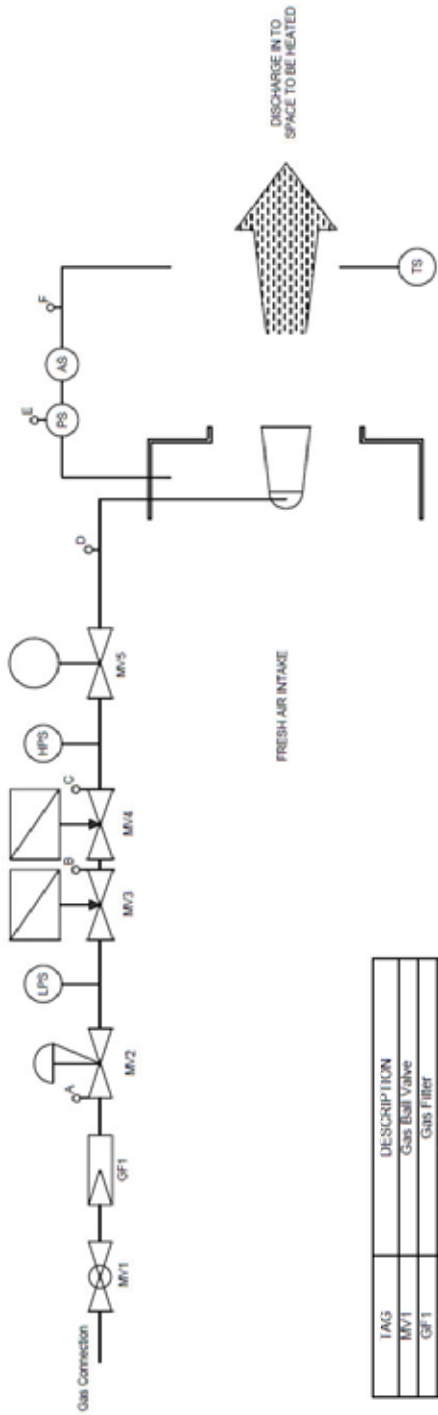
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### Air Sensing Flange and Test Point

<b>warmatic</b> www.warmatic.co.uk	2 Aulton Court Redcar TS10 3HS 01642 899950 <a href="http://www.warmatic.co.uk">www.warmatic.co.uk</a>	Orders Date Order QA HWS Part No Qty Price Total	11/06/2012        	TITLE POSITIVE PRESSURE CHAMBER_AIR PROOFING DATE NO PART NO PRICE TOTAL	ORDER NO ORDER DATE ORDER REF
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Direct Ignition Layout for burners under 180kW output

SIDE PLATE BURNERS UNDER 180kW OUTPUT

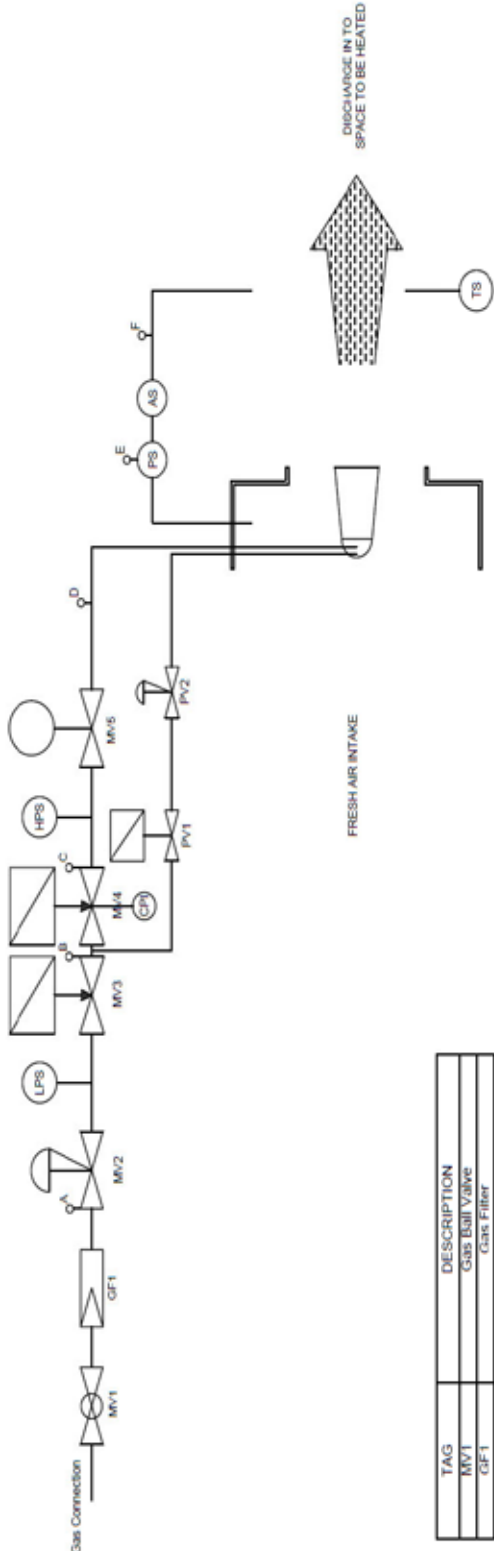


TAGS	DESCRIPTION
MV1	Gas Ball Valve
GF1	Gas Filter
MV2	Gas Regulator
MV3	Main Primary Solenoid Valve
MV4	Main Secondary Solenoid Valve
MV5	Gas Modulating Valve
LPS	Low Gas Pressure Switch
HPS	High Gas Pressure Switch
PS	Air Pressure Switch
AS	Three Port Air Test Solenoid Valve
TS	Over Temperature Switch
A	Gas Inlet Test Pressure Point
B	Gas Pressure After Regulator
C	Gas Pressure After The Main Valve
D	Burner Head Pressure
E	Up Stream Air Pressure Test Point
F	Down Stream Air Pressure Test Point

COMPONENT LIST & SERVICES	
Burner:	** Inch NP II / RGIV
Fuel:	Natural Gas / LPG
Max. Gas Supply Pressure	300mbar
Min. Gas Supply Pressure	21mbar Nat & 31mbar LPG
Electricity Supply (Burner Section)	240v, 50Hz, 1Ph, 3Wire
Modulating Valve Voltage & Control	24vac, 0-10vdc Control

General gas train layout above 180kW option 1 – pilot line taken between the main valves and CPI switch on the 2<sub>nd</sub> main valve

SIDE PLATE BURNERS ABOVE 180kW OUTPUT - OPTION 1



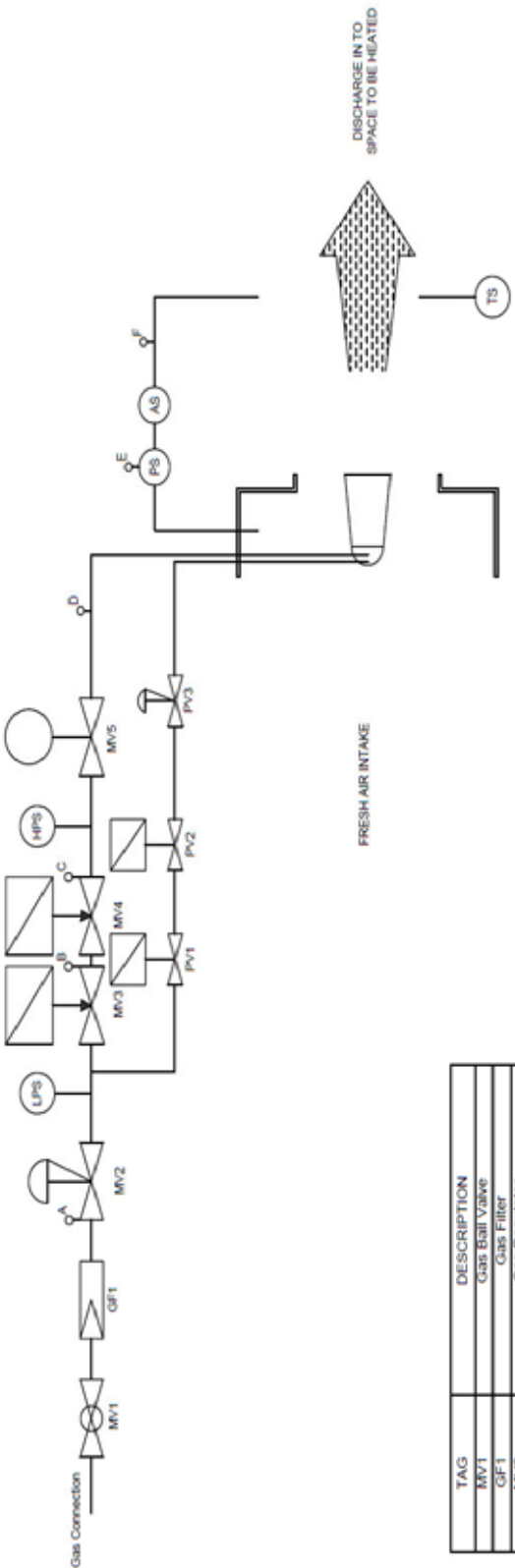
TAG	DESCRIPTION
MV1	Gas Ball Valve
GF1	Gas Filter
MV2	Gas Regulator
MV3	Main Primary Solenoid Valve
MV4	Main Secondary Solenoid Valve
MV5	Gas Modulating Valve
PV1	Pilot Valve
PV2	Pilot Pressure Regulator
LPS	Low Gas Pressure Switch
HPS	High Gas Pressure Switch
PS	Air Pressure Switch
AS	Three Port Air Test Solenoid Valve
CPI	Close Position Indicator
TS	Over Temperature Switch
A	Gas Inlet Test Pressure Point
B	Gas Pressure After Regulator
C	Gas Pressure After The Main Valve
D	Burner Head Pressure
E	Up Stream Air Pressure Test Point
F	Down Stream Air Pressure Test Point

COMPONENT LIST & SERVICES	
Burner	** Inch NP II / RGIV
Fuel	Natural Gas / LPG
Max. Gas Supply Pressure	300mbar
Min. Gas Supply Pressure	21mbar Nat & 31mbar LPG
Electricity Supply (Burner Section)	240V, 50Hz, 1Ph, 3Wire
Modulating Valve Voltage & Control	24vac - 0-10vdc Control

4.0 – Technical Data

General gas train layout above 180kW option 2 – Separate pilot line

SIDE PLATE BURNERS ABOVE 180kW OUTPUT - OPTION 2



TAG	DESCRIPTION
MV1	Gas Ball Valve
GF1	Gas Filter
MV2	Gas Regulator
MV3	Main Primary Solenoid Valve
MV4	Main Secondary Solenoid Valve
MV5	Gas Modulating Valve
PV1	Pilot Valve 1
PV2	Pilot Valve 2
PV3	Pilot Pressure Regulator
LPS	Low Gas Pressure Switch
HPS	High Gas Pressure Switch
PS	Air Pressure Switch
AS	Three Port Air Test Solenoid Valve
CPI	Close Position Indicator
TS	Over Temperature Switch
A	Gas Inlet Test Pressure Point
B	Gas Pressure After Regulator
C	Gas Pressure After The Main Valve
D	Burner Head Pressure
E	Up Stream Air Pressure Test Point
F	Down Stream Air Pressure Test Point

COMPONENT LIST & SERVICES	
Burner:	** Inch NP II / RGIV
Fuel:	Natural Gas / LPG
Max. Gas Supply Pressure	300mbar
Min. Gas Supply Pressure	21mbar Nat & 31mbar LPG
Electricity Supply (Burner Section)	240v, 50Hz, 1Ph, 3Wire
Modulating Valve Voltage & Control	24vac - 0-10vdc Control

## 4.0 – Technical Data

### 4.1 Combustion Control System

The controls fitted on the Heater are detailed on the 4.0 Technical Data

#### 4.1.1 SAFETY CONTROLS

The safety interlocks on the Nordair Niche are:

- 1 Combustion air proving switch (PS)
- 2 Ultra-violet burner flame detector (UV) or flame rectification
- 3 Overheat limit control (OLC)
- 4 Low gas pressure switch (LPS)
- 5 High gas pressure switch (HPS)

Failure of either the combustion air switch or flame scanning circuit will cause the Heater to go to LOCKOUT and the burner management system will require a RESET before a re-light can be attempted.

The Heater discharge overheat limit control is a manual reset switch. After a failure the switch will have to be RESET before a re-light can be attempted.

#### 4.1.2 TEMPERATURE CONTROL SYSTEM

Can be fitted with a modulating temperature control system. The space temperature is sensed by a heated space detector, which inputs to the panel mounted temperature controller. This achieves control by modulation of the fuel gas flow control valve (MV5). The temperature controller additionally limits the Heater air temperature, to pre-set high and low limits.

#### 4.1.3 MAIN CONTROL PANEL (If supplied)

The control panel houses the combustion/circulation air fan starter, the burner management system, and the heated space temperature controller. On larger units, a separate starter panel may be supplied. The panel door is fitted with an interlocked isolator, POWER ON, and LOCKOUT lights and the burner management RESET button. The panel is mounted on or adjacent to the Heater.

#### 4.1.4 FUEL GAS SYSTEM

The PILOT LINE (if fitted) comprises:

- 1 Pilot governor (PV2)
- 2 Gas Filter

- 3 Two British Gas certificated solenoid valves (PV1 OR PV2)
- 4 One pilot gas isolation valve (PV3)

#### 4.1.5 Pipe work and fittings

Note: Two pressure test points are fitted on the pilot line on the inlet and discharge of the pilot solenoid valve.

The MAIN GAS LINE comprises:

- Gas isolation valve (MV1)
- Pressure governor (MV2)
- Double block safety shut-off system (MV3/4)
- Gas flow control valve (MV5)
- Gas Filter (GF1)
- CPI Switch (if fitted)
- Pipe work and fittings

Note: Four pressure test points are fitted on the main gas line; on the supply, the inlet and discharge of the second block valve and downstream of the flow control valve.

Note: On small Heaters items 2 and 3 are combined in one multi-functional control. All items above are detailed on the 4.0 Technical Data

#### 4.1.6 Gas Train Layout

Depending on the turndown requirements, burners under 180kW will be direct ignition but when higher turndowns are required a pilot will be fitted to burners under 180kW

All burners above 180kW will be fitted with a pilot line which will consist of a gas filter, regulator and two pilot valves.



## 5.0 – Commissioning

### 5.1 Pre-Start up

This appliance must be commissioned by a Gas Safe registered engineer.

#### 5.1.1 PRESTART CHECKS

- 1 Inspect and clean the inside of the unit from foreign objects such as rags, tools, particles of metal and such that may pose damage to the inside of the unit.
- 2 Check filters are securely in place.
- 3 Check electrical connection are tight and wired correctly.
- 4 Make sure the main switch is in the OFF position "O". Check available power supply is of the correct type.
- 5 Visually inspect components for damage and correct fitting.
- 6 Check that the correct gas type and supply pressure is correct according to section 1. the individual ball valve (MVI) should be in the closed position at this point and the gas should be purged and tightness tested to (MVI)
- 7 Close the heater access doors.
- 8 Switch warm electrical isolator to ON position 1 check power supply is correct and ON.
- 9 Set the external controls to enable the gas burner to allow the commissioning of the gas burner.
- 10 Run the main supply fans and check fan rotation. The fan rotation can be observed through the fan section access door or through the heater access door as the fan slows down when fan is switched off. Rotation arrows are fitted on the end of the heater and inside the heater above the interior bearing support. If the rotation is incorrect, two phases should be interchanged, as dictated by the engineer

responsible for the sit's electrical system. Check Air Flow is above our minimum airflow rate as per this manual.

- 11 Check the air pressure drop across the burner whilst the fan is operating with a water column, or a digital manometer connected to the two pressure test points on the air pressure switch (DPS). See Gas train layout drawing test points A & B. This pressure should be between 1.4 and 1.6 mbar if the air differential pressure measured above is not within the operating range check inlet and outlet ductwork as appropriate and any filters fitted. If the pressure differential is still not within limits, isolate the heater and contact Reznor before proceeding.
- 12 Attach a pressure manometer to the gas test point on the gas pressure regulator (see Gas Train Layout Drawing section 4.0) , open the inlet gas ball valve (MVI) then close and tightness test the heater gas train as per current Standards and Regulations.

### 5.2 DRY RUN

Prior to a live run with gas a dry run with the inlet gas ball valve (MVI) must be performed. The heater will go through its safety sequence and lockout after the point of consumption (the orange lamp will be lit). Once satisfied move on to start up.

#### 5.2.1 START UP

- 1 Attach a manometer to pressure test point F and the low-pressure test point on the air pressure switch (DPS).
- 2 Open the main gas supply valve (MV1) and the pilot burner isolation valve (PV3). Leave the main burner isolation valve (MV6) closed. Reset the Heater by pressing the push-button marked RESET on either the main panel or remote station. The Heater pilot will light automatically (after the automatic damper start check and combustion air pre-purge) and

## 5.0 – Commissioning

- 1 then LOCKOUT after the main gas shut-off valves are addressed.  
During the short period that the pilot is in operation, check the pilot gas pressure on the manometer. It should be 10 mbar and the pilot flame approximately 100 - 150mm in length, covering the first three or four holes of the mixing plate and have a steady blue colour when viewed through the sight glass on the access side of the Heater. Adjust as necessary this manual. Check the flame signal - refer to Section 5.2.3
- 2 Open the main burner isolation valve (MV6). RESET the Heater which should now light to main burner stage. When alight, close the main burner isolation valve to shut down the gas flow to the burner. Check that the unit goes to LOCKOUT.
- 3 Reset the Heater and drive the burner to low fire by adjusting the temperature controller set point to low. Check the flame is continuous across the width of the burner and has a flame length of approx. 50 - 65mm from the burner rail when viewed through the sight glass on the access side of the Heater. Check the burner pressure across pressure test point and the downstream (low) pressure test point on the air pressure switch, i.e. on the rear of the pressure switch. This pressure is specified on the data badge and the technical data chart of this manual. Adjust as necessary. Check the flame signal - refer to Section 5.2.3. Where possible, check the actual gas flow rate by meter reading with all other appliances turned off.
- 5 Drive the burner to high fire by adjusting the temperature controller set point and high limit to 55°C. Check the flame is continuous across the burner rail and has a flame length of approximately 250 - 350mm from the burner rail. Check the burner pressure across pressure test point D and the downstream (low) pressure test point on the air pressure switch. This pressure is specified on the data badge and technical data chart of this manual. Adjust as necessary. Check the maximum Heater

discharge temperature. Check the flame signal - refer to Section 5.2.3. Where possible check the actual gas flow rate by meter reading with all other appliances turned off.

- 6 Check the operation of the overheat limit control by adjusting the temperature controller set point and high limit to 65°C. Monitor the discharge temperature on the temperature controller. Check that the overheat control operates as the set temperature is passed. Check that the control must be manually reset by pressing the green reset button on the front of the switch. Return the temperature controller to its original settings.

### 5.2.3 FLAME SIGNAL CHECK

- 1 The Nordair Niche is fitted with a Test Terminal which can be used to measure the flame scanning signal. Refer to the Electrical Schematic and connect a 0-1 mA ammeter to the two test points with standard 2.3 mm test plugs, with the positive lead on the detector side. Disconnect the terminal link to obtain the signal reading. A minimum signal of 70 micro amps is required; typical signals are in the 250-400 micro amp range on both pilot and main flame. After completion, replace the terminal link and remove the test jacks.
- 2 Drive the burner to high fire as previously described. Measure the carbon dioxide content of the discharge air stream. This figure must not exceed 2800 ppm. If the discharge exceeds this limit, isolate the Heater and report to BMM before proceeding.
- 3 Stop and start the Heater a few times to check for reliability.

### 5.3 PILOT ADJUSTMENT

The pilot gas pressure and flame length may be adjusted by altering the discharge pressure of the pilot governor. Screwing the adjusting screw clockwise (located under the top cap) increases

## 5.0 – Commissioning

the discharge pressure and the flame length; anti-clockwise decreases the pressure and the flame length.

### 5.3.1 HIGH GAS OUTPUT TEST

Drive the burner to high fire by adjusting the set point on thermostat to a higher value. Check the flame is continuous over the entire width of burner rail and mixing plate.

Check the burner pressure across pressure test point (A) and the downstream (low) pressure test point (D) on the DSP (6). This pressure is specified on the data plate attached to the gas burner plate. Check the flame signal as described in “Low gas output test”



The flame signal should be around 70µA

### 5.3.2 LOW GAS OUTPUT TEST

Rest the heater, start the unit in “MANUAL” mode, open the MVI and drive the burner to low fire by decreasing the set point to the minimum operating range. Check that the flame is continuous across the entire width of the burner rail when viewed through the observation hole.



**Adjust the heater flame by adjusting the gas valve actuator to minimum.**

Potential hazard! If the flame is not covered the entire rail, uncombusted gas may seep out inside the unit and endanger the surrounding equipment and personnel

Check the flame signal current

Potential hazard! Do not adjust the gas regulator (16) whilst the gas actuator (15) is not fully opened. This may result in uncombusted gas to seep out inside the unit and endanger the surrounding equipment and



The flame signal should be around 70µA

Repeat steps if unable to stabilize the flame to minimum. Do not stop until successful with the testing.

### 5.3.3 FINAL TESTING

Where possible, check the actual gas flow rate by meter reading if fitted on the appliance or at the main gas meter in the building with all other appliances turned off.

Check that the thermostat control is maintaining the temperature that has been set.

If the temperature is too high and the overheat keeps triggering reduce the gas flow by altering the adjuster on the gas regulator (MV2).

Only adjust the gas regulator (12) when the actuator (11) is fully opened

Stop unit.

## 5.0 – Commissioning

### 5.3.4 SUMMER/OFF/WINTER SWITCH

In the SUMMER position this switch provides ventilation only and is independent of the programmed ON and OFF periods. This position is manually selected and must be manually de-selected. Whenever the switch is in this position, the fan is operating.

In the OFF position the Heater is shutdown and will not operate. This overrides any frost protection fitted. It is suitable for Heater shutdown for short periods such as holidays. The programme memory is unaffected by this switch and assumes control of the Heater when the switch is returned to the WINTER position. In the WINTER position the Heater operates off the programme memory to provide heating.

### 5.3.5 RESET BUTTON

Visual indication of Heater lockout is provided. In the event of lockout occurring, the Heater can be reset by depressing the RESET button. This parallels the RESET button on the Heater main control panel. If, after 4 attempts to reset the Heater, the lockout indicator still illuminates, then a Service Engineer should be called to investigate the problem.

## 5.4 COMBUSTION CONTROLLER

The Nordair Niche heaters have an option of different combustion controllers, Siemens and Honeywell. In section 6 combustion controllers' further information can be found.

## 6.0 – Combustion controllers

### 6.1 Siemens LME75.0001 – PME75.831

The LME75 control box is selected for gas burners which operated for over 24 hour, these control boxes have a self check function without stopping the operation of the burner

Application:

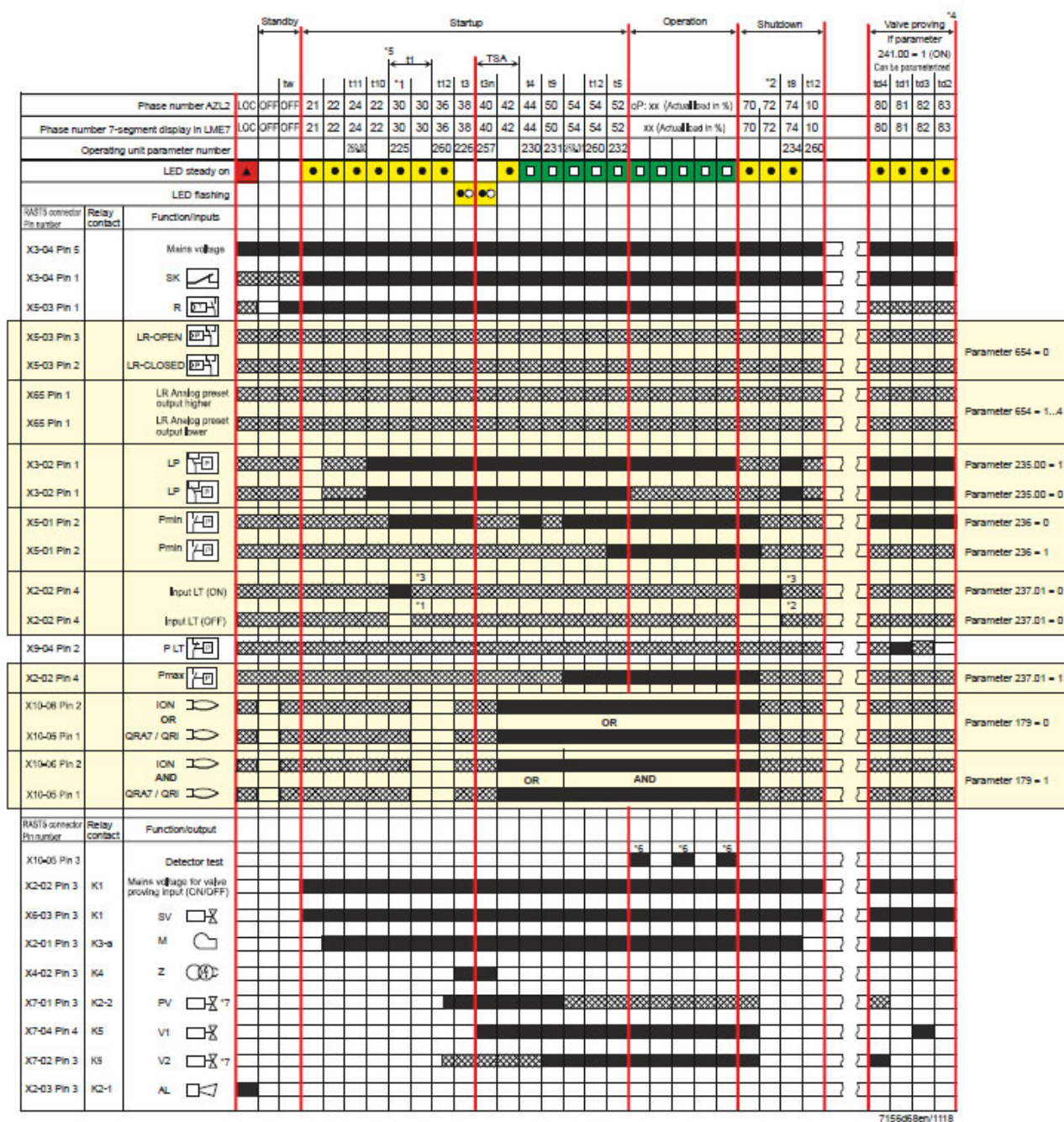
- 1-stage or modulating, direct or pilot-ignited forced draft burners
- With independent ignition load position below or above the low-fire position
- Integrated actuator control via 3-position controller or analog signal
- Integrated valve proving function, can be switched via separate digital input for simple handling on dual-fuel burners
- Prepurge position at high-fire to low-fire
- Flame failure response time can be parameterized.
- For example, for burners to EN 676 or industrial thermo processing plants to EN 746 Part 2
- Continuous operation >24 hours of uninterrupted operation

Only qualified personnel are allowed to start up and operate the equipment. Qualified personnel in the context of the safety-related notes contained in this User Documentation are persons who are authorized to commission, ground, and tag units, systems, and electrical circuits in compliance with established safety practices and standards.



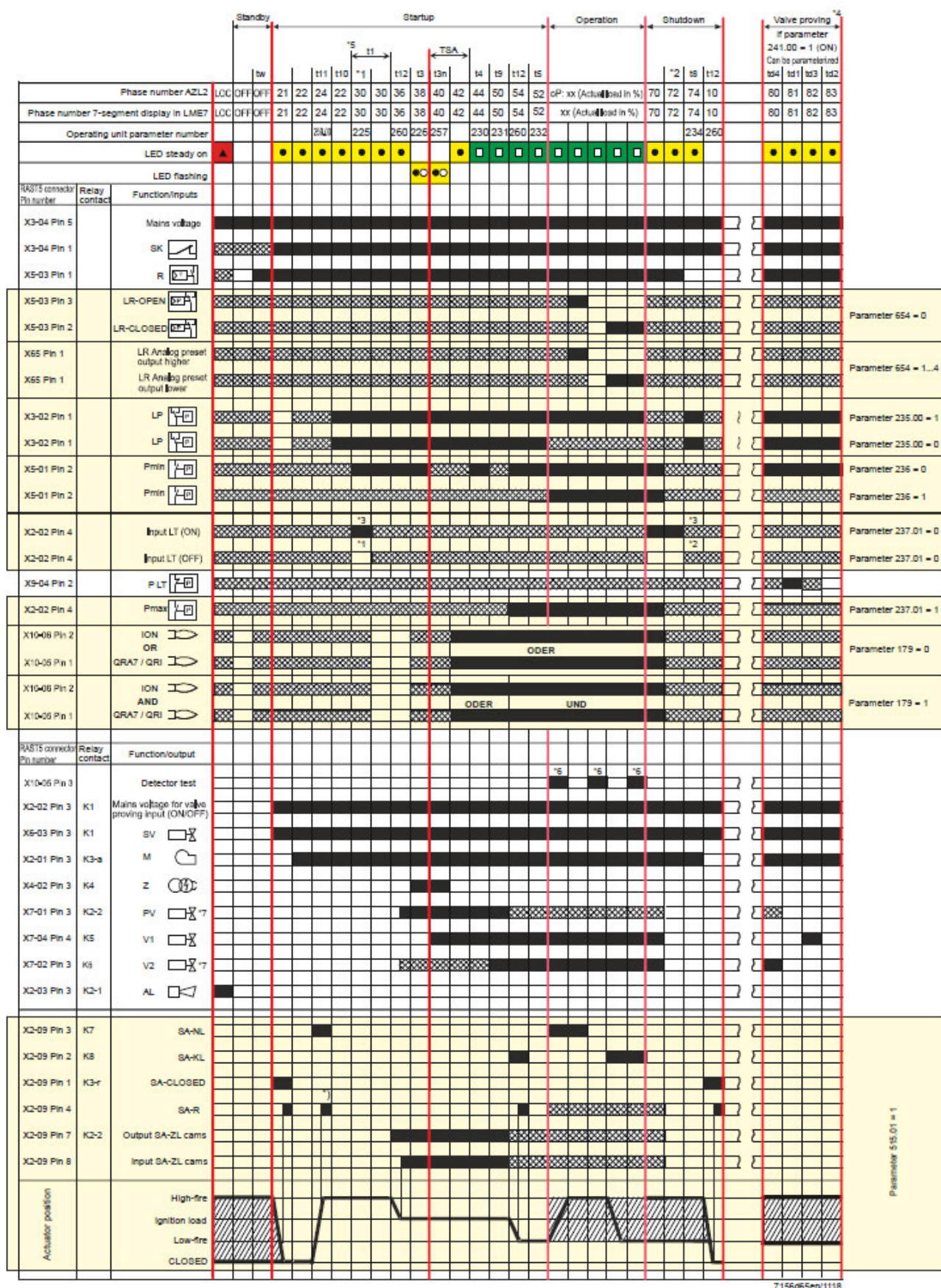
## 6.0 – Combustion controllers

### 6.2 Program 1 – without siemens actuator



## 6.0 – Combustion controllers

### 6.3 Option 2 with siemens actuators





## 6.0 – Combustion controllers

### 6.4 Display information

Phase number display 7-segment    AZL2		LED	Function
LOC	LOC	Red	Lockout phase
<b>Standby</b>			
OFF	OFF	OFF	Standby, waiting for heat request
P08	Ph08	OFF	Power ON / test phase (e.g., detector test)
<b>Startup</b>			
P21	Ph21	Yellow	Safety valve ON, air pressure switch in no-load position Actuator travels to CLOSED position
P22	Ph22	Yellow	Part 1: Fan motor ON Part 2: Specified time air pressure switch Message (timeout), stabilization air pressure switch
P24	Ph24	Yellow	Actuator travels to the prepurge position (timeout)
P30	Ph30	Yellow	Part 1: Prepurge time without extraneous light test Valve proving during prepurging (t1), if Parameter 241.00 = 1 and Parameter 241.02 = 1 or Parameter 241.01 = 0 or Parameter 234 (postpurge time) = 0 seconds Part 2: Prepurging with extraneous light test (1 second)
P36	Ph36	Yellow	Actuator closed in ignition load / low-fire and Parameter 259.02: Actuator opens at a position > ignition load
P38	Ph38	Flashing yellow	Preignition time
P40	Ph40	Flashing yellow	First safety time / ignition transformer ON
P42	Ph42	Green	Safety time (ignition transformer OFF), flame check
P44	Ph44	Green	Interval: End of safety time and fuel valve V2 ON
P50	Ph50	Green	Second safety time, fuel valve V2 ON
P52	Ph52	Green	Interval until release of load controller target (analog or 3-position step input)
P54	Ph54	Green	Parameter 259.01: Actuator opens at a position > low-fire Parameter 260: Actuator closes at low-fire
<b>Operation</b>			
xx	oP:xx	Green	Operation (modulation), actual load displayed in percent
<b>Shutdown</b>			
P10	Ph10	OFF	Actuator travels to CLOSED position (home run)
P70	Ph70	Yellow	Stop operation
P72	Ph72	Yellow	Stop operation
P74	Ph74	Yellow	Postpurge time Valve proving during postpurging (t8), if Parameter 241.00 = 1 and Parameter 241.02 = 1 or Parameter 241.01 = 1 and Parameter 234 (postpurge time) > 0 seconds
<b>Safety shutdown phases</b>			
P01	Ph01	Yellow / red	Undervoltage / overvoltage
P02	Ph02	Yellow	Safety shutdown, followed by a non-alterable lockout with interlocking → e.g., safety loop open
P04	Ph04	Green / red	Extraneous light during burner startup Timeout, extraneous light tolerance time in standby Parameter 216 → Non-alterable lockout
P90	Ph90	Yellow	Gas pressure switch-min open Parameter 223 = 0 → Safety shutdown and start prevention Parameter 223 = 1 → Non-alterable lockout



6.0 – Combustion controllers

6.5 – Fuel Train – Gas direct ignition (G) 1<sub>st</sub> stage or modulating

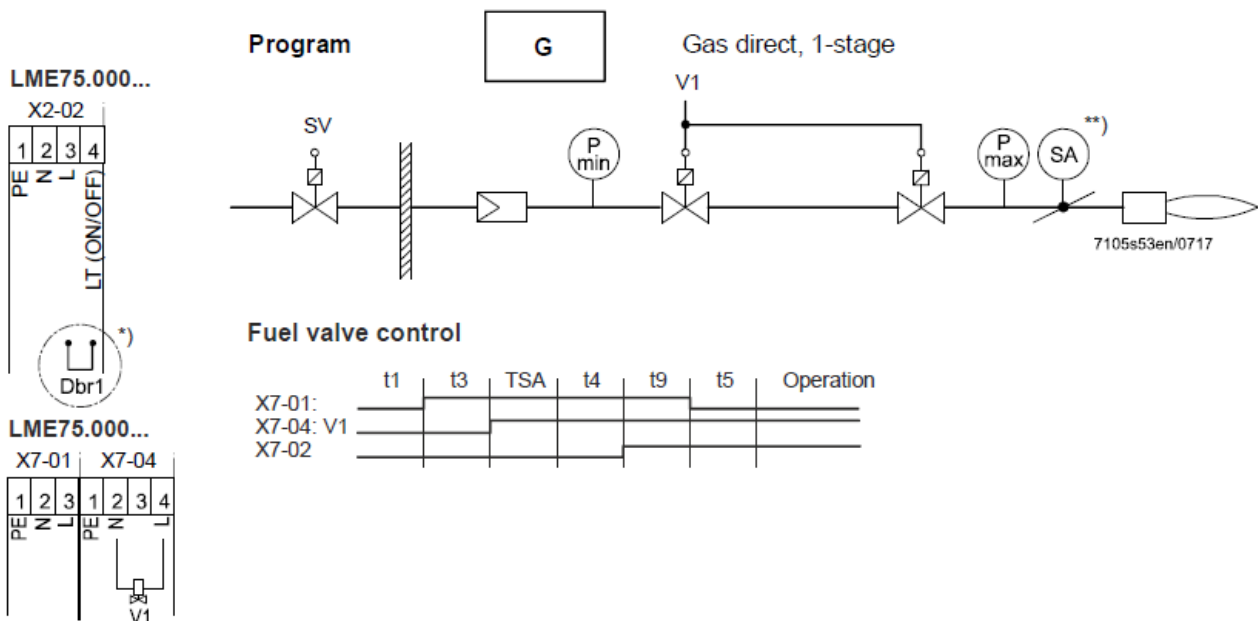


Figure 6: Fuel train gas direct ignition (G), 1-stage or modulating, without valve proving

\*) Alternatively, parameter 241.00 can be set to 0

\*\*) Optional

6.5.1 – Fuel Train – Gas direct ignition 2 (Gp2), 1-stage or modulating, without value proving.

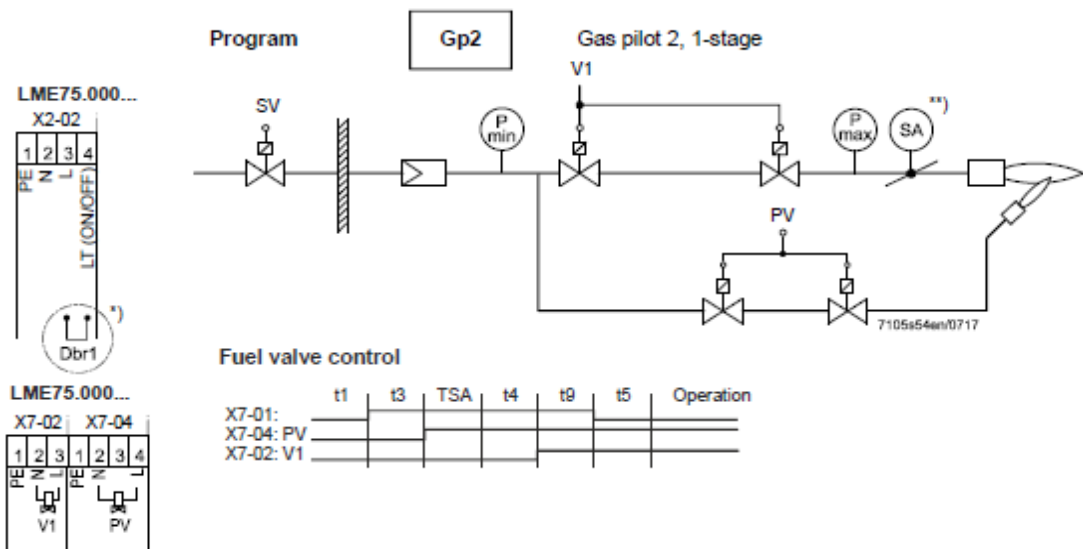


Figure 7: Fuel train gas pilot ignition 2 (Gp2), 1-stage or modulating, without valve proving

\*) Alternatively, parameter 241.00 can be set to 0

\*\*) Optional

## 6.0 – Combustion controllers

### 6.6 – Siemens control box connected to Siemens actuators

#### PME75.831Ax

- 1-stage modulating
- With/without pilot ignition
- With/without valve proving

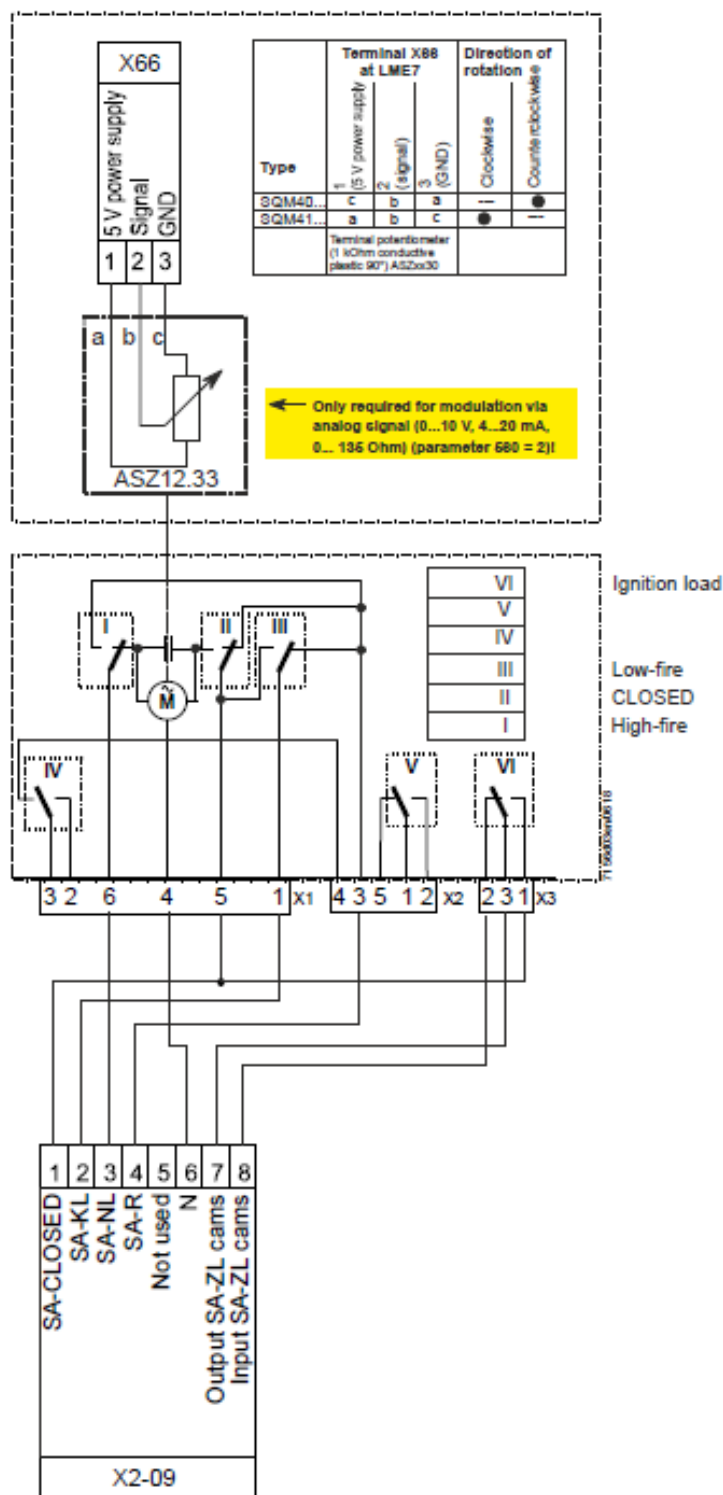
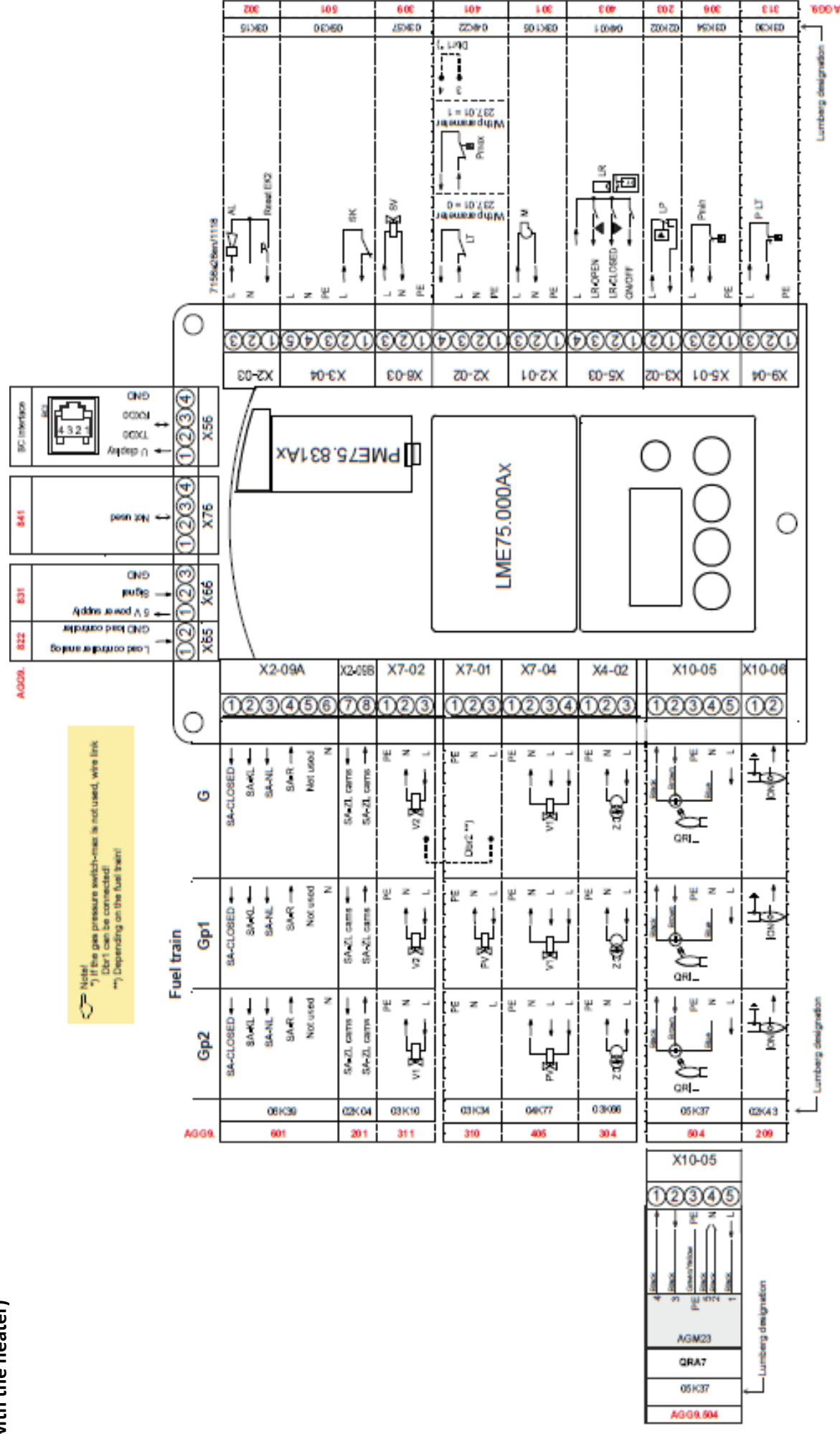


Figure 26: Connection diagram example 1: LME75.000Ax with SQM40/SQM41 (diagram 8) and ASZ

## 6.0 – Combustion controllers

### 6.7 LME75 – Electrical connections reference only (please use wiring diagram sent with the heater)



## 6.0 – Combustion controllers

### 6.8.1 Error codes continued

Error code		Plain text	Possible cause
AZL2	LCD display (alternating)		
Loc: 60	Loc 60	Analog load controller source 4...20 mA, I < 4 mA	Wire breakage
Loc: 138	Loc 138	Restore process successful	Restore process successful
Loc: 139	Loc 139	No PME75 detected	No PME75 plugged in
Loc: 167	Loc 167	Manual locking	Manual locking
Loc: 206	Loc 206	AZL2 incompatible	Use the latest version
rSt Er1	rSt Er1	Error in compatibility between PME75 and LME75 during restore process	Program sequence of PME75 does not match the LME75
rSt Er2	rSt Er2	Error in compatibility between PME75 and LME75 during restore process	LME75 hardware does not match the PME75
rSt Er3	rSt Er3	Error during restore process	<ul style="list-style-type: none"> <li>PME75 faulty</li> <li>PME75 removed during restore process</li> </ul>
bAC Er3	bAC Er3	Error in compatibility between PME75 and LME75 during backup process	Program sequence of PME75 does not match the LME75
Err PrC	Err PrC	Fault in PME75	<ul style="list-style-type: none"> <li>Error in data content of the PME75</li> <li>No PME75 plugged in</li> </ul>

## 6.0 – Combustion controllers

Error code		Plain text	Possible cause
AZL2	LCD display (alternating)		
Loc: 2	Loc 2	No flame at end of safety time	<ul style="list-style-type: none"> <li>Faulty or soiled fuel valves</li> <li>Faulty or soiled flame detector</li> <li>Poor adjustment of burner, no fuel</li> <li>Faulty ignition</li> </ul>
Loc: 3	Loc 3	Air pressure faulty (air pressure switch welded in no-load position, decrease to specified time) (air pressure switch flame-on response time)	Air pressure switch faulty <ul style="list-style-type: none"> <li>Loss of air pressure signal after specified time</li> <li>Air pressure switch welded in no-load position</li> </ul>
Loc: 4	Loc 4	Extraneous light	Extraneous light during burner startup / standby or after extraneous light tolerance time has elapsed (parameter 216) in standby
Loc: 5	Loc 5	Air pressure faulty, air pressure switch welded in operating position	Time supervision air pressure switch <ul style="list-style-type: none"> <li>Air pressure switch welded in operating position</li> </ul>
Loc: 6	Loc 6	Actuator fault	<ul style="list-style-type: none"> <li>Actuator faulty or blocked</li> <li>Faulty connection</li> <li>Faulty adjustment</li> </ul>
Loc: 7	Loc 7	Loss of flame	Too many losses of flame during operation (limitation of restarts) <ul style="list-style-type: none"> <li>Faulty or soiled fuel valves</li> <li>Faulty or soiled flame detector</li> <li>Poor adjustment of burner</li> </ul>
Loc: 10	Loc 10	Errors that cannot be assigned (application) Internal error	Wiring fault or internal fault, output contacts, other faults
Loc: 12	Loc 12	Valve proving error in fuel valve V1	Fuel valve V1 leaking
Loc: 13	Loc 13	Valve proving error in fuel valve V2	Fuel valve V2 leaking
Loc: 20	Loc 20	Gas pressure switch-min open	Gas shortage
Loc: 21	Loc 21	Gas pressure switch-max open	Gas pressure has exceeded maximum limit
Loc: 22	Loc 22	Safety loop open	<ul style="list-style-type: none"> <li>External limit thermostat or pressure switch open</li> <li>Safety temperature limiter has tripped</li> </ul>

## 6.0 – Combustion controllers

### 6.8.2 Key

AL - Alarm device

Dbr... Wire link



reset (EK1)- Lockout reset button (info button)

EK2 - Remote lockout reset button

FSV - Flame signal amplifier

ION - Ionization probe

K... Relay contact

LED - 3-color signal lamp

LP - Air pressure switch

LR - Load controller

LR- OPEN - Load controller OPEN position

LR- CLOSED - Load controller CLOSED position

M - Fan motor

NT - Power supply unit

P LT- Pressure switch valve proving

Pmax - Pressure switch-max

Pmin - Pressure switch-min

PV- Pilot valve

QRA7 - UV flame detector

QRI- Infrared flame detector

R- Control thermostat or pressure stat

SA- Actuator

SA-KL- Actuator low-fire

SA-NL- Actuator high-fire

SA-R- Actuator feedback

SA- Closed Actuator CLOSED

SA-ZL - Actuator ignition load

SK- Safety loop

SV- Safety valve

V1- Fuel valve

V2 - Fuel valve

Z- Ignition transformer

Input/output signal 1 (ON)

Input/output signal 0 (OFF)

Permissible input signal 1 (ON) or 0 (OFF)

### 6 Siemens LME21.350C2 Combustion controller

for standard operation, not to be used for 24hr operation. LME... burner controls are used for the start-up and supervision of 1- or 2-stage gas or gas / oil burners in intermittent operation. The flame is supervised by an ionization probe or flame detector QRA... with ancillary unit AGQ3...A27 for gas / oil forced draft burners or blue-burning flames with blue-flame detectors QRC... In terms of housing dimensions, the LME... are identical with the LGB... and LMG... burner controls

- For gas burners with or without fan to EN 298: 2003
- For gas burners with fans conforming to EN 676
- For oil burners to EN 230: 2005
- Undervoltage detection
- Air pressure supervision with functional check of the air pressure switch during start-up and operation
- Electrical remote reset facility
- Multicolour indication of fault status and operational status messages
- Limitation of the number of repetitions
- Accurate control sequence thanks to digital signal handling
- Controlled intermittent operation after 24 hours of continuous operation



Do not to open, interfere with or modify the unit!

All activities (mounting, installation, and service work, etc.) must be performed by qualified staff

- Before making any wiring changes in the connection area, completely isolate the plant from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If not observed, there is a risk of electric shock hazard

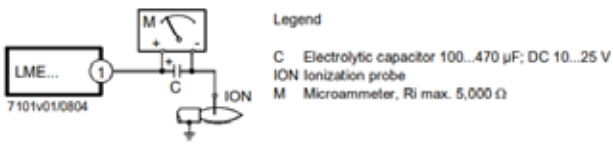
- Ensure protection against electric shock hazard by providing adequate protection for the burner control's connection terminals

6.0 – Combustion controllers

- Check the connecting lines of the air pressure switch for short-circuits (connection terminals 3, 6 and 11)
- Press the lockout reset button / operation button of the LME... or the AGK20... lockout reset button extension only manually (applying a force of no more than 10 N) without using any tools or pointed objects
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage
- Each time work has been carried out (mounting, installation, service work, etc.).

6.9.1 Flame Rectification information.

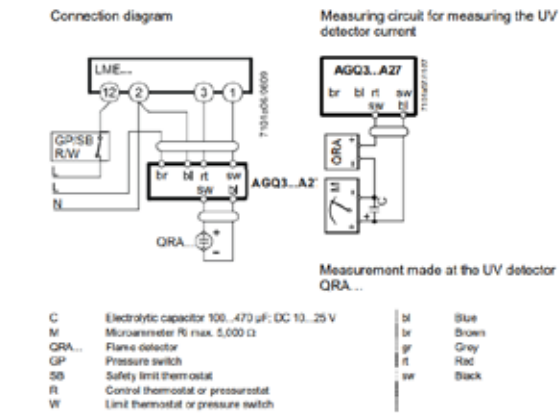
With the same quality of flame, the detector current with the LME... may be different from than with LMG... / LGB... Flame supervision with ionization is accomplished by making use of the conductivity and rectifying effect of the flame. The flame signal amplifier only responds to the DC current component of the flame signal. A short-circuit between ionization probe and ground causes the burner to initiate lockout.



6.9.2 UV cell detection option information

In connection with LME...C2 burner controls, use of UV ancillary unit AGQ3...A27 is mandatory.

Correct functioning of aged UV cells can be checked as UV test with a higher supply voltage across the UV cell after controlled shutdown until terminal 3 on.



	Detector current required (with flame)	Perm. detector current (without flame)	Possible detector current with flame (typically)
QRC...	Min. 70 µA	Max. 5.5 µA	Max. 100 µA

The values given in the table above only apply under the following conditions:  
- Mains voltage AC 120 V / AC 230 V  
- Ambient temperature 23 °C

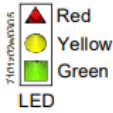
6.9.3 Resetting the burner controller

When lockout occurs, the burner control can immediately be reset. To do this, press the lockout reset button for about 1 second (<3 seconds). The LME... can only be reset when all contacts in the line are closed and when there is no undervoltage.

6.9.4 LME21 – Fault Diagnostics.



Lockout reset button «EK» is the key operating element for resetting the burner control and for activating / deactivating the diagnostics functions.



The multicolour signal lamp (LED) in the lockout reset button is the key indicating element for visual diagnostics and interface diagnostics.



## 6.0 – Combustion controllers

Color code table for multicolor signal lamp (LED)		
Status	Color code	Color
Waiting time «tw», other waiting states	○ .....	Off
Ignition phase, ignition controlled	● ○ ● ○ ● ○ ● ○ ● ○ ●	Flashing yellow
Operation, flame ok	□ .....	Green
Operation, flame not ok	□ ○ □ ○ □ ○ □ ○ □ ○	Flashing green
Extraneous light on burner startup	□ ▲ □ ▲ □ ▲ □ ▲ □ ▲	Green-red
Undervoltage	● ▲ ● ▲ ● ▲ ● ▲ ● ▲	Yellow-red
Fault, alarm	▲ .....	Red
Error code output (refer to «Error code table»)	▲ ○   ▲ ○   ▲ ○   ▲ ○	Flashing red
Interface diagnostics	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲	Red flicker light

..... Steady on  
○ Off

▲ Red  
 ● Yellow  
 □ Green

There are 2 diagnostics choices:

1. Visual diagnostics: Operational status indication or diagnostics of the cause of fault.
2. Interface diagnostics: With the help of the OCI400 interface adapter and the ACS410 PC software or flue gas analysers of different makes.

Visual diagnostics:

In normal operation, the different operating states are indicated in the form of colour codes according to the colour code table given below.

After lockout, the red fault signal lamp LED will remain steady on. In that condition, visual diagnostics of the cause of fault according to the error code table can be activated by pressing the lockout reset button for more than 3 seconds. Pressing the reset button again for at least 3 seconds, interface diagnostics will be activated. Interface diagnostics works only if the AGK20... lockout reset button extension is not fitted. If, by accident, interface diagnostics has been activated, in which case the slightly red light of the signal lamp LED flickers, it can be deactivated by pressing again the lockout reset button for at least 3 seconds. The instant of switching over is indicated by a yellow light pulse

Red blink code of signal lamp (LED)	«AL» at term. 10	Possible cause
2 blinks	On	No establishment of flame at the end of «TSA» - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner, no fuel - Faulty ignition equipment
3 x blinks	On	«LP» faulty - Loss of air pressure signal after «t10» - «LP» welded in normal position
4 blinks	On	Extraneous light when burner is started up
5 blinks	On	Time out «LP» - «LP» welded in working position
6 blinks	On	Free
7 blinks	On	Too many losses of flame during operation (limitation of repetitions) - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner
8 x blinks	On	Free
9 blinks	On	Free
10 blinks	Off	Wiring error or internal error, output contacts, other faults
14 blinks	On	CPI contact not closed

During the time the cause of fault is diagnosed, the control outputs are deactivated

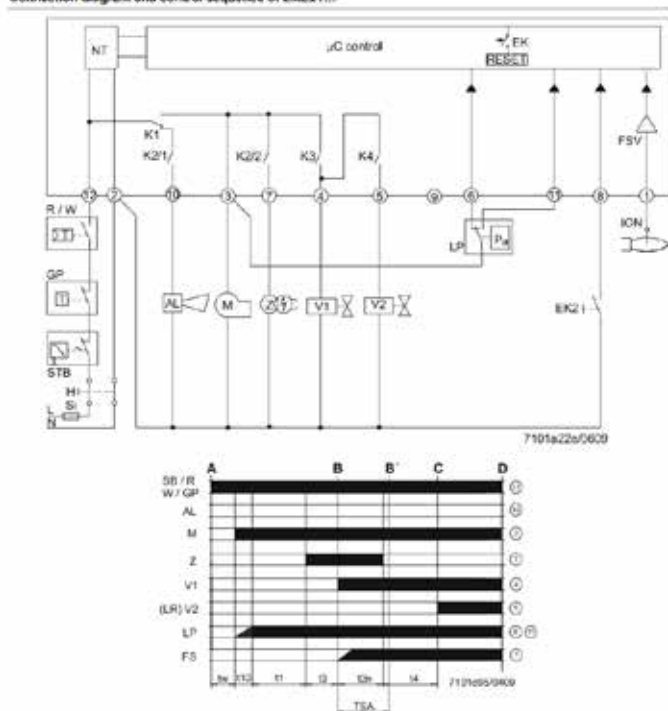
- Burner remains shut down
- External fault indication remains deactivated
- Fault status signal «AL» at terminal 10, according to the error code table

The diagnostics of the cause of fault is quit and the burner switched on again by resetting the burner control. Press the lockout reset button for about 1 second (<3 seconds).



## 6.0 – Combustion controllers

Connection diagram and control sequence of LME21...



LK	Air damper
LKP	Air damper position
LP	Air pressure switch
LR	Load controller
	Fan motor
MS	Synchronous motor
NL	Nominal load
NT	Power supply
QRA...	Flame detector
QRC...	Blue-flame detector
bl	blue
br	brown
sw	black
	Control thermostat / pressurestat
RV	Gas regulation damper
SA	Actuator SQN...
SB	Safety limiter
STB	Safety limit thermostat
Si	External pre-fuse
t	Time
W	Limit thermostat / pressure switch
Z	Ignition transformer
ZV	Pilot gas valve

A	Start command (switching on by «R»)
B-B'	Interval for establishment of flame
C	Operating position of burner reached
C-D	Burner operation (generation of heat)
	Controlled shutdown by «R»

- Burner will immediately be shut down
- Burner control will immediately be ready for new startup

### 6.9.5 Legend

AGK25...	PTC resistor
AL	Error message (alarm)
BCI	Burner Communication Interface
V...	Fuel valve
CPI	Closed Position Indicator
DBR...	Wire link
EK	Lockout reset button (internal)
EK2	Remote lockout reset button
ION	Ionization probe
FS	Flame signal
FSV	Flame signal amplifier
GP	Pressure switch
H	Main switch
HS	Auxiliary contactor, relay
ION	Ionization probe
K1...4	Internal relays
KL	Low-fire

I	Cam I actuator
t	Prepurge time
t1	Purge time
t3	Preignition time
t3n	Postignition time
t4	Interval between ignition «Off» and release of «V2»
t10	Specified time for air pressure signal
t11	Programmed opening time for actuator «SA»
t12	Programmed closing time for actuator «SA»
t22	2nd safety time
TSA	Ignition safety time
tw	Waiting time

## 7.0 – Installation into Air handling Unit or Duct work

This section of the manual is for the installation of the side plate burner within air handling units and duct work systems.

The installer will have to manufacture a profile plate with a calculated profile opening, the calculation for the profile plate opening is shown further on in this section 7.0. the profile opening is critical to achieve the correct combustion and air pressure drop across the plate.

The pressure across the profile plate ideal should be between 1.2 mbar and 1.6mbar.

Adjustment plates are also required for trimming the pressure drop and airflow through the plate, these ideal when the airflow may be greater then expected or low than expected given the heater adjustment

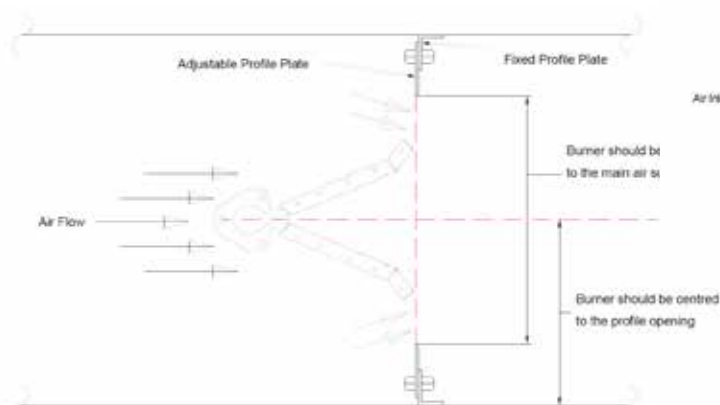
Two burner options are available for the Nordair Niche unit, Midco or Maxon burners.

The Midco burner requires a minimum 50mm gap between both sides of the burner sides and profile opening

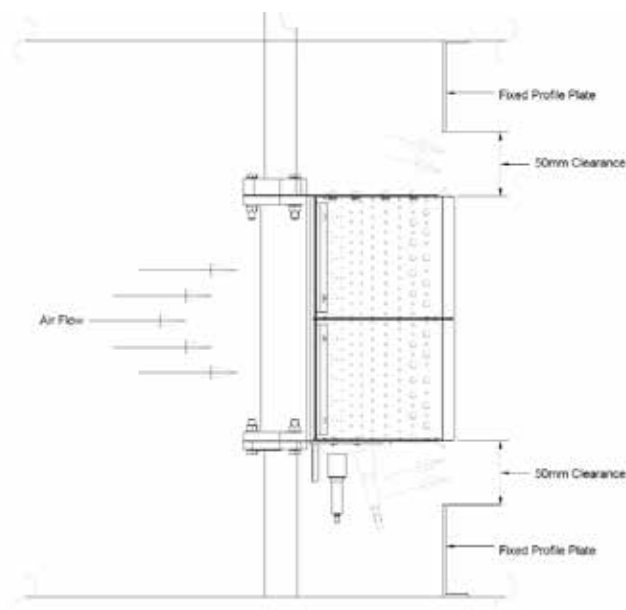
The Maxon burner requires a minimum 25mm gap between both sides of the burner sides and profile opening.

The gas burner head will require supporting using the brackets at the rear of the burner, steel supports are required from the floor to the roof of the unit see technical drawings in this section 7.0

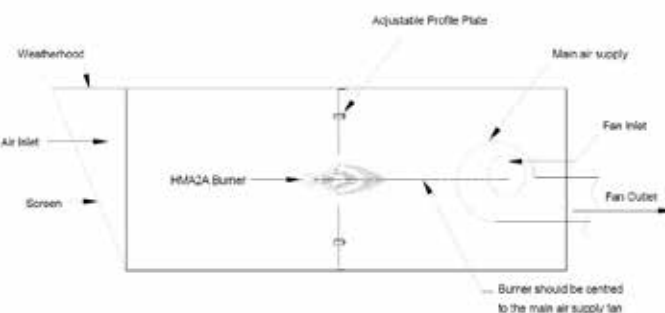
### General configuration – Side view



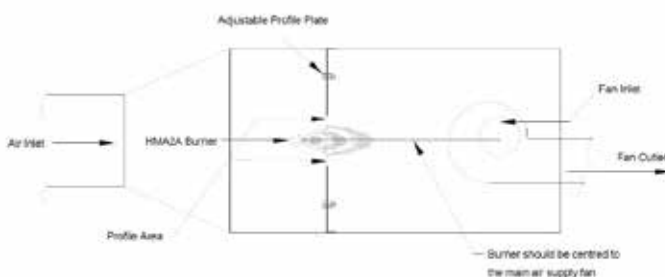
### General configuration – Top View



### Heater Installation Side View



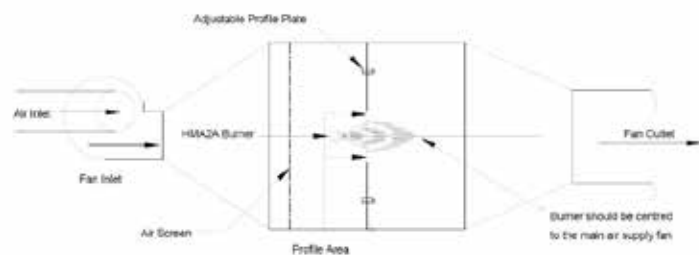
### Ducted Installation Side View



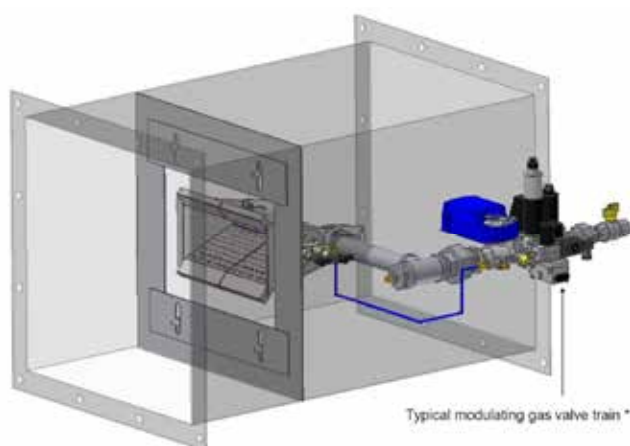
### Push thought installation side view

## 7.0 – Installation into Air handling Unit or Duct work

### NP 2 Minimum Capacity



Typical installation configuration



Typical modulating gas valve train \*

#### Minimum capacities

Minimum capacities are given as a guideline. They strongly depend on process conditions.

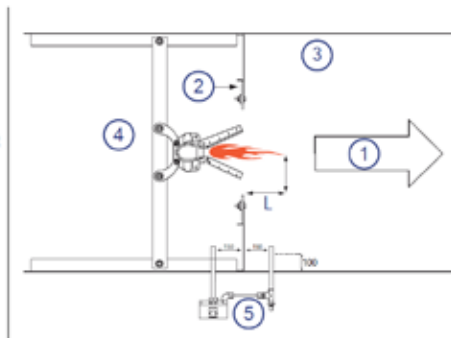
Air velocities $m/s$		11	12	13	14	15	16	17	
Minimum capacity kW/ft (HHV)	NP-I	natural gas	4	5	5	6	6	7	8
		propane	not recommended	6	7	8	8	10	
	NP-II	natural gas	5	6	6	7	8	8	9
		propane	not recommended	7	8	9	9	10	

#### Profile plate

Air-stream velocity across and through the burner's mixing plates must be kept uniform and within desired limits by use of a silhouette profile plate through which the burner fires. A 150 mm (minimum) profile plate should be installed surrounding the interior duct walls at the leading edge of the burner mixing plates.

- 1) Direction of process air movement
- 2) Adjustable profile plate
- 3) Fixed profile plate
- 4) Universal support bracket
- 5) Differential pressure switch

- A Minimum 150 mm  
B Minimum 150 mm  
L Flame length



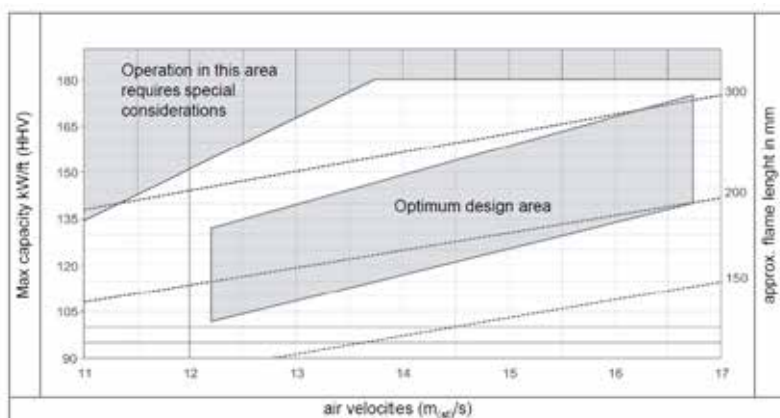
### Calculating Profile Opening

For burner capacity = 150 kW/ft (HHV)

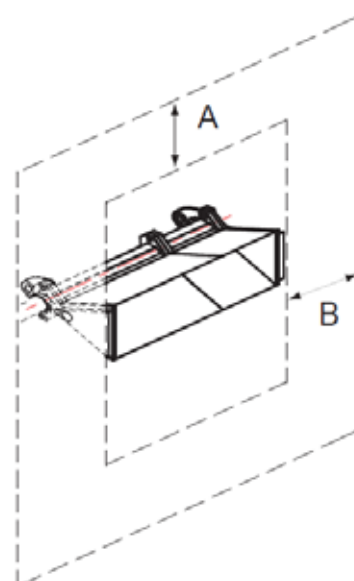
Fuel	NP-I	NP-II
natural gas (10.9 kWh/Nm <sup>3</sup> HHV, sg = 0.6)	14 mbar	7 mbar
propane (25.79 kWh/Nm <sup>3</sup> HHV, sg = 1.52)	5 mbar	3 mbar

#### Note :

- For other capacities per foot or gases with different heating values and/or specific weights as shown in the above table, values for differential gas pressure will behave according to the normal laws of physics.
- Listed values are approximate net pressures at burner inlet. NOT taking into account any losses in piping/gas manifolds etc.
- Stated pressures are indicative - actual pressures are function of altitude, type of fuel, gas quality.



Air Velocity Chart – Maxon NP2



## 7.0 – Installation into Air handling Unit or Duct work

### Burner displacement and weight [1]

Burner type	NP-I / NP-II / NP-III		RG-IV		NP-I		RG-IV		NP-I		RG-IV	
	Cast iron bodies with AISI 430 mixing plates and carbon steel fasteners				Alu bodies with AISI 321 mixing plates and carbon steel fasteners				Alu bodies with AISI 321 mixing plates and stainless steel fasteners			
Description	Area cm²/ section	Weight kg	Area cm²/ section	Weight kg	Area cm²/ section	Weight kg	Area cm²/ section	Weight kg	Area cm²/ section	Weight kg	Area cm²/ section	Weight kg
150 mm straight section	232	2.3	307	2.4	232	1.5	307	1.7	232	1.5	307	1.7
305 mm straight section	465	4.1	613	4.4	465	2.9	613	3.4	465	2.9	613	3.4
455 mm straight section	697	7	920	7.5	N/A [2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
610 mm straight section	929	9	1226	9.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
150 mm x 150 mm elbow section	418	4.1	557	4.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
305 mm x 150 mm T-section	557	6	697	6.4	557	0.6	697	4.7	557	3.9	697	4.7
305 mm back inlet section	465	4.9	613	5.2	465	3.1	613	3.6	465	3.1	613	3.6
915 mm back inlet section	1115	12	1394	12.8	1115	7.8	1394	9.5	1115	7.8	1394	9.5
150 mm pilot assembly section includes built-in pilot	232	4.5	307	2.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

### Velocity factors (fresh air - 15° C)

Velocity m/s	8	9	10	11	12	13	14	15	16	17	18	19	20
Air pressure differential mbar	0.39	0.50	0.61	0.74	0.88	1.04	1.20	1.38	1.57	1.77	1.99	2.21	2.45

To determine profile opening areas, add burner displacement areas (cm<sup>2</sup>/section) from table below for complete burner assembly to “Net Free Area” of duct:

“Net free area” of duct (cm<sup>2</sup>) =

$$\frac{\text{Fan volume m}^3(\text{st})/\text{h}}{\text{Velocity (m/s x 3600)}} \times 10\,000 = \text{.....cm}^2$$

m<sup>3</sup>(st)/h = fan volume at 288 Kelvin and 1 atmosphere

Net free area (cm<sup>2</sup>) + burner displacement (cm<sup>2</sup>) =  
profile area (cm<sup>2</sup>)

The relation between velocity and pressure differential across the burner slightly differ with the ratio between net profile area and total duct section. Velocities should always be confirmed and established by use of a velometer on actual field site installation.

A dedicated drawing will be provided with each project. If there is any doubt, please contact Reznor, where we can assist in calculating the profile opening size.

## 8.0 – Servicing

### IMPORTANT

Servicing and maintenance should be only carried out by Reznor approved engineers.

Only use replacement parts provided by the appliance manufacturer.

Check that the air openings for combustion and for ventilation of any plant room or compartment are clear.

### 8.1 ISOLATION

#### 8.1.1 FUEL GAS ISOLATION

The fuel gas to the Nordair Niche heater should be isolated and locked off at the manual ball valve mounted at the start of the fuel gas line. Additionally, before entering or servicing the Heater the burner manual isolation valve and pilot line isolation valve should be closed.

#### 8.1.2 ELECTRICAL ISOLATION

All electric power to the Heater and the remote-control station is switched through the local isolator. This isolator is fitted with a lock facility to permit it to be locked in the OFF position.

Additionally isolate the power at the Wall Isolator.

### 8.2 ROUTINE MAINTENANCE

The Heater should be routinely serviced at the start of each heating season. Isolate the Heater as above before servicing. Details of access to individual components are given in Section 8.4 of this manual.

1- Remove and clean spark igniter. Check that the gap is correctly set at 2.5 mm. Replace every two years.

2- Clean the flame detector lens to ensure freedom from dirt and moisture. If the cell shows any sign of cracks, it should be replaced. Routinely replace the cell every two years or after 10,000 hours of operation, whichever comes first.

3- Inspect the entire Heater paint system for general damage. Repair as necessary.

4- Every two years brush the burner plates and clear the burner holes carefully with a Size 1.8mm drill for NP II and 2.0mm drill for NP I.

**WARNING: THE BURNER HOLES MUST NOT BE ENLARGED.**

5- Inspect and lubricate all damper linkages to ensure freedom of operation. Wipe off all excess lubricants to prevent dirt build up on linkage parts.

6- Check the fan belt for cracks and splits. Check tension. The correct tension gives 16mm deflection per metre of span when the belt is centrally loaded with a force of 27N. Adjust as necessary.

7- The fan should be checked and greased if required and inspection & cleaning of the fan impeller.

**NEVER** use high temperature grease.

**NEVER** mix two different greases within the bearing, always flush existing grease out.

Note: Removing the cover plate on the end of the Heater gains access to the outboard fan bearing.

#### AMBIENT CONDITIONS OPERATING CONDITIONS BEARING OPERATING CONDITIONS SUGGESTED GREASING INTERVALS

AMBIENT CONDITIONS		OPERATING CONDITIONS		BEARING OPERATING CONDITIONS		SUGGESTED GREASING INTERVALS
Dirt	Moisture	Load	Speed	Low	High	
Clean	Dry	Light to Medium	Slow to Medium	0	120	2 to 5 months
				120	200	1 to 2 months
Moderate to Dirty	Dry	Light to Medium	Slow to Medium	0	120	1 to 4 weeks
				120	200	1 to 7 days
Extreme Dirt	Dry	Light to Medium	Slow to Medium	0	200	Daily Flushing out Dirt

### 8.3 ANNUAL SERVICE CHECKS

After Servicing, test fire the Heater following the Commissioning Procedure detailed in Section 5 of this manual, to ensure correct operation generally. Special attention must be paid to the damper system and related controls and interlocks.

Additionally check that the fresh air and recirculation air entry path to the Heater has been kept clear and instruct the User of the need for this, as necessary.

## 8.0 – Servicing

### 8.4 REMOVAL PROCEDURE FOR REPLACEABLE COMPONENTS

#### IMPORTANT

Turn off the gas at the appliance service valve and the electricity at the main panel and wall isolator before proceeding.

#### 8.4.1 BURNER

The burner is located inside the Heater casing and is mounted on two brackets from the support straps. To remove the burner, isolate the Heater as in 8.1 and undo the union on the fuel gas line adjacent to the burner isolation valve (MV6) and unscrew the main and pilot gas feed pipes from the burner rail. Access to the rear of the burner assembly is made by removing the partition plate below the burner, separating the fresh air inlet to the burner from the return air inlet compartment. This is held in place by screws which engage in captive nuts on the top side of the partition. Remove the Flame Detector and pull off the ignition plug cap. Disconnect the burner support brackets and remove the burner. The burner will easily pass through the access hatch for further strip down. Replace in the reverse order, soundness test the gas pipe work, check the burner operation and duty as described in the commissioning section of this manual.

#### 8.4.2 FLAME DETECTOR

This is a 240 Volt instrument.

The flame detector is mounted on the end of the burner rail inside the Heater casing. To remove the detector, isolate the panel electric supply and lock off. Push the scanner towards the burner and rotate to release the bayonet fixing and lift the detector from its mount. Remove the two screws holding the detector cover and disconnect the supply leads noting the polarity of the connections.

Replace the flame detector in the reverse order ensuring correct polarity of connections. Ensure the access panel is securely closed and the retaining nuts are tightened down. Check operation by inserting a test meter in the points provided in the main control panel and reading the flame signals during start up to full rate burner operation (See section 5). Operate the appliance over six starts for reliability of operation

including turn off of start and main gas valves to check for lockout operation.

#### 8.4.3 IGNITER SPARK PLUG

This is a high-tension spark plug.

The igniter spark plug is mounted on the end of the burner rail inside the Heater casing. To remove the spark plug, isolate the Heater as above. Enter the service access door. Access to the spark plug is made through the profile plate. To remove the spark plug pull off the high tension lead and unscrew the plug with a plug spanner.

When replacing the spark plug check the plug gap is set at 1.5mm. Check ignition reliability over six start-ups.

#### 8.4.4 IGNITER SPARK TRANSFORMER

This is a 240 Volt instrument.

The ignition transformer is in a plastic box mounted on the Heater casing adjacent to the main control panel. To remove the transformer, isolate the Heater as above and unscrew the four retaining screws holding the box lid in place and remove the lid. Disconnect the supply cable at the terminal strip and undo the transformer retaining screws. The transformer may then be 'unscrewed' from the High Tension cable leading to the spark plug.

Replacement is a simple reversal of this procedure.

Check ignition reliability over six start-ups.

#### 8.4.5 COMBUSTION AIR PRESSURE SWITCH (DPS)

Note: The switch is set and sealed and should be replaced if not operating correctly.

This switch is a 240 Volt instrument.

The air switch is mounted directly on the Heater casing and can be serviced in situ. However, if it is necessary to remove the switch, isolate the Heater as above. Disconnect the supply cable. Break the downstream pipe compression fitting and unscrew the switch housing from its locating fitting. Reverse the procedure to replace, after ensuring switch setting is as specified



## 8.0 – Servicing

in Section 1.3 of this manual. Operate the Heater to ensure reliability of operation over six start-ups.

### 8.4.6 HEATER OVERHEAT LIMIT CONTROL

This is a 240 Volt instrument.

The overheat limit control is mounted directly on the Heater casing and can be serviced in situ. However, if it is necessary to remove the control isolate the Heater as above and lock off. Remove the switch cover. Disconnect the supply cable and unscrew the control housing from its locating fitting. Reverse the procedure to replace, check the switch is set to 50°C. Test the switch operation as described in section 5 over at least three operations.

### 8.4.7 AIR FAN AND MOTOR (If Fitted)

The air fan motor is either a 415 Volt, 3 phase or 240 Volt, single phase motor. Check the data badge for type.

The motor and slide rails are easily accessible inside the Heater casing. If it is necessary to remove the motor, isolate the Heater as above. Slacken the fan-belt tension and remove the drive belts. Pull the motor away from the Heater casing to make access to the motor terminal box and disconnect the supply cable. The motor may now be removed from the unit. Following replacement, the Heater must be fully re-commissioned as in Section 5.

It is unlikely that the air fan will need replacing or servicing. If required, a full procedure should be obtained from Reznor.

Replacement must be followed by full re-commissioning as in Section 4.

### 8.4.8 FUEL GAS MULTI-FUNCTIONAL CONTROL - SMALL UNITS

This is a 240 Volt instrument.

The fuel gas multi-functional control can be serviced in situ. However, if it is necessary to remove the unit, isolate the Heater as above. Disconnect the Hirschman electric termination. Unbolt the control from its flanges and remove.

When replacing, care must be taken to ensure the flange 'O' rings are undamaged and in the correct location. Following replacement, the Heater must be fully re-commissioned as in Section 5, including tests for soundness prior to start-up.

### 8.4.9 GOVERNOR AND BLOCK VALVES

The block valves are 240 Volt instruments.

All these items may be serviced in situ. However, if it is necessary to remove any item, isolate the Heater as above. Disconnect the electric termination to the two block valves, the pilot block valve, and the flow control block valve. Break the two pipe unions and remove the fuel gas line complete for further strip-down.

### 8.4.10 FUEL GAS FLOW CONTROL VALVE

This is a 24 Volt instrument.

The fuel gas flow control valve can be serviced in situ. However, if it is necessary to remove the valve, isolate the Heater as above. Disconnect the supply cables to the control valve.

On small Heaters fitted with a multi-functional control, support the multi-functional control, and unbolt its discharge flange. Break the union downstream of the burner isolation valve and remove the section of line containing the flow control valve for further strip-down.

On large Heaters fitted with separate block valves, it will be necessary to remove the fuel gas line complete, as Section 8.4.10 above.

Following replacement, re-commission the Heater.

Note: If the fresh air damper is not in the full open position, the heat input must not exceed the maximum heat input at recirculation condition specified in the technical data section of this manual.

### 8.4.11 PILOT GAS GOVERNOR AND BLOCK VALVE

The block valve is a 240 Volt instrument.

Both items may be serviced in situ. However, if it is necessary to remove either item, isolate the Heater as above. Disconnect the electric termination to the solenoid valve. Undo the upstream pipe union and the compression fitting downstream of the manual

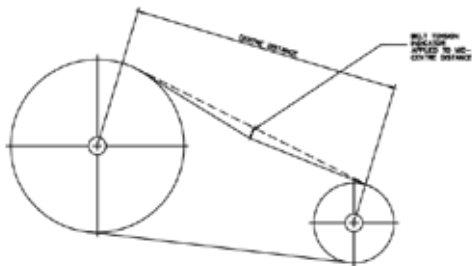


## 8.0 – Servicing

block valve (PV3). Remove the pilot gas line complete for further strip down.

Replace broken or distorted connections and retest for soundness. Ensure the pilot gas pressure is correct and the flame is sensing an output. Ensure reliability over six start-ups.

### 8.4.12 BELT TENSIONING PROCEDURE (if fitted)



The setting tensions are designed to cover a wide range of drives. A precise setting force for individual applications can be calculated as detailed below.

#### SETTING FORCES

Belt Section	Setting Force To Deflect Belt 16mm per Metre Of Span.			
	Small Pulley Diameter (mm)	Basic Setting Forces Newton's (N) Kilograms (kgf)		1.25 x Setting Forces Newton's (N) Kilograms (kgf)
SPZ	56 to 71	16	1.6	20
	75 to 90	18	1.8	22
	95 to 125	20	2.0	25
	Over 125	22	2.2	28
SPA	80 to 100	22	2.2	28
	106 to 140	30	3.0	38
	150 to 200	36	3.7	45
	Over 200	40	4.0	50
SPB	112 to 160	40	4.0	50
	170 to 224	50	5.1	62
	236 to 355	62	6.3	77
	Over 355	65	6.6	81
SPC	224 to 250	70	7.1	87
	265 to 355	92	9.4	115
	Over 375	115	12.0	144

#### BELT TENSIONING USING FENNER BELT TENSION INDICATOR

- 1 Calculate the deflection in mm on a basis of 16mm per metre of centre distance. Centre Distance (m) x 16 = Deflection (mm).
- 2 Set lower marker ring at the deflection distance required in mm on the lower scale.
- 3 Set upper ring against to bottom edge of the top tube.

4 Place the belt tension indicator on top of the belt at the centre of span and apply a force at right angles to the belt deflecting it to the point where the lower marker ring is level with the top of the adjacent belt.

5 Read off the force value indicated by the top edge of the upper marker ring.

6 Compare this force to the kgf value shown in the table above.

7 If a Fenner Belt Tension Indicator is not available, a spring balance and rule will be sufficed.

### 8.5 MAIN PANEL CONTROLS (If supplied)

All panel controls are readily accessible and may be easily exchanged for replacement components in the event of failure. Ensure any replacement item is of the same make and type as the original.

#### 8.5.1 Siemens

The Siemens Automatic Sequence Controller is a plug-in unit locating on a pre-wired chassis. To remove the controller, undo the two retaining screws at the top left and lower right corners, and pull the module off the chassis.

Replacement is a simple reversal of the above procedure.

#### 8.5.2 CONTROLS CIRCUIT (24 VOLT) TRANSFORMER

The Controls Circuit Transformer is fixed to the panel back plate by tapped screws. To remove the transformer, undo the wiring connections after first noting that the connections are correct to the wiring diagram attached to the panel. Undo the two retaining screws and remove the unit complete.

Replacement is a simple reversal of the above procedure.

#### 8.5.3 CONTROL RELAYS, R1, R2 & R3 (If fitted)

The Control Relays are DIN Rail mounted. To remove a relay, undo the wiring connections after first noting that the connections are correct to the wiring diagram, attached to the panel. Release

## 8.0 – Servicing

the DIN rail retaining clip under the relay with a screwdriver and remove the relay.

Replacement is a simple reversal of the above procedure.

### 8.5.4 6A MCB

The 6A MCB is DIN Rail mounted. To remove the MCB, undo the wiring connections after first noting that the connections are correct to the wiring diagram attached to the panel. Release the DIN rail retaining clip under the MCB with a screwdriver and remove the MCB.

Replacement is a simple reversal of the above procedure.

### 8.5.5 THERMAL OVERLOAD

The thermal overload is attached to the underside of the main contactor. To remove the overload, undo the wiring connections after first noting that the connections are correct to the wiring diagram attached to the panel, and that the overload setting is as specified in Section 1.3 of this manual. Unscrew the three connections to the contactor and remove the overload.

Replacement is a simple reversal of the above procedure.

### 8.5.6 MAIN CONTACTOR (If supplied)

The Main Contactor is DIN Rail mounted. To remove the contactor, remove the thermal overload, as 8.5.5 above, and then undo the wiring connections, after first noting that the connections are correct to the wiring diagram attached to the panel. Release the DIN rail retaining clip under the contactor with a screwdriver and remove the contactor.

Replacement is a simple reversal of the above procedure.

### 8.5.7 MOTOR FUSE

To replace a motor fuse, pull the fuse carrier off the fuse holder base. The fuse is attached to the fuse carrier by two screws. Unscrew, remove, and replace.

## 8.6 REMOTE CONTROL STATION

The remote-control station contains some serviceable parts, although these items should only be fitted by an approved Reznor approved engineers



## 9.0 – Recommend Spares

The following parts are standard throughout the range.

1	1	HY400003Maxon Flame Rod
2	1	HY400004 Maxon Uv Cell
3	1	HY400005Ignition Transformer 240v
4	1	HY400006 Maxon Spark Igniter
5	1	HY400007 HT Lead X 3M
6	1	HY400008 Igniter Cap - Straight
7	1	HY400009 Dungs LGW 3 Air DP Switch
8	1	HY400010- 3 way test solenoid
9	1	HY400011 Siemens LME 75 Control box
10	1	HY400012 Siemens LME 73 control box
11	1	HY400013 Siemens LME 21 .control box
12	1	HY400014 Siemens PME75.831 chip
13	1	HY410015 Siemens PME73.840 chip

All Replacement parts can be obtained from Reznor by quoting the heater serial number, the part number and description.

## 10.0 – Appendix 1

### SOUNDNESS TESTING THE FUEL GAS PIPEWORK

This procedure should only be carried out by a Gas Safe Registered Engineer.

The pressure test points, and all valves are identified on the Process and Instrumentation Diagram for the Heater included in Section 1 of this manual.

Isolate the Heater electric supply at the main control panel and lock off. Close the manual isolation valves MV1, MV6 and PV3. Ensure the supply pressure is available on the upstream side of MV1.

#### A1.1 TESTING THE UPSTREAM PIPEWORK AND BURNER CONTROLS

1 Connect a 60-mbar manometer to the pressure test nipple A. Monitor the pressure for two minutes. Any rise in pressure indicates that valve MV1 is leaking and must be replaced. Remove pressure test points B and F.

2 Open MV1 to pressurise the pipework on both the main gas and pilot line to the first block valve.

3 Close MV1. Allow one minute for the temperature to stabilise and then test the system for 2 minutes and watch for a drop in the pipework pressure. If the pressure falls, open valve MV1 and test the pipework connections and valves from MV1 to MV3, and MV1 to PV2 for leaks with a proprietary leak detector fluid or spray. Turn off MV1, seal any leaks and re-test.

4 If no external leaks are found either the pilot block valve, PV1, or either the first main gas block valve, MV3, is letting by.

5 To test this, seal pressure test point A and fit a manometer to pressure test point B. Leave for two minutes with MV1 open. A rise in pressure on the manometer confirms a leak on the block valve, MV3. Turn off MV1, exchange the valve and re-test from point 2 above.

6 Repeat this procedure for the pilot block valve: Seal test point B and fit a manometer to pressure test point F. Leave for two minutes with MV1 open. A rise in pressure on the manometer confirms a leak on the pilot block valve, PV2. Turn off MV1, exchange the valve and re-test from point 1 above. Seal test point F.

#### A1.2 TESTING THE DOWNSTREAM BURNER VALVE

1 Close MV1 and connect pressure test points A and B with flexible 6 mm bore tubing teed into the manometer. Remove pressure test point C. Open MV1 to pressurise the downstream block valve, MV4.

2 Close MV1 and leave for one minute for the temperature to stabilise. Monitor the pressure for 2 minutes. If the pressure falls, open valve MV1 and leak test the line between the two block valves MV3 and MV4 with a proprietary leak detector. Turn off MV1, seal any leaks and re-test. Note: Smaller Heaters in the BMM Series are fitted with multi-functional valves combining the pressure regulator and two block valves in one component. The above procedure still applies, but if a leak is found on either block valve, the whole control should be replaced. If no external leaks are found, the downstream block valve is letting by.

3 To confirm this, close MV1, remove the manometer and refit to pressure test point C. Connect pressure test points A and B with flexible 6mm bore tubing. Open MV1 and allow one minute for the temperature to stabilise. Monitor the pressure for a further 2 minutes with MV1 still open. A rise in pressure confirms that the second block valve MV4 is letting by. Turn off MV1. Replace the valve and re-test from 2 above.

#### A1.3 TESTING THE DOWNSTREAM BURNER PIPEWORK

1 Close MV1 and connect pressure test points A and D with flexible 6 mm bore tubing teed into the manometer. Open MV1 to pressurise the downstream pilot pipework.

2 Close MV1 and leave for one minute for the temperature to stabilise. Monitor the pressure for 2 minutes. If the pressure falls, open valve MV1 and leak test the line between the downstream block valve, MV4 and the manual block, MV6 with a proprietary leak detector fluid or spray. If no external leaks are found the manual block valve, MV6, is letting by. Turn off MV1, seal any leakages and re-test from 2 above.

## 10.0 – Appendix 1

### A1.4 TESTING THE DOWNSTREAM PILOT PIPEWORK

- 1 Close MV1 and connect pressure test points A and F with flexible 6mm bore tubing teed into the manometer. Open MV1 to pressurise the downstream pilot pipework.
- 2 Close MV1 and leave for one minute for the temperature to stabilise. Monitor the pressure for 2 minutes. If the pressure falls, open valve MV1 and leak test the line between the downstream block valve, PV2 and the manual block, PV3 with a proprietary leak detector fluid or spray. If no external leaks are found, the manual block valve, PV3 is letting by. Turn off MV1, seal any leakages and re-test from 2 above.

### A1.5 TESTING THE BURNER CONNECTIONS

- 1 Remove the burner access panel as described in Section 8.4 of this manual. Remove the burner spark igniter. Slacken the two retaining bolts holding the burner to the burner support straps and unbolt the burner supply endplate from the burner casting and mixing plates.
- 2 Connect pressure test points A and D with flexible 6mm bore tubing teed into the manometer. Open MV1 and MV6 to pressurise the burner pipework. Leak test the main gas burner pipework and connections with proprietary leak detector fluid. Turn off MV6. Seal any leakages and re-test.
- 3 Connect pressure test points A and F with flexible 6 mm bore tubing teed into the manometer. Open MV1 and PV3 to pressurise the pilot burner pipework. Leak test the pilot gas burner pipework and connections with proprietary leak detector fluid. Turn off PV3. Seal any leakages and re-test.
- 4 Turn off MV1.
- 5 Replace the spark igniter and profile division plate.

## 10.0 – Appendix 2

### START SEQUENCE

The burner start sequence is controlled by the Siemens burner management unit. The timings are pre-set. This unit must NOT be tampered with.

A brief description of the start-up sequence is:-

The unit checks:

- 1 The NO FLAME signal on the UV flame scanner. Note: If the scanner detects a flame at any time other than in the correct operating sequence, the flame programmer initiates a lockout.
- 2 The operation of the combustion air proving switch in the NO AIR position.
- 3 The Heater discharge high temperature switch.

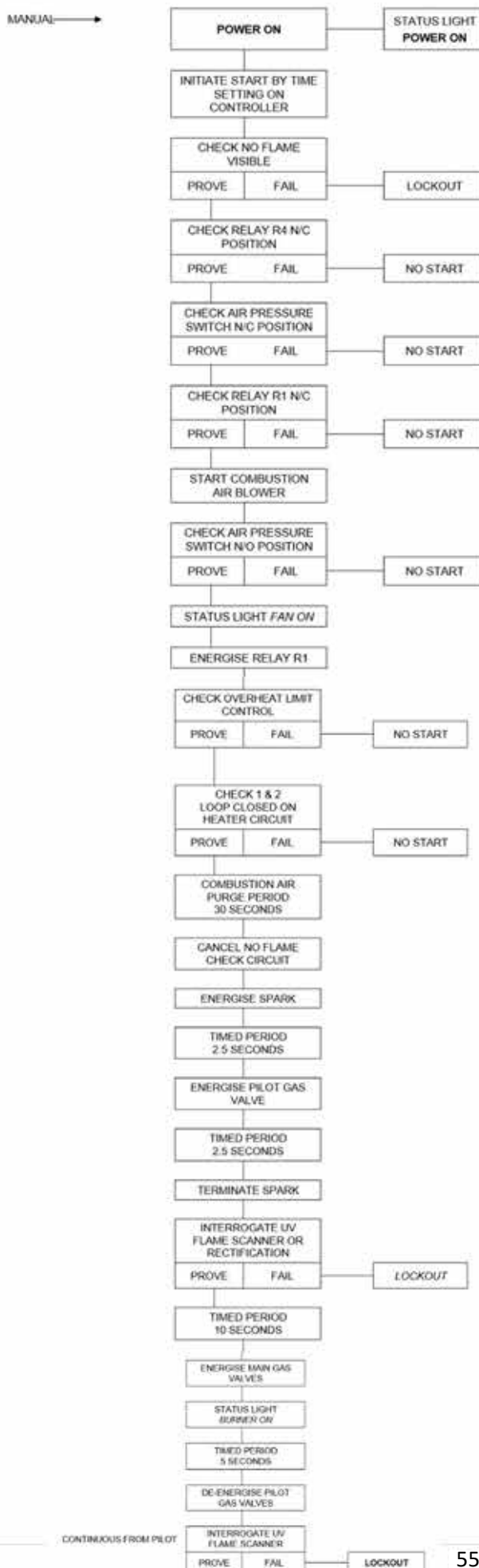
If the checks are completed, the unit starts the combustion air fan and then checks the combustion air flow.

Once the air flow is proven, the unit checks that the damper control circuit is functioning correctly. After the damper microswitch is made, to prove the fresh air damper is fully open, the sequence allows 30 seconds for the combustion air to purge any combustible gas from the Heater.

After completion of the purge, the spark ignition system is energised, the pilot valve opened, and the spark terminated. If the pilot flame is not proven by the UV scanner, the system will initiate a LOCKOUT.

If the flame is proven the main gas valves are opened, the pilot extinguished, and the main burner flame proven.

The following flow chart shows the complete start sequence, including the lighting of the various indicating lamps:





## 10.0 – Appendix 3

Reznor “NP”, “RG” & “LV-NP-I” AIRFLO

### GAS BURNERS

Nordair Niche series “NP”, “RG” and “LV-NP-I” AIRFLO line burners are exclusively designed for direct fired fresh air heating applications. They are the standard of the industry for low temperature make up air applications. Their unique design makes it possible to operate the burner without a combustion air blower. The line burner concept allows for great flexibility in application and configuration.

### A3.2 PRINCIPLE OF OPERATION

“NP”, “RG” AND “LV-NP-I” burners are raw gas burners.

They are mounted in the air stream to be heated and a specific velocity is created at the burner to provide progressive aeration of the space between the burner mixing plates. As the sketch shows, the fuel gas is thoroughly mixed with the air to be heated which penetrates into the V-shaped space between the plates. The design of the mixing plates provides for complete combustion and a wide range of turndown.

Contrary to the conventional burners which stratified air streams need to be mixed downstream of the burner, the principle of working with a specific air velocity and a small pressure drop across the burner, ensures good mixing of combustion products with the air stream giving good temperature uniformity, thus shorter lengths of duct are required and no baffles, perforated plates etc need to be installed.

Optimum performance demands that the air velocities be uniform across the entire burner.

### A3.3 FEATURES

- High turndown, up to 25:1
- To suit this broad range of applications, BMM offers several versions according to the application and the operating

conditions:

- Series “NP” is suitable for natural gas, propane or propane/air mixtures, for constant air velocities.
- Series “RG” for natural gas only, for air velocity changes of up to 2:1
- Series “LV-NP-I” is suitable for natural gas, propane, or propane/air mixtures, for varying air velocities. Only straight elements available.
- Capacities range from 150kw to 300kw per unit of burner (300mm). The burners are assembled from a number of these units depending on the capacity and the available space.
- Extremely good, clean combustion, 100% net thermal efficiency meeting or exceeding all known standards for direct fired make up air and space heating appliances.
- No need for external combustion air blower, mixing equipment, etc.
- Carefully controlled progressive aeration patterns give excellent mixing, superior cross ignition and flame retention with uniform distribution of temperature.
- High quality materials for long life.
- Simple and static with no moving parts or special maintenance requirements.
- Operate economically and installs easily.
- Unlimited capacity: burners are assembled for modular units.

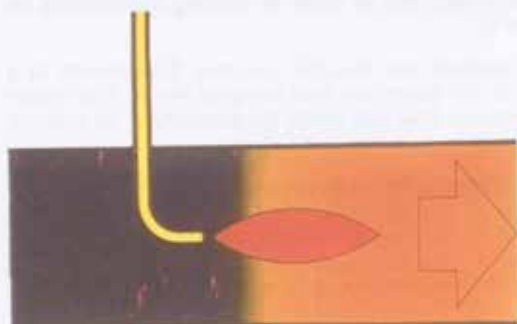
### A3.5 APPLICATIONS

Series “NP”, “RG” and “LV-NP-I” AIRFLO line burners are designed for direct heating of fresh, clean air for high and low temperature air heating applications.

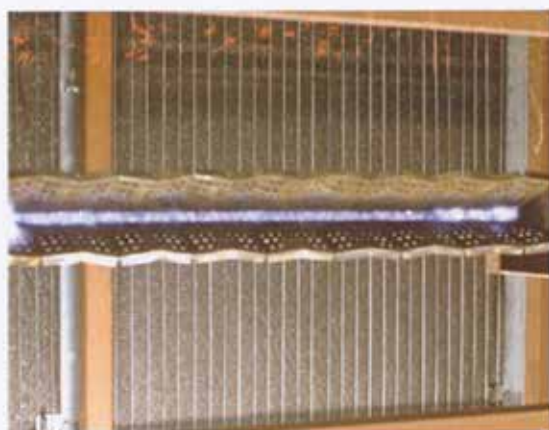
Typical low temperature applications include humidity controlled dual stage paint, spray booth, general make up air applications, packaged units, door heaters, grain drying, malt drying.

Typical high temperature process air applications include spray dryers, chemical dryers, fresh air oven heating, drying, baking and curing operations, metal parts finishing and all fresh air heating applications up to 650°C.

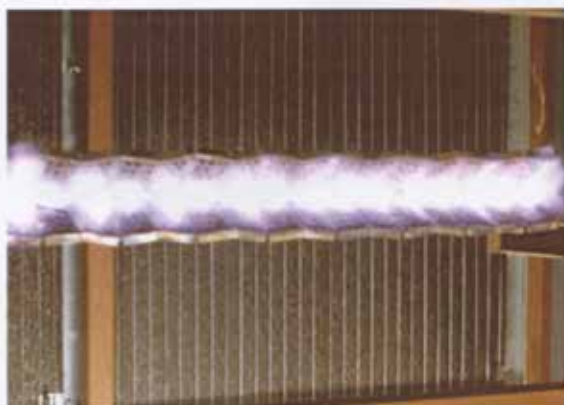
These burners can also be mounted downstream of a steam or hot water coil thus bringing the air to higher temperature. This can boost the capacity of an existing installation.



Cross sectional view of an AIRFLO® burner in an airstream



“NP” AIRFLO® line burner at low fire in an air duct to a spray booth air supply house



The same burner at medium fire



“NP-I” burner of 1500kW complete with pilot, spark ignitor and flame rod

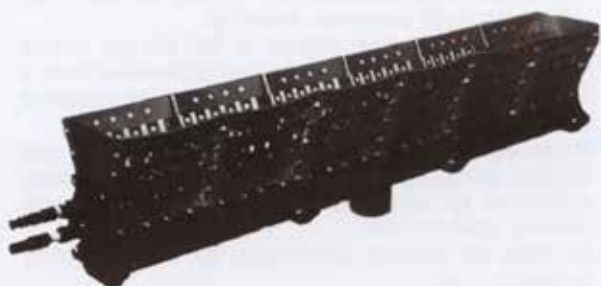
Line burners — "NP", "RG" & "LV-NP-I" AIRFLO®



"NP-I" burner of 300 mm length (150 kW) with end plates, bottom gas inlet, spark ignitor, pilot and flame rod



"RG-IV" burner section of 300 mm length (150 kW) no endplates



"LV-NP-I" burner of 900 mm length (525 kW) with endplates, bottom gas inlet, spark ignitor, pilot and flame rod

### A3.5.1 DESIGN AND APPLICATION DETAILS

BMM series "NP", "RG" and "LV-NP-I" AIRFLO burners consist of rust resistant cast iron bodies (which serve as the gas manifold) drilled to discharge the fuel between diverging stainless steel mixing plates.

The entire burner assembly is mounted directly in the airstream being heated. The fresh air stream passes through the mixing plates and mixes with the fuels as combustion air; thus available heat from the gaseous fuel is released directly into the airstream.

Air velocities across the burner assemblies (the key to successful operation) are established by the use of profile plates.

Nominal capacities of 6kw per 300mm sections (minimum) to 300kw (maximum) give 25:1 turndown. Fuel used and design velocities may result in higher or lower turndown. Modular design allows to match burner shape and total heat release to the specific application needs.

### 1.6 BURNER SELECTION

Several variations are offered, each optimized for a specific type of application as follows. All are raw gas burners, intended for use in fresh air streams.

- FOR MAKE-UP AIR HEATING:

"NP-I" AND "NP-II" burner types provide a nominal capacity of 150kw per 300mm section.

Turndown of 25:1

With staged burner configuration turndown may exceed 50:1.

Optimum air stream velocity is 15m (st)/s.

## 10.0 – Appendix 3

“NP-II” burners are selected when “NP-I” burners cannot be used because gas supply pressure is too low. The NP-II will cover the same applications with a turndown of 20:1.

- FOR PROCESS AIR HEATING:
- “NP-I” and “NP-II” burners may be used if temperature rise does not exceed 450°C.

“NP-III” burners provide a nominal capacity of 300kw per 300mm section an optimum air stream velocity of 20m (st)/s for temperatures up to 650°C with a turndown of 7:1.

Special aluminium body “NP-I” AIRFLO burner can be supplied having all stainless steel fasteners and aluminium back-up bars for applications where corrosion is determined.

“LV-NP-I” burner may be used where air flows can vary between 5 to 25m (st)/s for a nominal capacity of 175kw per 300mm section at 15m/s and a turndown of 25:1.

- FOR 2 SPEED AIR HANDLING SYSTEMS:

Usually make up air applications.

“RG-IV” burners (for natural gas only) may be used for a nominal capacity of 150 kw per 300mm section at an optimum velocity of 15m (st)/s or 75kw per 300mm section at a velocity of 7.5m (st)/s.

### 1.7 GENERAL CONSIDERATIONS

- Air velocity: the burner will perform properly within a given range of air velocity. The higher the velocity at a given gas pressure, the shorter the flame length. A higher velocity will obviously create a higher pressure drop of the process air.
- Gas Pressure: the burner capacity will depend upon the differential gas pressure burner to duct. A satisfactory performance can be expected within a given range of gas pressures but here again, for a given air velocity, a higher gas pressure will result in a higher heat release and a longer flame.

Optimum performance demands that air velocities be uniform across the entire burner

Nominal capacities and pressure required for various burner types					
	NP-I [1]	NP-II [1]	NP-III [1]	RG-IV [2]	LV-NP-I [3]
Maximum capacity per unit – kw	150	150	300	75/150	175
Minimum capacity per unit – kw [4]	6	7	60	7	9
Natural gas pressure required – mbar [5]	12-14	6-7	12-14	12-14	30-32
Flame length –mm	250-300	250-300	700-800	300-350	150-600
Air velocity required – m/s	15	15	20	8-16	5-15
Pressure drop process air – mbar	1.4	1.4	2.5	0.3-1.4	0.5-1.5
Turndown	25:1	20:1	6:1	20:1	25:1

### SPECIFIC INSTALLATION INSTRUCTIONS FOR BMM SERIES “NP”, “RG” & “LV-NP-I” BURNER SYSTEM

Instructions provided by the company responsible for the manufacture of a complete system incorporating Nordair Niche burners take precedence over the installation and operating instructions provided by Reznor. If any of the instructions provided by Reznor are in conflict with local codes or regulations, please contact our head office or representative.

Before reading following “installation instructions” please refer to the “general instructions” on burner system installation, piping lay out, pipe size and manifolding, electrical installation and burner installation.

**IMPORTANT:** Do not discard packing material until all loose items are accounted for.

Series “NP”, “RG” and “LV-NP-I” AIRFLO line burners are used only for heating of fresh air in motion. They should be mounted so as to direct their flames parallel to and in the same direction as the movement of the air (see sketch below).

Do not mount the AIRFLO assembly so that the movement of air is across the face of the line burner, nor should it be mounted too near to a turn in the duct which may cause air to be directed at an angle over the burner.

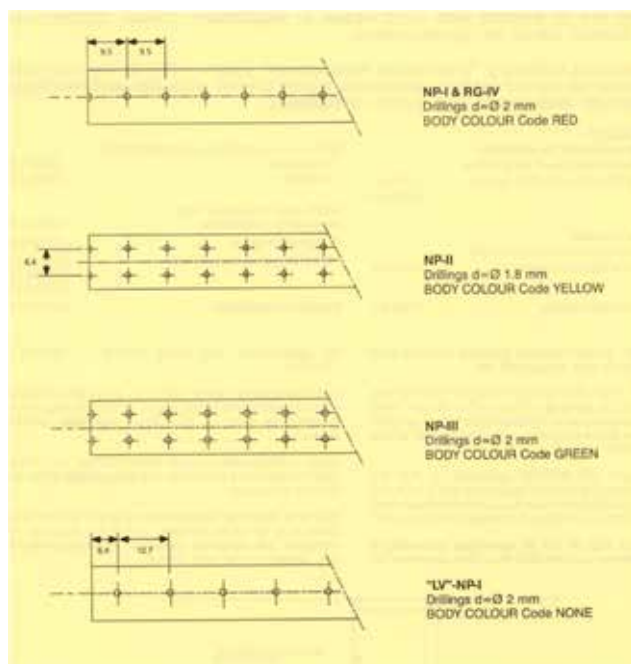
Velocity and flow of air at operating temperature must be uniform and not less than specified for the application.

Install adjustable profile plates to attain this velocity. Minimum silhouette profile plates of 150mm should be installed in duct to completely surround burner assembly.

Install a differential pressure switch across the profile plate to make sure the burner can only operate when air velocity is correct.

## 10.0 – Appendix 3

Wiring to electrical components as spark igniters and flame rods of induct burners, should be designed to withstand the maximum expected return temperature and radiation heat from burner.



### SPECIFIC START-UP INSTRUCTIONS AIRFLO LINE BURNERS – SERIES “NP”, “RG” “LV-NP-I”

Instructions provided by the company responsible for the manufacture of a complete system incorporating Nordair Niche burners take precedence over the installation and operating instructions provided by Reznor. If any of the instructions provided by Reznor are in conflict with local codes or regulations, please contact our head office or representative.

Before initiating the following start-up and adjustment procedure, IT IS IMPORTANT that a check can be made to verify that all of the equipment associated with and necessary to the operation of the AIRFLO burner system has been installed and piped in accordance with the “specific installation instructions”. If the burner system is part of a complete incinerator or other heating unit which has been purchased as a complete prepiped

and prewired package, it may be assumed that these instructions have already been carried out by the company responsible for the overall installation.

Initial adjustment and light-off should be undertaken only by trained and experienced personnel familiar with combustion systems, with control/safety circuitry with knowledge of the overall installation.

### 1.8 INTRODUCTION

“NP”, “RG” AND “LV-NP-I” are raw gas burners. There is no flammable air-gas mixture in the feeder line and, therefore, a flash-back will not occur. However, the burner depends completely on the process air to supply the oxygen for combustion. A correct air velocity is therefore very important, and the process air must be fresh air.

1. Close all burner fuel valves and/or cocks. Make preliminary adjustments to fuel regulators.
2. Check all electric circuitry. Verify that all safety devices and interlocks are operable and functioning within their respective settings/ranges. Be sure all manifolds are tight and that test ports are plugged if not being used.
3. Check that all duct and chamber dampers are properly positioned and locked into operating positions.
4. Start main process fans; check whether system has been purged.
5. Check  $\Delta P$  or velocity over the burner!

Do not bypass control panel timers typically controlling sequential operations.



## 10.0 – Appendix 3

1. Disconnect the automatic control motor linkage from your Nordair Niche control valve by loosening the control motors connecting rod from the valves toggle linkage. Initial start-up adjustment should only be accomplished during a “manual” control mode. Manually set and secure control valve in its “minimum” position.
7. To light and adjust gas pilot: pilot gas regulator should initially be set at approximately midpoint of its adjustment range. With pilot gas solenoid valve closed, open main fuel gas and pilot gas cock. Energize spark igniter and open pilot gas solenoid. Turn adjustable orifice screw out (counter clockwise) several turns from its fully seated position. Observe pilot ignition through a sight port by viewing micro amp signal metered from flame safeguard relay circuit.
8. Prepare to ignite main burner by adjusting main gas regulator to approximately midpoint of its adjustment range. Linkage arrangement for the use of series “CV” gas control valve is illustrated for a typical control motor. Arrange accordingly.
9. With control valve at “minimum”, ignite main burner by operating main fuel shut off valve. Adjust main gas regulator to give the desired outlet pressure. Refine pilot adjustment if it has been affected. Adjust burner “minimum” by turning in on the minimum stop screw of the gas control valve until stable flame appears in the narrow zipper channel at the base of burner mixing plates.

### 1.8.1 MAINTENANCE INSTRUCTIONS

Periodic maintenance will ensure continued trouble-free operation of your series “NP”, “RG” or “LV-NP-I” AIRFLO burner system.

Inspection annually, at least, is recommended for makeup air heating installations and more

frequently for process applications in regular operation. Your own experience is the best guide in determining frequency of inspection, but as a minimum the following procedure should be followed:

1. Shut the system down totally, disconnecting or locking out power supply so there can be no accidental start-up during inspection.
2. Inspect the burners carefully, including upstream and downstream side of the mixing plates as well as burner body face. Any accumulation of scale or foreign material on either side of the mixing plates should be removed with a wire brush. Check visually that no holes in the mixing plates are blocked.

Burner type	NP-I	NP-II	NP-III	RG-IV	LV-NP-I
Rows of gas ports	1	2	2	1	1
Drill size in mm	1.9	1.8	1.9	1.9	1.9

If any burner ports are blocked (even partially) clear them with a piece of wire or a drill bit matching the drill size for your appropriate burner type (see table above)

**WARNING: DO NOT ENLARGE BURNER PORTS OR PERFORMANCE**

**MAY BE DRASTICALLY AFFECTED.**

If any mixing plates are loose or fasteners are missing, tighten/replace as necessary. Always use zinc plated or stainless-steel fasteners.

3. Put system back into operation and, if possible, view from downstream side while cycling burner through full firing range. This will give a visual check for blocked burner ports.

## 10.0 – Appendix 3

1. Observe flame patten and, if necessary, take steps to correct velocity and/or air distribution problems.

### 1.8.2 REPAIR/REPLACEMENT PROCEDURES

If adverse operating conditions or accidental damage make it necessary to replace either individual mixing plates or complete burner sections, follow this procedure:

1. Identify necessary replacement parts. Carefully consider the economics of installing a complete replacement burner instead of replacing individual parts. Once exposed to actual flame temperatures, burner castings harden and the removal and replacing of fasteners can be time consuming and difficult. Accessibility may also be severely limited thus requiring removal of the complete assembly.
2. When necessary parts have been received, remove damaged mixing plates or burner sections, taking care not to damage remaining portion of burner. If new burner bodies are being installed, apply thin coat of key graphite paste to the mating flanges of loose cast iron bodies. (This is necessary to provide a gas-tight seal after assembly). Insert new section into place, making sure that both flanges are square and flush, then bolt sections together.
3. Install new mixing plates, back-up bars and plate support brackets to the new body castings. Be careful not to damage gaskets that go between mixing plates and burner body. They are cut to overlap approximately 2 mm for tight air seal.
4. If end plate sets must be installed, apply key paste to both sides of end plate at the areas that will contact the cast iron body and end flange or pilot. Then put in position between mixing plates and insert fasteners loosely. Do not tighten at this time.
5. Tighten burner body bolts making sure that mating cast iron flanges remain square and flush.

6. Align mixing plates and check that gaskets are in position and properly aligned, then tighten all mixing plate mounting screws and bolts.
7. Double check that all fasteners are secure.
8. Return burner to operation, observing flame carefully at all firing rates.

### PERFORMANCE SELECTION DATA "NP" AIRFLO BURNERS

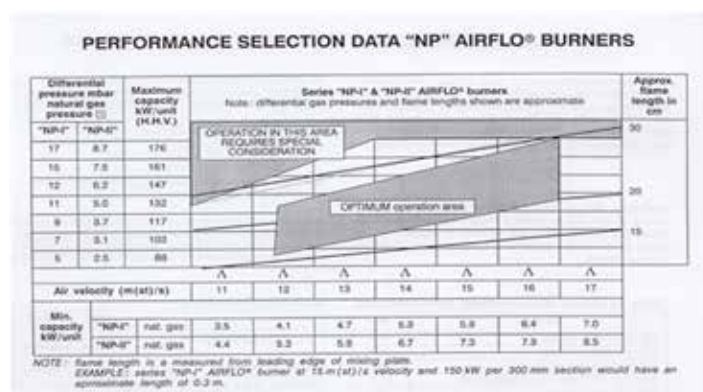
Airstream Velocity across and through the burner's mixing plates must be kept uniform and within desired limits by use of a silhouette profile plate through which the burner fires. A 150mm (minimum) profile plate should be installed surrounding the interior duct walls at the leading edge of your burners mixing plates.

Optimum design ranges for the various types are shown in the above graphs. Velocities ( $\text{m}^3$  (st)/h) are measured with a velometer directly in the duct at the plane of the profile plate and leading edge of burner mixing plates.

Table 1: burner displacement ( $\text{cm}^2/\text{section}$ )

Section	NP
150mm straight section	232
300mm straight section	465
300mm back inlet section	465
300 x 300 x 300mm H-back inlet section	1115
300 x 150 mm T-section	557
150 x 150mm elbow section	418

To determine profile opening areas, add burner displacement areas ( $\text{cm}^2/\text{section}$ ) from table 1





## 10.0 – Appendix 3

for complete burner assembly to “Net Free Area” of duct:

“Net Free Area” of duct (cm<sup>2</sup>) =

Fan volume m<sup>3</sup> (st) h

\_\_\_\_\_ x 10,000 = ..... cm<sup>2</sup>

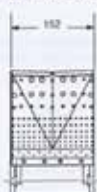
Velocity (m/s x 3600)

Various duct size/profile area relationships may give slightly different field site data than is shown in table 2. Velocities should always be confirmed and established by use of a velometer on actual field site installation.

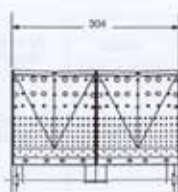
Velocity m/s (15°C)	8	9	10	11	12	13	14	15	16	17	18	19	20
Pressure drop in mbar	0.39	0.50	0.61	0.74	0.88	1.04	1.21	1.38	1.57	1.77	1.99	2.21	2.45

### DIMENSIONS “NP” AIRFLO® BURNERS (in mm unless stated otherwise)

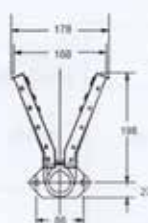
#### BURNER SECTIONS



150 mm STRAIGHT SECTION

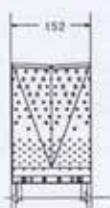


300 mm STRAIGHT SECTION

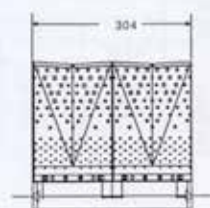


### DIMENSIONS “RG” AIRFLO® BURNERS (in mm unless stated otherwise)

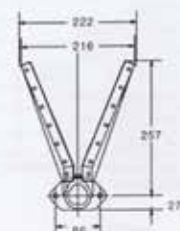
#### BURNER SECTIONS



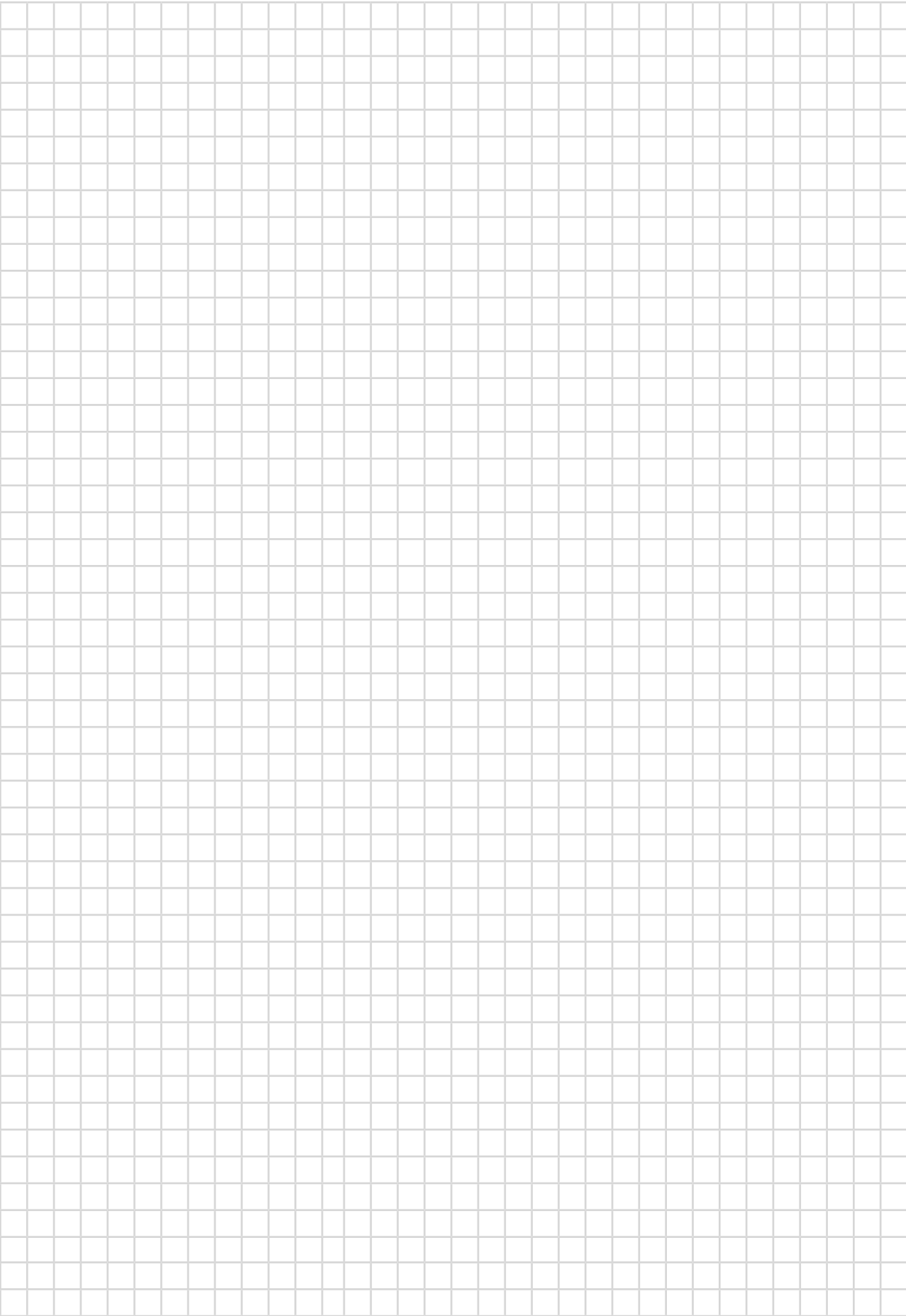
150 mm STRAIGHT SECTION



300 mm STRAIGHT SECTION



Notes





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