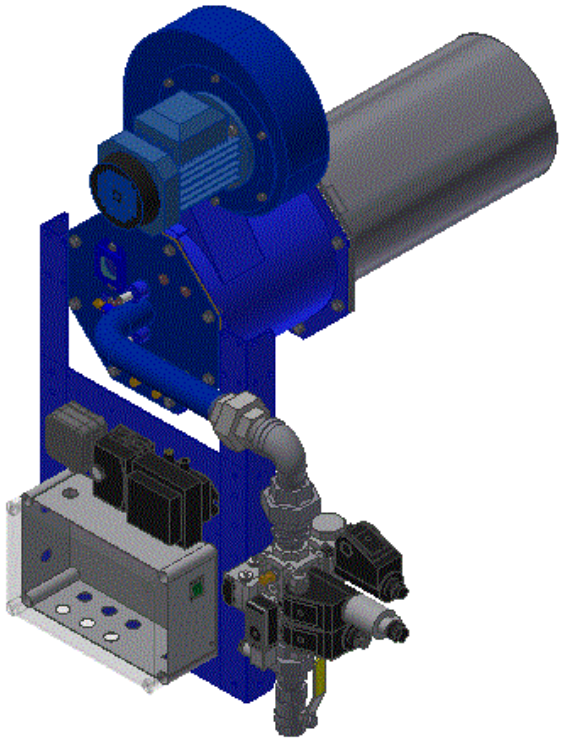
LANEMARK
COMBUSTION ENGINEERING

PROCESS BURNER DIVISION

INSTALLATION, COMMISSIONING AND MAINTENANCE MANUAL



The information contained in this manual is advisory and in general terms only and does not constitute a legal liability on Lanemark Combustion Engineering Ltd.

Lanemark Combustion Engineering Ltd reserves the right to supply equipment to their latest specification.

FD-E Mk 6 SERIES GAS BURNER J***

CUSTOMER

END USER

BURNERS **FD**EN-3 NATURAL GAS BURNER**

If this manual was sent out with an actual burner (or several burners built to the same specification) a duplicate Burner Data Plate will be shown on this page. This will give the actual burner :-

Serial Numbers
Gas Type (Natural or Propane)
Electrical and Gas Train Specification
Burner Head Pressure Setting
Fan Motor Supply Voltage Required

SERIAL NO. J*****- 1

MODEL FD10EN

FUEL TYPE NATURAL GAS

HEAT INPUT 440 **kW**

BURNER HEAD PRESSURE 5.6 **mbar**

MANUFACTURED MM/YYYY

SUPPLY GAS TEMP	15	**ºC**	**SUPPLY AIR TEMP.**	15	**ºC**
MAXIMUM HEAT INPUT	440	**kW**	**MINIMUM HEAT INPUT**	13	**kW**
GROSS CALORFIC VALUE	39.911	**MJ/Nm3**	**NET CALORIFIC VALUE**	35.9	**MJ/Nm3**
MAXIMUM INLET PRESSURE	100	**mbar**	**MINIMUM INLET PRESSURE**	20	**mbar**
GAS VALVE TRAIN TYPE	KROMSCHRODER VCD2		**DRAWING NO.**	56708	
ELECTRICAL WIRING DIAGRAM NO.	62053				

CONTROL SUPPLY	230	**V**	1	**PH**	50	**Hz**	**FLC**	3 **A**
FAN SUPPLY	400	**V**	3	**PH**	50	**Hz**		
FAN POWER & FLC	0.25	**kW**	0.70	**A**				

SERIAL NO. J***** - 1

MODEL FD10EN

FUEL TYPE NATURAL GAS

HEAT INPUT 440 **kW**

BURNER HEAD PRESSURE 5.6 **mbar**

MANUFACTURED MM/YYYY

SERIAL NO. J***** - 1

MODEL FD10EN

SUPPLY VOLTAGE 230 **V**

MANUFACTURED MM/YYYY

INFORMATION ONLY

If this manual was sent out with an actual burner a copy of the :-

- Declaration Of Incorporation For Partly Completed Machinery..
- Declaration Of Conformity To Order.
- Test Certificates.
- Calibration Certificates.
- Certificates for equipment supplied by Lanemark Combustion Engineering Ltd but not manufactured by Lanemark.

will be included after this page if specifically requested by the Customer's order.

LANEMARK
COMBUSTION ENGINEERING

Declaration of Conformity

QAF 06-34

(In accordance with Machinery Directive 2006/42/EC) CE

Reference/ Serial No. J*****

Issued by: Lanemark Combustion Engineering Limited

Object of Declaration: FD**EN-3 NATURAL GAS BURNER

Customers Name:

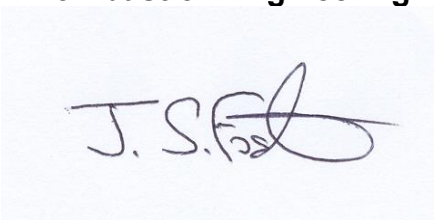
Purchase Order/ Reference:

The object of the declaration described above have been inspected and tested in accordance with the conditions and requirements of the purchase order and unless otherwise stated conform in all respects to the specifications(s) drawings relevant thereto and is in conformity with the requirements of the following documents:

2014/30/EC	Electromagnetic Compatibility Directive.
ISO 9001: 2015	Quality Management System – Requirements.
BS EN 746-2: 2010	Industrial Thermoprocessing Equipment, Safety requirements for combustion and fuel handling systems.
2014/35/EC	Low Voltage Directive (LVD).
BS EN 60204-1:2006	Safety of Machinery. Electrical equipment of machines General requirements.

Additional Information: If applicable (i.e. Applicable concessions, Raw materials, Cast numbers/Test results/Batch numbers.

Signed for and behalf of:
Lanemark Combustion Engineering Limited



Name/function: J. Foster/ Director. Name/function: P. Collier/ Managing Director

Date of Issue: DD/MM/YYYY

Place of Issue: As address below

Registered Address: Lanemark House, Whitacre Road, Nuneaton, Warwickshire, UK, CV11 6BW
Tel: +44 (0) 24 7635 2000 Fax: +44 (0) 24 7634 1166
E-mail: info@lanemark.com Web site: http://www.lanemark.com
Company Registration No. 05471903 VAT No. GB 185 5272 84
Place of Registration: England & Wales
Directors: P.R. Collier, J.S. Foster, A.E. Thompson

Reg. No. 567424

LANEMARK
COMBUSTION ENGINEERING

Declaration of Incorporation For Partly Completed Machinery
QAF 06-35

(In accordance with The Machinery Directive 2006/42/EC) CE

Reference/ Serial No. J*****

Object of Declaration: FD**EN-3 NATURAL GAS BURNER

Customers Name:

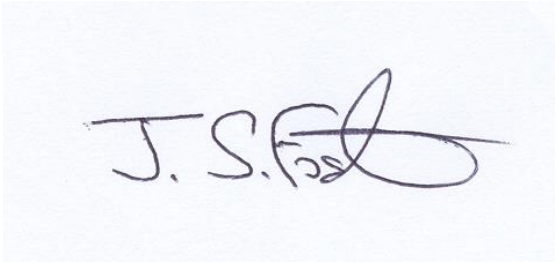
Purchase Order/ Reference:

LANEMARK COMBUSTION ENGINEERING LIMITED

Herby declares that the object of declaration identified above is in accordance with the relevant safety and health requirements of the EC Council Directive on Machinery.
It must be installed and commissioned in accordance with our customer installation and maintenance instructions.
We further declare that the equipment identified above as the object is intended to be incorporated into other equipment/machines to constitute machinery.
Our product must not be put into service until the assembled machinery has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC.

Additional Information: If applicable:

Signed for and behalf of:
Lanemark Combustion Engineering Limited



Name/ function: Managing Director

Name/ function: Director

Date of Issue: DD/MM/YYYY

Place of Issue: As address below

Registered Address: Lanemark House, Whitacre Road, Nuneaton, Warwickshire, UK, CV11 6BW
Tel: +44 (0) 24 7635 2000 Fax: +44 (0) 24 7634 1166
E-mail: info@lanemark.com Web site: http://www.lanemark.com
Company Registration No. 05471903 VAT No. GB 185 5272 84
Place of Registration: England & Wales
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Reg. No. 567424

SECTION 1 GENERAL DESIGN

BRIEF BURNER SPECIFICATION

The FD range of burners are forced draught burners designed for industrial process air heating requirements.

Short flame lengths, exceptional flame stability and accurate turndown as low as 9 kW (30,000 Btu/h) are achieved by the unique Lanemark cone design combustion head.

Two configurations are available:-

FD '**C'** where the controls are all mounted inside a steel control panel.

FD '**E'** where the controls are all mounted on a mounting plate.

For both configurations the combustion air fan, gas train and controls are all prefitted and prewired.

The burners can be supplied as on/off, high/low, high/low/ultra low, modulating gas only or modulating air and gas to suit the process requirements.

The controls include the gas burner sequence controller, on/off switch, differential air pressure switch, ignition transformer and two off 3-way air valves. These air valves are fitted so that the burner can be used on applications where the recirculation or exhaust fans can run continuously without interfering with the operation of the air pressure switch.

The burners can be supplied with 230V or 110V controls and the combustion fans can have 400V 3 phase or 230V single phase motors. The electrical protection rating is IP54 which is suitable for most commercial applications but higher ratings are available to order.

The burner's combustion air fan is generally designed to run continuously when the oven is in use or alternatively it can it can be energised from the burner's controller to run only when the burner is required to run.

The fan motor electrical supply is made via an isolator, contactor and motor overload normally provided by others in the main site motor control panel. Alternatively Lanemark can supply and fit these components. A fan motor isolation switch is fitted inside the burner control panel as standard.

The burner is painted blue and is suitable for mounting directly onto the side of the oven or for down firing as required.

The gas train inlet position must be specified at the time of ordering but can be configured to suit most installations.

If the burner is to run for more than 24 hours without being switched off then the burner must be equipped with a control box certified for continuous running to comply with European combustion equipment standards.

These burners are generally built to the customers' specification and may incorporate many variations and features to suit the particular application. If this manual was sent out with an actual burner then a duplicate copy of the burners Data Plates will be shown in the front of this manual giving the principal information and the manual will be specific to that burner project.

SHIPPING CONTENTS

The burner is shipped in a single heavy duty cardboard box with an infill of expanded foam. The gas train on larger models may be packed in a transport only position or supplied loose in the box. The control pack on larger models may also be supplied loose in the box.

CONSTRUCTION STANDARDS

The burners are generally constructed in accordance with:-

EN676: Automatic Forced Draught Burners For Gaseous Fuels.

EN 746 Part 1: Common Safety Requirements for Industrial Thermoprocessing Equipment.

EN 746 Part 2: Safety Requirements for Combustion and Fuel Handling Systems of Industrial Thermoprocessing Equipment.

As these burners are intended to be incorporated into another machine or system they are supplied with a Declaration of Incorporation For Partly Completed Machinery as required by the Machinery Directive 2006/42/EC.

INSTALLATION

It is UK Law that these burners are installed, commissioned and maintained by competent persons only e.g. GAS SAFE & ACS registered installers only. For other countries they must be installed and commissioned in accordance with local regulations.

GENERAL DESIGN CONSIDERATIONS

The burner must be installed in accordance with the following regulations:-

I.E.E Regulations (BS7671)
Local Gas Service Area Recommendations
BS5440 Part 1 Specification for Installation of Flues
BS2915 Specification for Bursting Discs and Bursting Disc Devices
BS5440 Part 2 Specification for Installation of Ventilation for Gas Appliances
BS6644 Installation of Gas Fired Boilers between 60kW and 2MW
British Gas IM/30 Code of Practice for Gas Fired Process Plant
British Gas IM/11 Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters
British Gas IM/12 Use of Gas in High Temperature Plant
British Gas IM/18 Use of Gas in Low Temperature Plant
LPGA COP9 LPG Air Plant
LPGA COP17 Purging LPG Vessels and Systems
IGE/UP/1 Soundness Testing and Purging Of Industrial and Commercial Gas Installations
IGE/UP/4 Commissioning Of Gas Fired Plant on Industrial and Commercial Premises
IGE/UP/2 Gas Installation Pipe work, Boosters and Compressors on Industrial and Commercial Premises
Health and Safety Executive HS (g) 16 Evaporating and Other Ovens
DETR Good Practice Guide Selecting and Specifying New Paint Plant and Stoving Ovens

For some applications the discharge of flue gas into the atmosphere may be controlled and it is the responsibility of the owner to obtain permission from Local or National Government Departments as required.

OVEN AND FURNACE APPLICATION

The burners are suitable for firing into ovens, furnaces and after burners with a pressure of between:-

- 5.0 mBar (- 2.0 in.wg)
+ 0.8 mBar (+ 0.3 in.wg)

and process temperatures of up to 500 °C.

The standard burner flame tube projects 100 mm from the burner mounting flange.

If the burner is mounted on the outside face of an oven and there is typically 150 mm of internal insulation then consideration should be given to the position of the flame as it expands into the combustion chamber through the burner port hole. The neck of the burner port should be protected from flame impingement by fitting a combustion tube or similar. See *Fig 1 Section 2.*

The length of the flame is contained in this manual for various outputs and typical combustion chamber minimum diameters are:-

FD5	350 mm.	FD10	500 mm.
FD15	600 mm.	FD20	750 mm.

The burner flame is generally quite stable under most firing conditions but if the flame is subject to a cross flow of air (or combustion products) at or in excess of velocities of 6 m/s (20 ft/sec) then a combustion tube should be fitted. This tube shields and stabilises the flame and can recirculate some of the ovens cooler gas back around the base of the combustion tube.

A drawing of standard length combustion tubes is contained in this manual and they are available as an optional accessory from Lanemark Combustion Engineering Ltd. See *Fig 1 Section 2.*

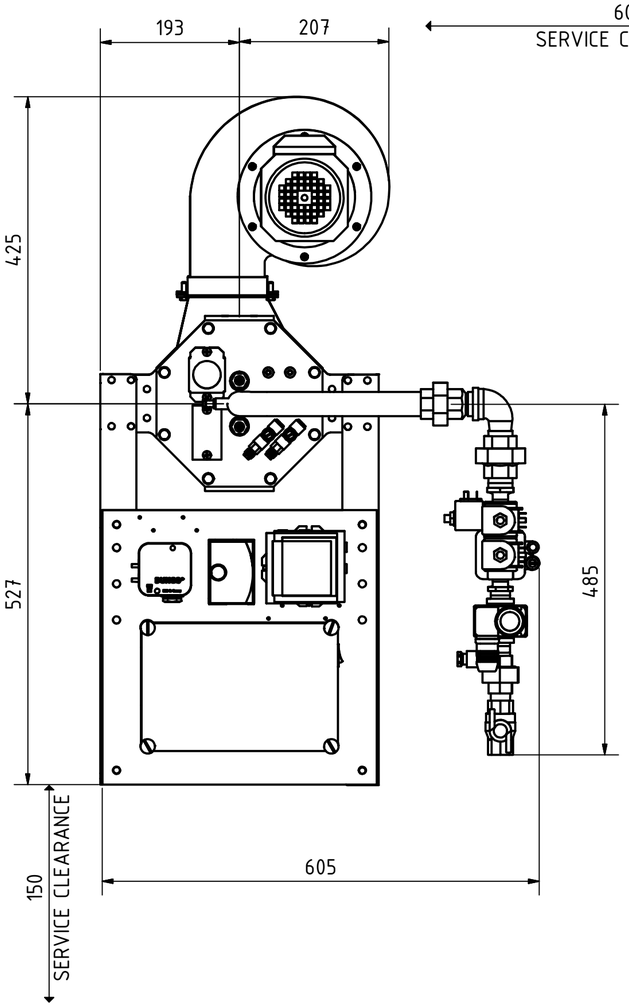
For higher velocities or temperatures the Technical Department of Lanemark would be pleased to advise on the application and special heads and combustion tubes made from high temperature alloys can generally be designed to protect the combustion head and maintain flame stability.

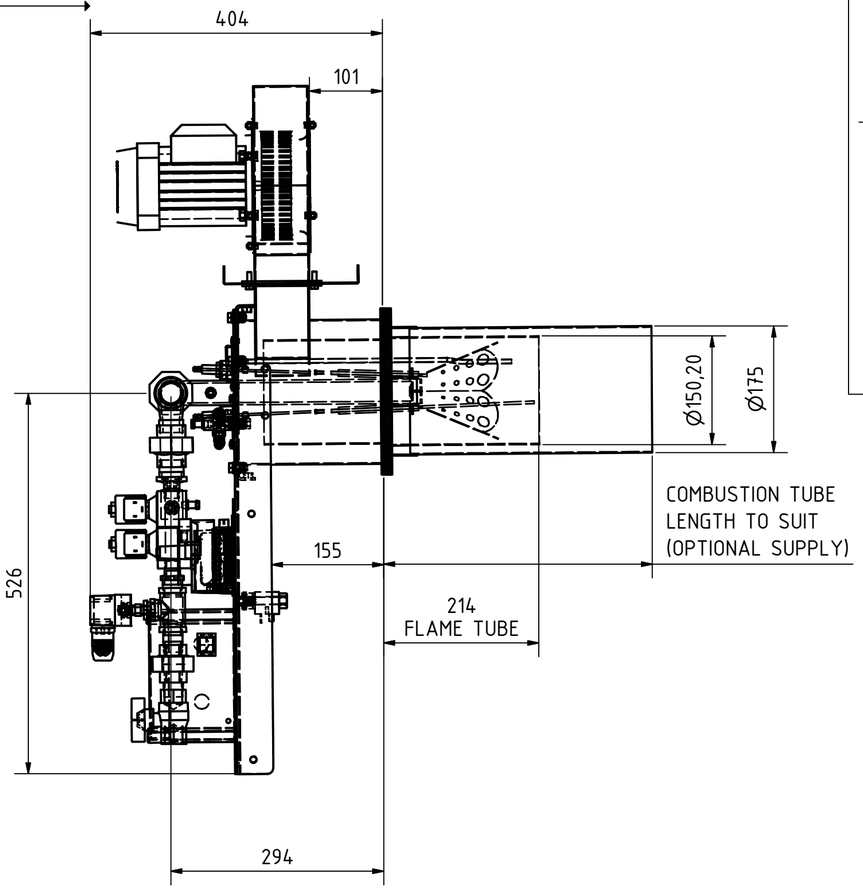
The low fire (also start gas rate) of the burner cannot exceed 30% of the full high setting to comply with standards. The maximum low fire rate is restricted to 74 kW (250,000 Btu/h) on all burners and the minimum is typically 15 kW (50,000 Btu/h) depending on burner type etc. Should a higher low fire rate be required then a pilot stage / low fire / high fire burner should be specified.

For *down firing* applications the burners own combustion air fan should be wired to run continuously and overrun once the oven has been switched off, to prevent hot air from back flowing out of the burner.

For very contaminated environments inlet air filters can be supplied and fitted to the combustion fans air inlet or adapter flanges so that clean air can be ducted in from outside.

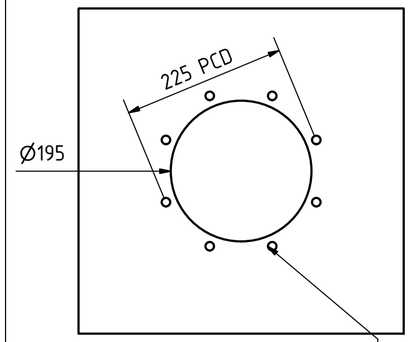
The oven should be fitted with a suitable Bursting Disc or Explosion Relief Panel and if the burner is being fitted to an existing oven the original equipment manufacturer should be consulted to check the suitability of the application.





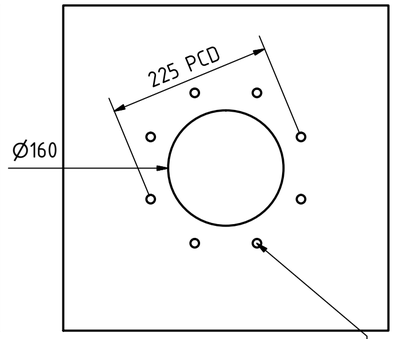
OVEN MOUNTING DETAILS

OVEN CUT OUT DETAIL
FOR COMBUSTION TUBE



8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 225 PCD

OVEN CUT OUT DETAIL
FOR FLAME TUBE



8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 225 PCD

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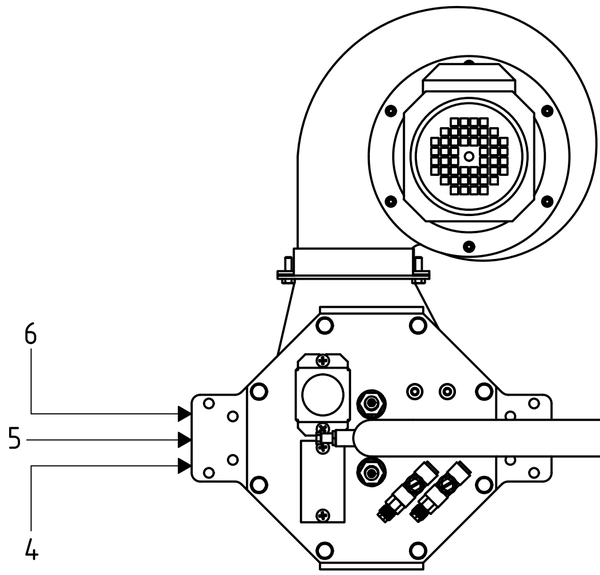

GAS TRAIN HANDING OPTION (TABLE 1)	
No.	DESCRIPTION
1	RIGHT HAND TOP
2	RIGHT HAND HORIZONTAL
3	RIGHT HAND BOTTOM
4	LEFT HAND BOTTOM
5	LEFT HAND HORIZONTAL
6	LEFT HAND TOP

PLEASE NOTE:

THE BURNER SHOWN IS GAS TRAIN HANDING POSITION 3.
OTHER HANDINGS ARE AVAILABLE AS PER TABLE 1.

DRAWING No: 40832

ISSUE	DESCRIPTION	DATE	BY
08			
07			
06			
05			
04			
03			
02	UPDATED FAN DIMENSIONS	02/12/2015	AJL
01	FIRST	28/06/2015	AJL
00	PROVISIONAL	25/06/2015	AJL

DIMENSIONS ARE IN mm AND DEGREES
TOLERANCE AS STATED OR ±
DRAWING SCALE (1 : 6)
PAPER SIZE A2

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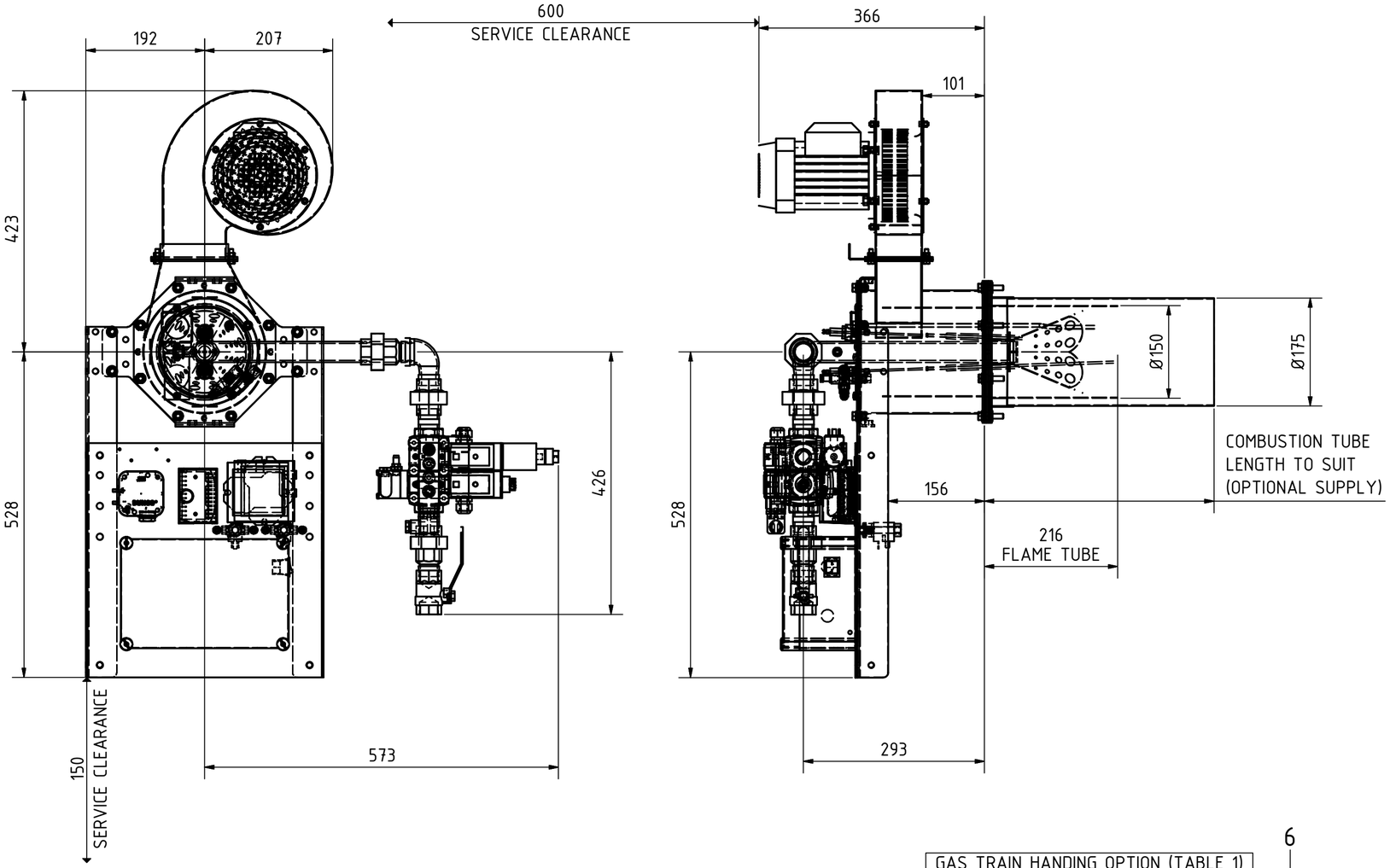
E-Mail: info@lanemark.com Website: www.lanemark.com

DRAWN BY: AJL
DATE: 25/06/2015
CHECKED BY: CPW
DATE: 02/12/2015
ISSUE: 02

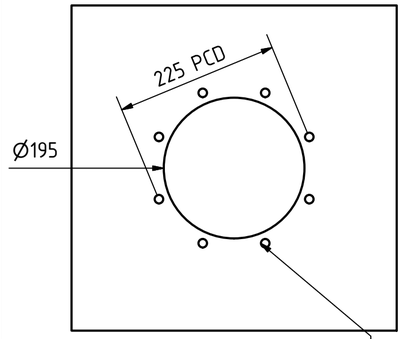
Do Not Scale Print
PROJECTION 1st
This is a angle drawing

TITLE: FD5-6-E G96 HI/LO GENERAL ARRANGEMENT
PROJECT No: -
DRAWING No: 40832
SHEET 1 OF 2



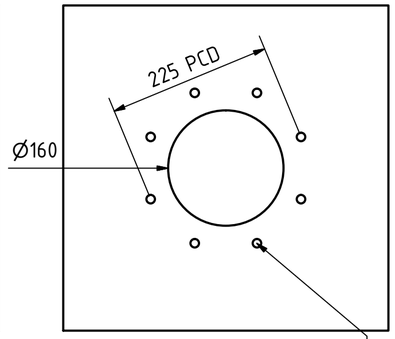
OVEN MOUNTING DETAILS

OVEN CUT OUT DETAIL
FOR COMBUSTION TUBE



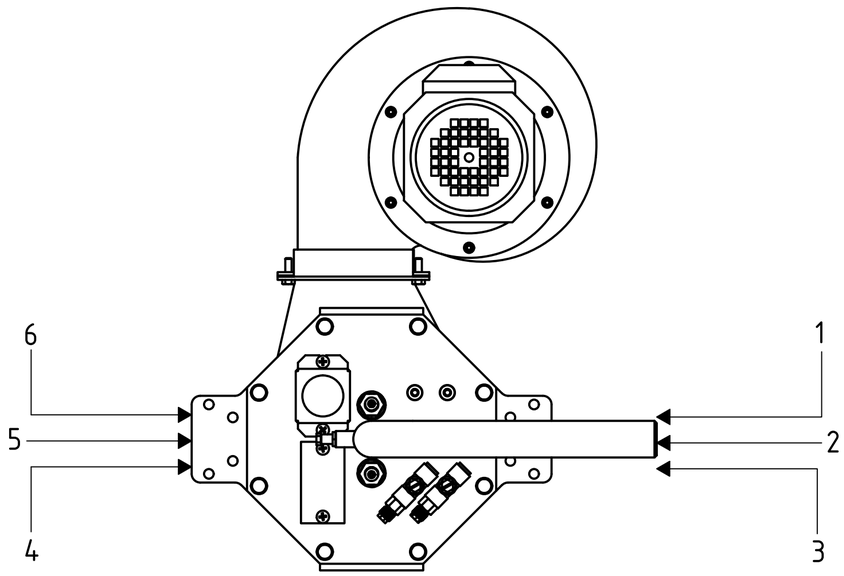
8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 225 PCD

OVEN CUT OUT DETAIL
FOR FLAME TUBE



8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 225 PCD

(1 : 4)



GAS TRAIN HANDING OPTION (TABLE 1)	
No.	DESCRIPTION
1	RIGHT HAND TOP
2	RIGHT HAND HORIZONTAL
3	RIGHT HAND BOTTOM
4	LEFT HAND BOTTOM
5	LEFT HAND HORIZONTAL
6	LEFT HAND TOP

PLEASE NOTE:

THE BURNER SHOWN IS GAS TRAIN HANDING POSITION 3.
OTHER HANDINGS ARE AVAILABLE AS PER TABLE 1.

DRAWING No: 40831

ISSUE	DESCRIPTION	DATE	BY
08			
07			
06			
05			
04			
03			
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01	FIRST	23/06/2015	AJL
00	PROVISIONAL	02/02/2015	AJL

DIMENSIONS ARE IN mm AND DEGREES
TOLERANCE AS STATED OR ±
DRAWING SCALE (1 : 6)
PAPER SIZE A2

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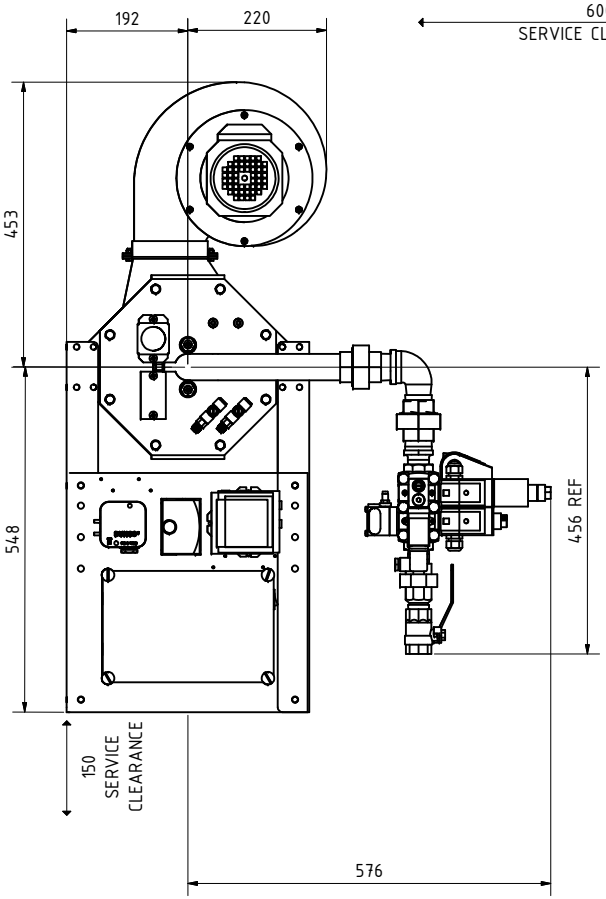
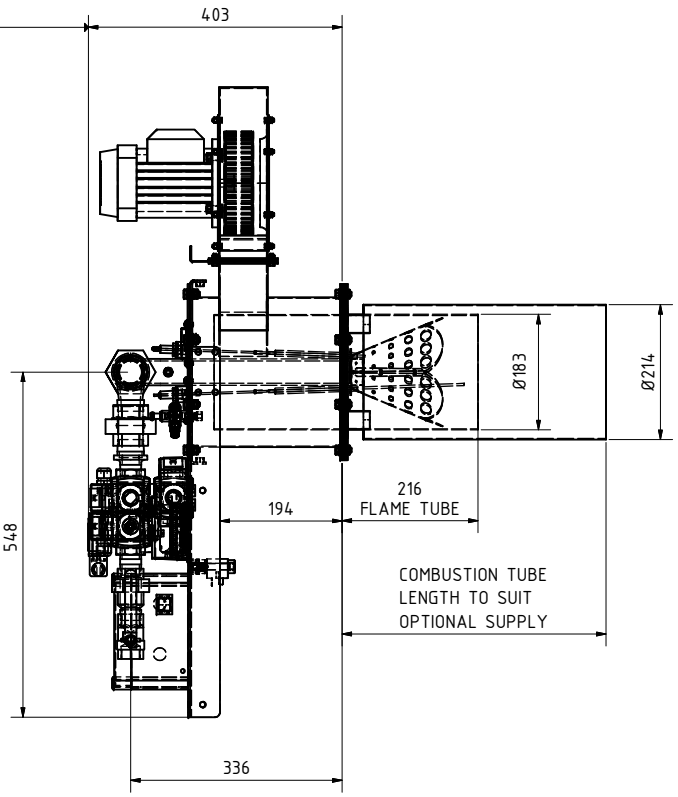
DRAWN BY: AJL
DATE: 24/06/2015
CHECKED BY: CPW
DATE: 02/12/2015
ISSUE: 02

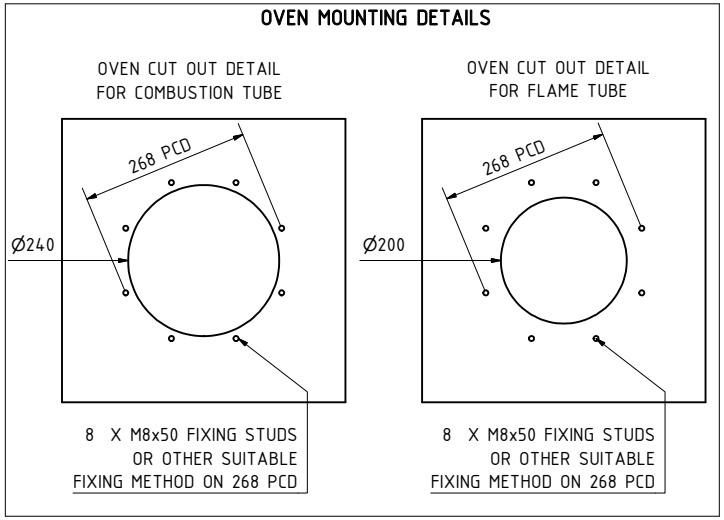
Do Not Scale Print
PROJECTION: 1st
This is a angle drawing

TITLE: FD5-6-E VCD1 HI/LO GENERAL ARRANGEMENT
PROJECT No: -
DRAWING No: 40831
SHEET 1 OF 2





OVEN MOUNTING DETAILS



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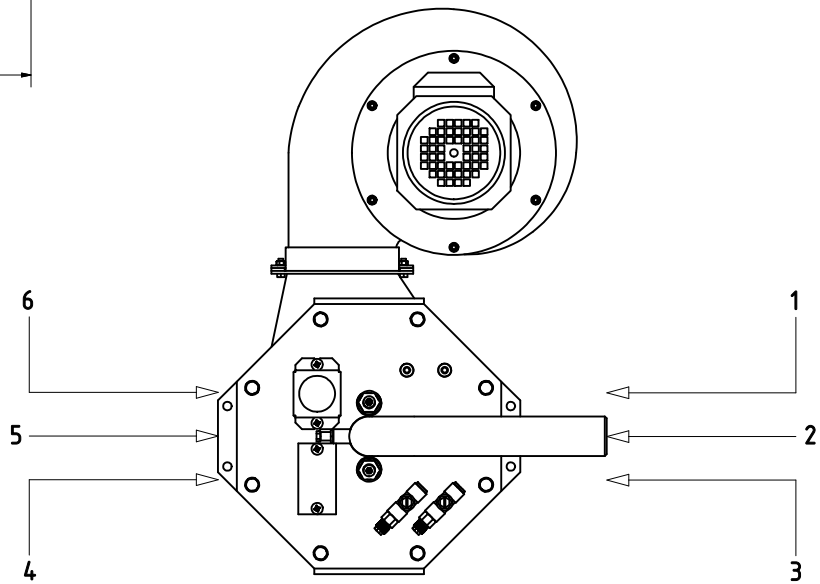

GAS TRAIN HANDING OPTION (TABLE 1)	
No.	DESCRIPTION
1	RIGHT HAND TOP
2	RIGHT HAND HORIZONTAL
3	RIGHT HAND BOTTOM
4	LEF THAND BOTTOM
5	LEFT HAND HORIZONTAL
6	LEFT HAND TOP

PLEASE NOTE:

THE BURNER SHOWN IS GAS TRAIN HANDING POSITION 3.
OTHER HANDINGS ARE AVAILABLE AS PER TABLE 1.

ISSUE	DESCRIPTION	DATE	BY
09			
08			
07			
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02			
01	FIRST	05/07/2015	AJL

DIMENSIONS ARE IN mm AND DEGREES
TOLERANCE AS STATED OR ±
DRAWING SCALE (1 : 6)
PAPER SIZE A2

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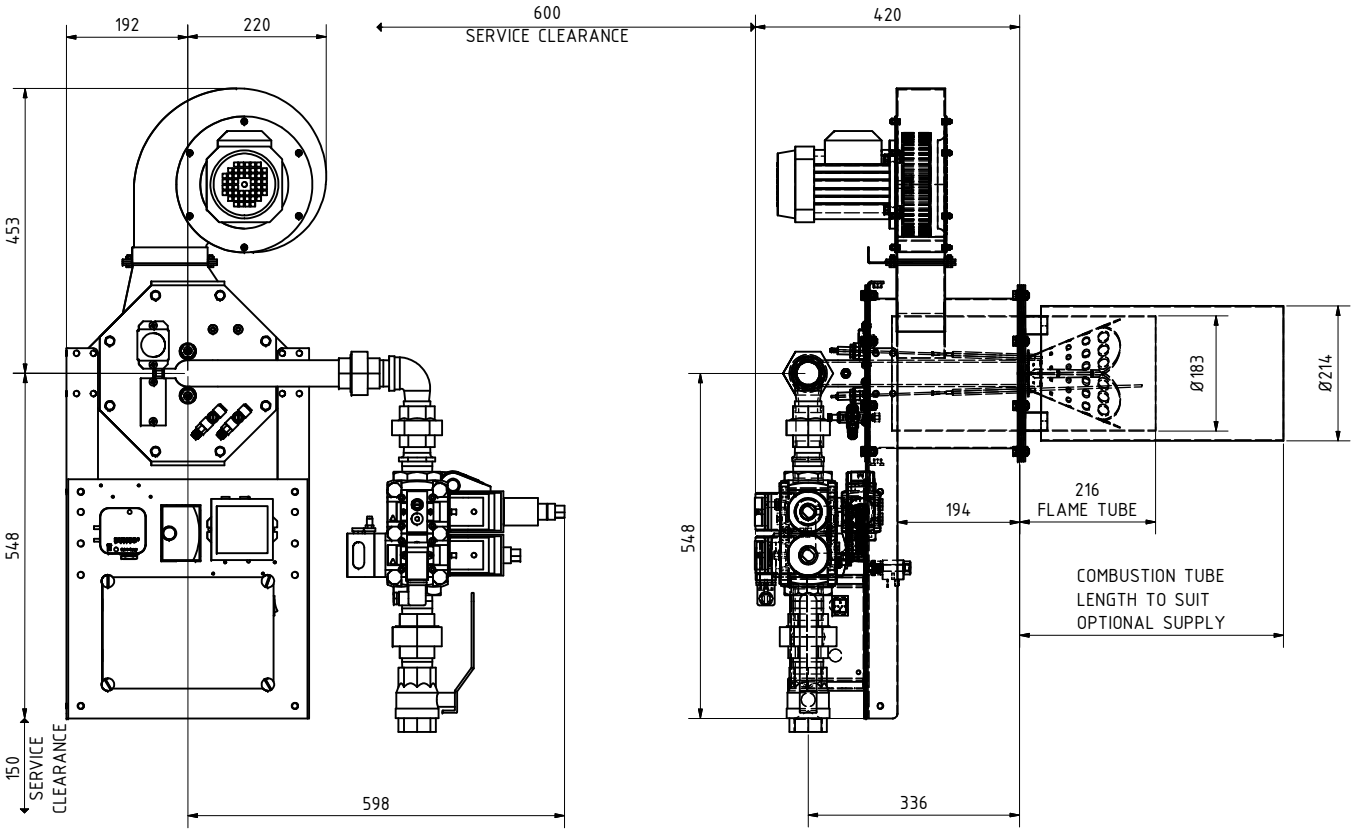
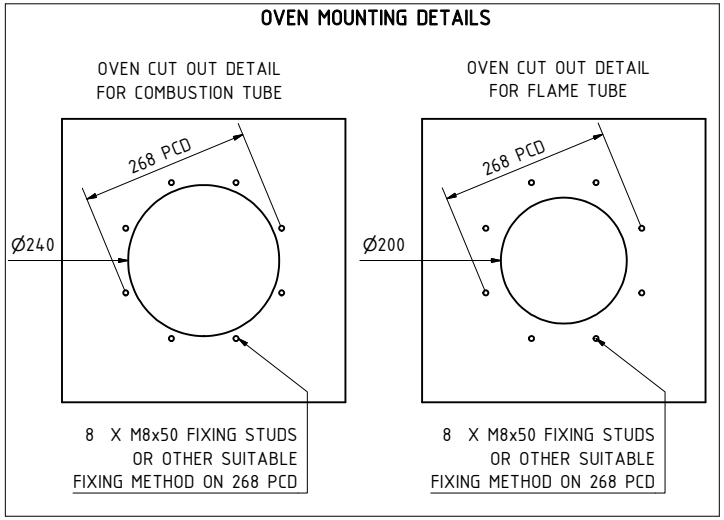
DRAWN BY: AJL
DATE: 06/07/2015
CHECKED BY: CPW
DATE: 06/07/2015
ISSUE: 01

Do Not Scale Print
PROJECTION: 1st This is a angle drawing
TITLE: FD10-6-E VCD1 HI/LO GENERAL ARRANGEMENT
PROJECT No: -
DRAWING No: 40835
SHEET 1 OF 2

DRAWING No: 40835



OVEN MOUNTING DETAILS



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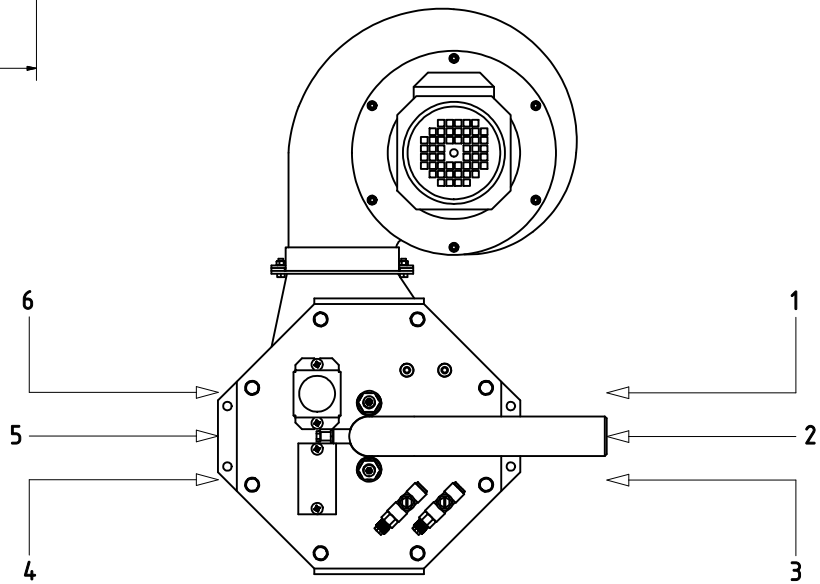

GAS TRAIN HANDING OPTION (TABLE 1)	
No.	DESCRIPTION
1	RIGHT HAND TOP
2	RIGHT HAND HORIZONTAL
3	RIGHT HAND BOTTOM
4	LEF THAND BOTTOM
5	LEFT HAND HORIZONTAL
6	LEFT HAND TOP

PLEASE NOTE:

THE BURNER SHOWN IS GAS TRAIN HANDING POSITION 3.
OTHER HANDINGS ARE AVAILABLE AS PER TABLE 1.

DRAWING No: 40912

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08			
07			
06			
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03			
02			
01	FIRST	20/01/2016	AJL

DIMENSIONS ARE IN mm AND DEGREES
TOLERANCE AS STATED OR ±
DRAWING SCALE (1 : 6)
PAPER SIZE A2

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DRAWN BY: AJL
DATE: 20/01/2016
CHECKED BY: BAS
DATE: 20/01/2016
ISSUE: 01

Do Not Scale Print
PROJECTION: 1st
This is a angle drawing

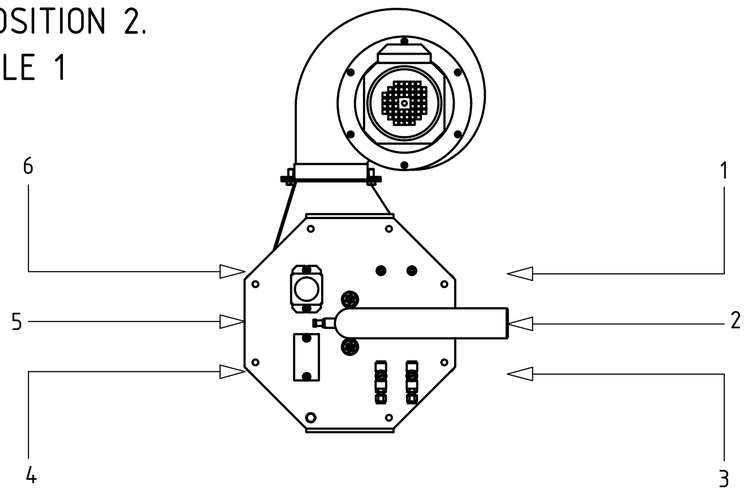
TITLE: FD10-6-E VCD2 HI/LO GENERAL ARRANGEMENT
PROJECT No: -
DRAWING No: 40912
SHEET 1 OF 2

PLEASE NOTE:

THE BURNER SHOWN IS GAS TRAIN HANDING POSITION 2.
OTHER HANDINGS ARE AVAILABLE AS PER TABLE 1

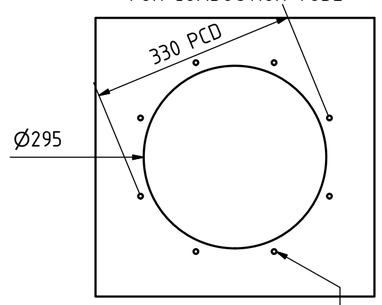
GAS TRAIN HANDING OPTION (TABLE 1)	
No.	DESCRIPTION
1	RIGHT HAND TOP
2	RIGHT HAND HORIZONTAL
3	RIGHT HAND BOTTOM
4	LEF THAND BOTTOM
5	LEFT HAND HORIZONTAL
6	LEFT HAND TOP

(1 : 7)



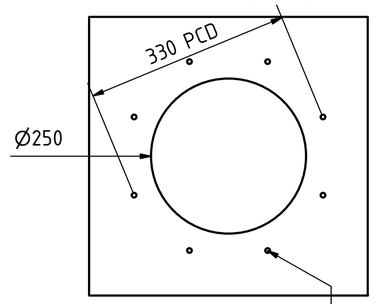
OVEN MOUNTING DETAILS

OVEN CUT OUT DETAIL
FOR COMBUSTION TUBE

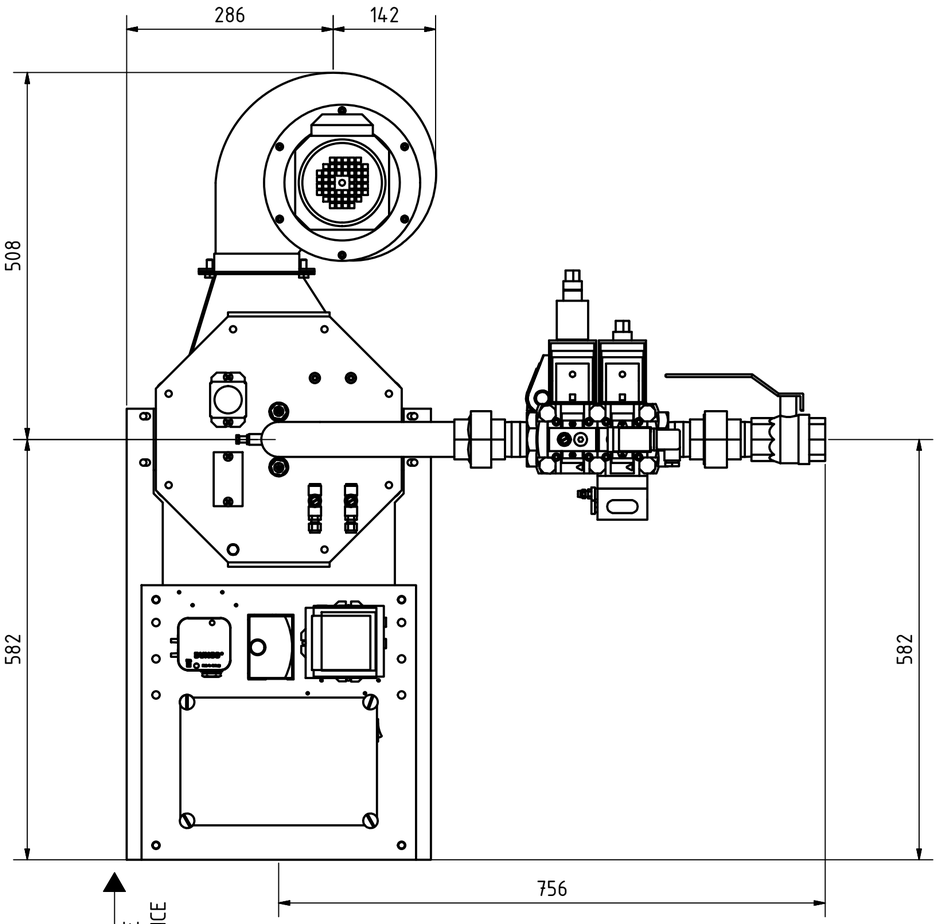


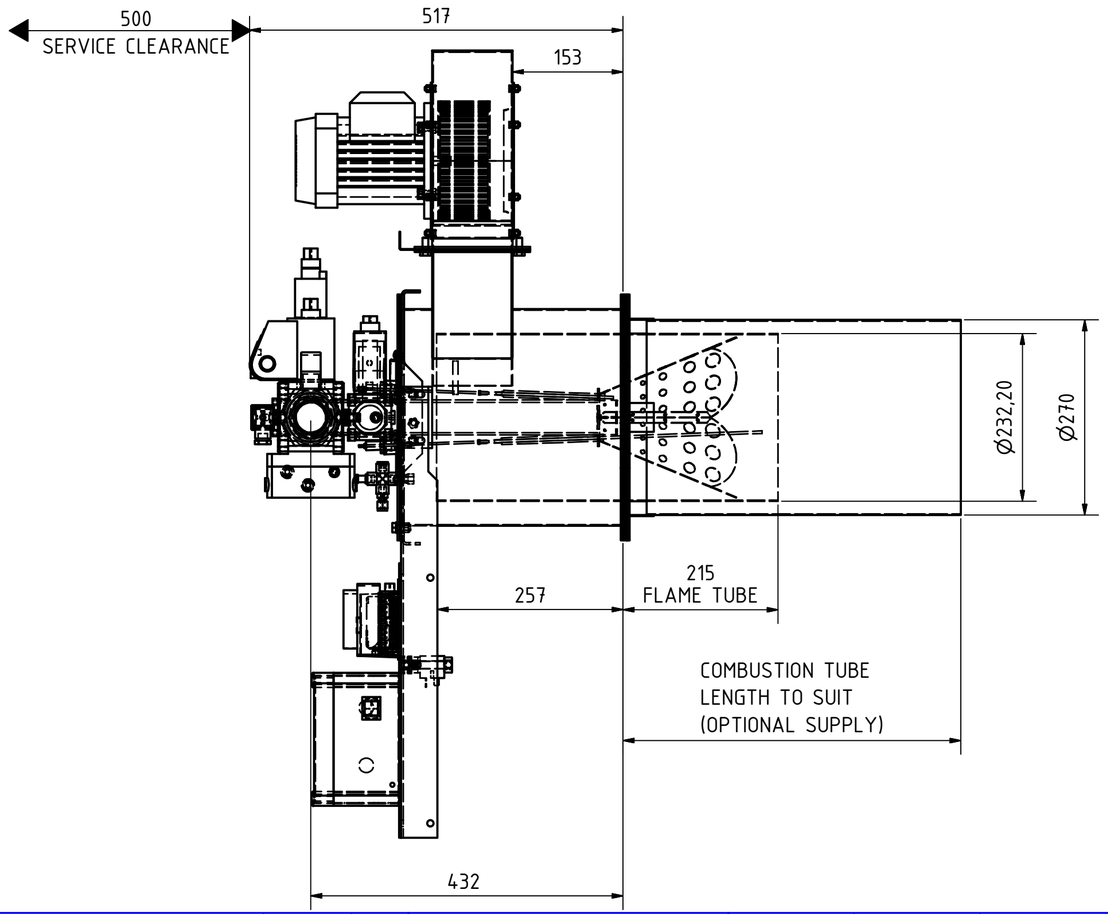
8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 330 PCD

OVEN CUT OUT DETAIL
FOR FLAME TUBE



8 X M8x50 FIXING STUDS
OR OTHER SUITABLE
FIXING METHOD ON 330 PCD





DRAWING No: 40908

DIMENSIONS ARE IN mm AND DEGREES	09			
	08			
TOLERANCE AS STATED OR ±	07			
	06			
DRAWING SCALE	05			
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	03			
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A2	01	FIRST	22/12/2015	AJL
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DRAWN BY: AJL	Do Not Scale Print	PROJECTION	This is a 1st angle drawing
DATE: 22/12/2015	TITLE: FD15-6-E VCD 2 HI/LO GENERAL ARRANGEMENT		
CHECKED BY: ARL			
DATE: 22/12/2015	PROJECT No: -		
ISSUE: 01	DRAWING No: 40908		SHEET 1 OF 1

TEMPERATURE CONTROL

If Lanemark supplied temperature controls with a burner details of these will be contained in the section of this manual *Temperature Controls*. This section also gives additional detail on specifying, installing and commissioning these controls.

If this manual was sent out with an actual burner the specific wiring diagram will be contained in the section of the manual *Control Panels* and this will show electrical interconnections for temperature controls.

The burner can be supplied to operate depending on the specification ordered as :-

1. On / off at fixed air.
2. Or High / low at fixed air.
3. Or High / low with 2 stage air.
4. Or Modulating gas at fixed air.
5. Or Modulating gas and modulating air.

to suit the application requirements.

It is anticipated that the burner will be run continuously in low (start gas) fire which can be as set as low as 15 kW (50,000 Btu/h) depending on model size.

The maximum low (pilot) stage is limited to 30% of the main flame by European Standards and is restricted by the pilot gas valve to 74 kW (250,000 Btu/h). For higher values of *low fire* a start gas stage / low fire / high fire burner should be specified.

The burner will usually be commissioned such that low fire is not sufficient to maintain the oven temperature. Then the main high flame will be brought in intermittently to maintain the set point or the burner flame will modulate upwards.

It is anticipated that a digital electronic temperature controller will be supplied either by Lanemark as an optional accessory or by the installer.

This controller should have a set point and an additional alarm stage with fixed differentials for high/low burners. Modulating burners will require a suitable controller that can provide the required control signal. These controllers will typically have full 3 term P.I.D control and Autotune to suit the characteristics of the application.

It is unlikely that simple mechanical thermostats will be suitable for controlling oven temperature because of the speed of response needed.

It is recommended that consideration be given to fitting a second totally independent temperature control device. This may be necessary if it is critical that the process being heated is never allowed to go over temperature. This will act as a High Temperature Trip Thermostat (Policeman Thermostat). Once its set point has been exceeded the burner is held off until manual intervention occurs to reset it.

FLUE SYSTEMS

The oven or furnace must be fitted with a suitable exhaust discharging the burner's products of combustion outside the building in a down draught free area. If this is not possible the oven/furnace manufacturer or Lanemark Combustion Engineering Ltd should be consulted.

For some installations Local and National Government Departments should be contacted for approval to discharge flue gas and this is the responsibility of the owner.

VENTILATION SYSTEMS

The burner should only be installed in a production area with sufficient natural or mechanical ventilation to ensure that there is adequate fresh air for complete combustion and adequate extract to maintain an acceptable working environment.

The burner should not be installed in an area where there is a high degree of powered mechanical extract but only natural ventilation inlet air. With such a combination the mechanical extract system may starve the burner of combustion air.

For suggested values for natural and mechanical ventilation see BS6644.

Where the air supply quality cannot be ensured consideration should be given to ducting fresh air in from outside.

PROTECTION OF BURNER SYSTEMS

The burner control panel and the gas train are manufactured to IP54 with regard to their protection against water and dust. This standard is sufficient for most commercial applications.

In food hygiene areas where " washing down " takes place or in areas of excessive condensation the burner's controls and gas train must be protected from the ingress of water or detergent.

If the air is very contaminated with chemicals or dust then the burner should have its air for combustion vented in from a source of fresh clean air.

Lanemark can supply equipment to higher IP standards, equipment manufactured from stainless steel for food preparation areas and with connections for fresh air ducts.

ELECTRICAL SUPPLY

The burner is available with:-

230V 1 Phase 50 Hz or 110V 1 Phase 50 Hz

controls and gas trains as given on the Burner Data Plate (a duplicate is shown in the front of this manual).

The single phase 230V or 110V control panel supply should be made into the control panel through a M20 cable gland from a suitable isolator and fused supply. The cable should be run in cable of sizes suitable for the panel load of 250 VA. All cable should be suitable for a service temperature of 60 degrees centigrade.

THIS BURNER MUST BE EARTHED

The burner's combustion air fan is built into the burner assembly. This will be 400V 3 phase or 230V single phase as specified. The fan motor power and the full load current will be contained on the Data Plate a copy of which is in the front of this manual if this manual was sent out with a burner.

The fan should have an independent isolator, motor protection device, contactor with an auxiliary contact provided by others. Alternatively Lanemark would be pleased to supply this as an optional extra.

The fan can run continuously from the main plant control panel. The burner must only run when the fan is running and stop immediately if the fan motors overload trips. An auxiliary contact on the motor overload should be interlocked to the burners own control panel. See the wiring diagram details.

Alternatively the fans motor contactor can be energised from the burners own control panel as shown in the wiring diagram.

All electrical installations should be in accordance with I.E.E Regulations (BS7671).

Output signals are available from the burners control panel, at 230V AC or 110V AC as appropriate for burner ON HIGH / ON LOW / AT LOCKOUT.

Time switches and ON/OFF switches should be connected as shown in the wiring diagram and temperature controllers as discussed later.

Main motor control panels must never backfeed into the Lanemark control panel.

Isolating or 110V transformers must be end and not centre tapped.

Depending on the model the burner control box may have over/under voltage protection and will not run if the supply voltage is incorrect.

Remote reset of control box ***lockout*** is possible by briefly applying a 110V or 230V input reset signal or pulling the reset terminal down to neutral as appropriate for the box type. See the wiring diagram.

This reset cable must NOT pick up any induced voltage as it can interfere with the box. If there is a possibility of such voltages screened cable is recommended.

GAS SUPPLY GENERAL

Before the burner is connected to a new or existing gas supply the Local Gas Supply Service Provider must be consulted to ensure that the gas meter and supply are of adequate size for the load required.

The burner gas train includes an isolating ball valve and union to allow the burner to be isolated and removed for servicing and a coarse filter.

The pipe work final connections should be made such that it is possible to isolate the gas supply and remove the burner for servicing without removing any gas pipe work. Consideration may be given to making the final connection in an armoured flexible gas hose that complies with current standards.

The gas supply pipe work should be designed and installed in accordance with the standards listed previously.

GAS SUPPLY NATURAL GAS

A stable gas supply pressure supply of:-

20 mBar (8 in.wg) minimum inlet pressure
100 mBar (14 in.wg) maximum inlet pressure

is required with the burner(s) running and if the supply is a medium pressure supply, or above the maximum required, an additional gas regulator should be installed. Lanemark would be pleased to advise on types, sizes etc.

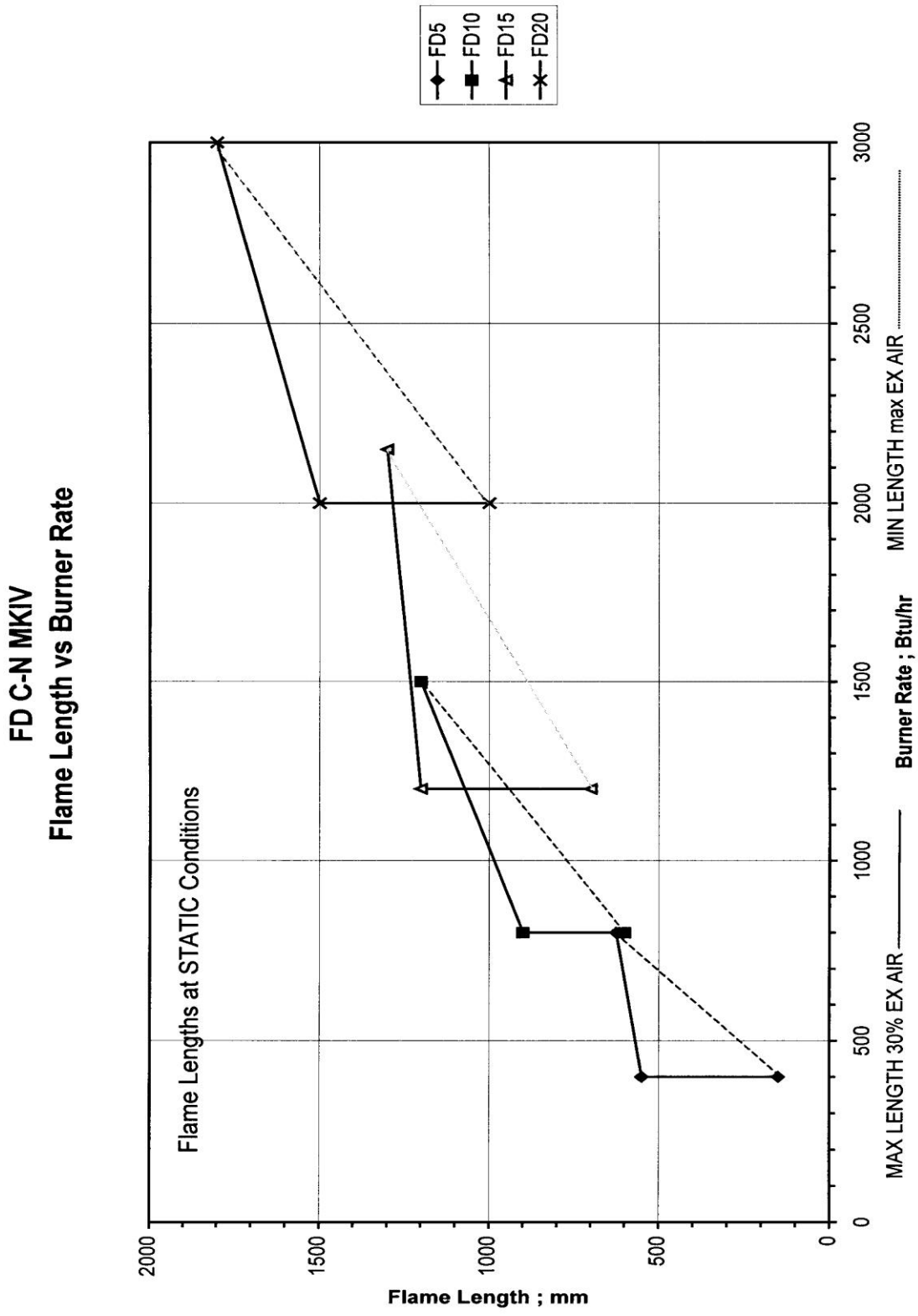
GAS SUPPLY PROPANE GAS

The burner should be connected to a Propane gas supply of sufficient capacity so that at the full burner out put, the gas flow rate of the storage system and its regulators is not exceeded. This burner should not be used on Propane/Butane or Propane/Air mixtures. A stable supply pressure of:-

35 mBar (14 in.wg) minimum inlet pressure
100 mBar (20 in.wg) maximum inlet pressure

is required with the burner(s) running. If the supply is above the maximum required an additional gas regulator should be installed. Low and high pressure slam shut cut offs with vents must be fitted. Care should be taken in the design and selection to prevent governor lockup or nuisance trip of these. Lanemark would be pleased to advise on types, sizes etc.

Fig 3 **GRAPH OF FLAME LENGTH mm AGAINST BURNER OUTPUT Btu/h**



SECTION 2 COMBUSTION TUBE DESIGN

COMBUSTION TUBE DESIGN

The length of the flame is contained in this manual S*ection 1 Fig 3* for various outputs and typical combustion chamber minimum diameters are:-

FD5 350 mm.
FD10 500 mm.
FD15 600 mm.
FD20 750 mm.

The burner flame is generally quite stable under most firing conditions but if the flame is subject to a cross flow of air (or combustion products) at or above velocities of 6 m/s (20 ft/sec) then a combustion tube should be fitted. This tube shields and stabilises the flame and can recirculate some of the ovens cooler gas back around the base of the combustion tube.

The standard lengths of these tubes are shown on the drawing but many different lengths have been used to suit a particular application.

A drawing of standard length combustion tubes is contained in this manual and they are available as an optional accessory from Lanemark International Ltd.

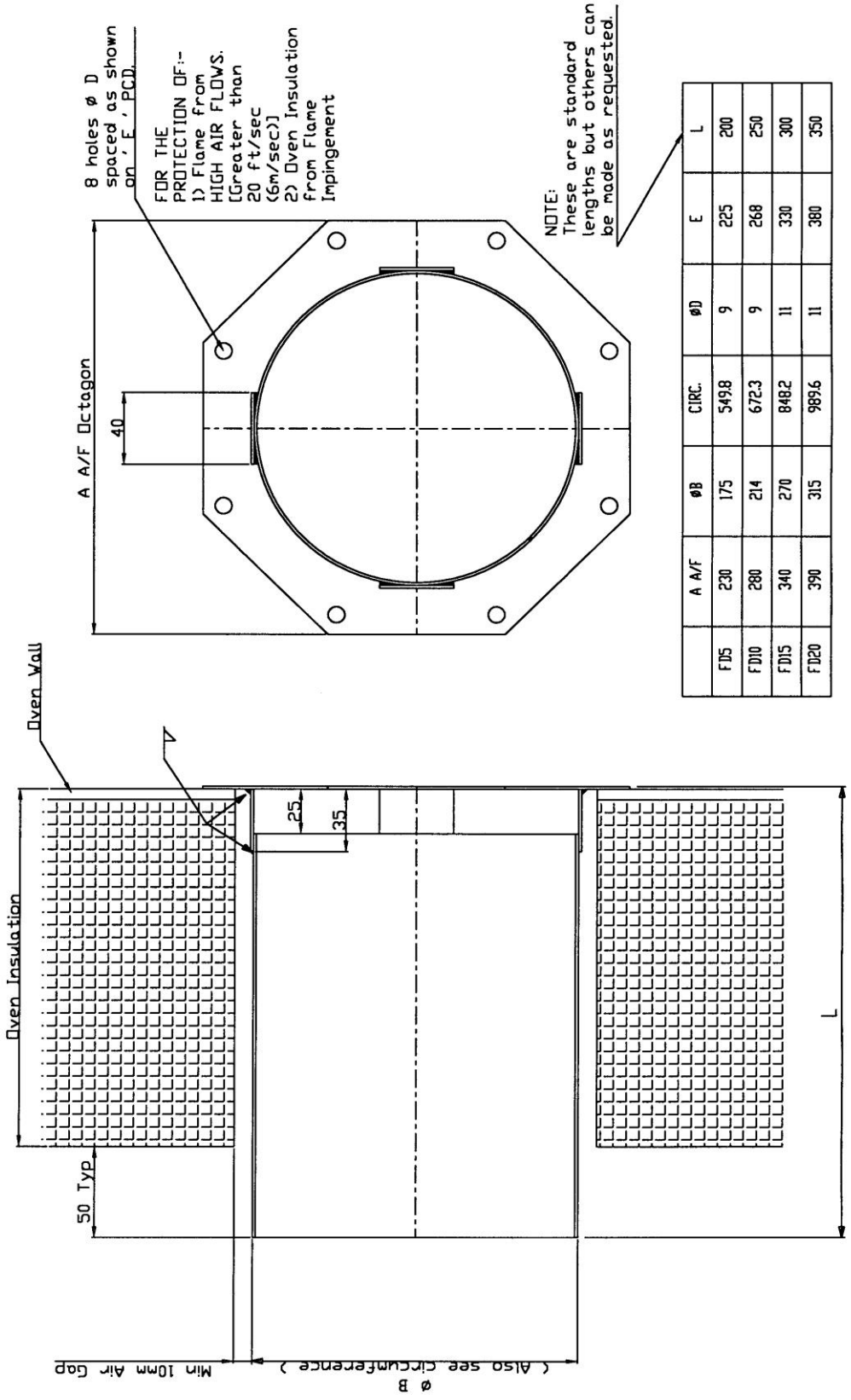
The tube can also be used to protect the oven or heat exchanger from excessive heat particularly in the area of the mounting aperture.

These tubes are generally made from commercial grade stainless steel but for higher temperature applications high temperature alloy is used.

OVEN MOUNTING APERTURE

The standard oven mounting aperture, see *Section 1 Fig 1* and *Fig 2*, must be enlarged to accept the standard combustion tube. See the drawing contained in this manual for details.

Fig 1 COMBUSTION TUBE DESIGN



	A A/F	øB	CIRC.	øD	E	L
FD5	230	175	549.8	9	225	200
FD10	280	214	672.3	9	268	250
FD15	340	270	848.2	11	330	300
FD20	390	315	989.6	11	380	350

Standard Combustion Tubes are manufactured from Stainless Steel, an alternative is available made from high temperature alloy.

SECTION 3 CONTROL PANEL DESIGN

CONTROLS

All control panels are supplied mounted to the burner within a painted steel enclosure.

If required a control cabinet including motor control, time switch, temperature control etc. can be supplied for remote mounting near the burner. Occasionally burners are supplied with no controls and these are supplied by others.

The control panels supplied by Lanemark are generally designed to suit each individual customer's requirements with regard to:-

Voltage 110V / 230V
Burner programmer (Satronic/ Siemens/ Honeywell)
Temperature controller
Fan motor control
Interface to gas train
Gas train modulation control

Figure 1 shows the general layout for the FD 'E' and *Figure 2* shows the layout for the FD 'C' panels which both contain:-

On / Off / Lockout Reset switch
Control fuse
Din Rail terminals to suit
Burner control programmer
Ignition transformer
3 way air valve
Air pressure switch
Combustion fan isolator switch

And if the application requires it:-

Temperature controller.
Modulating gas valve transformer and interface.
Time switch.
Variable Speed Drive.

PANEL INTERNAL WIRING DIAGRAM

If this manual was despatched with a burner this manual will contain the correct *Internal Wiring Diagram* in this section of the manual.

The correct drawing number is given on each burner's Data Plate and a duplicate Data Plate is stuck in the front of this manual.

PANEL TECHNICAL INFORMATION			
CABLE COLOURS		PROTECTION	
Power Wiring	Black	Degree of Enclosure Protection (IP Rating)	–
Neutral	White	CONTROL PANEL DETAILS	
Protective Conductor	Green/Yellow	Incoming Supply	230V 1PH 50HZ
Control Wiring	Red (Unless Otherwise Stated).	Panel Isolator Rating (Amps)	20A
Removable Links	Bridging Bars	Full Load Current	AS PER MOTOR RATING
Ignition Transformer Live	Brown	K.W Connected	AS PER MOTOR RATING
Ignition Transformer Neutral	Blue	Control Voltage	230V 1PH 50HZ
Ignition Transformer Earth	Green/Yellow	Supply Type	–
1Phase Fan	Brown/Black	Control Panel Dimension	–
3Phase Fan	Brown/Black/Blue	COMPONENT DETAILS	
24VDC +	Violet	Temperature Controller Output Signal	–
24VDC –	Blue	Speed Controller Signal Required	–
Control Signal Positive	Yellow	Temperature Controller Sensor Type	–
Control Signal Negative	Green		
CONDUCTORS/TERMINATIONS			
Size of Power Wiring	2.5mm^2	COMMENTS	
Size of Control Wiring	0.75 mm^2		
Size of Power Terminals	5mm2/4mm2 through		
Size of Control Terminals	5mm2/4mm2 through		
Cable Entry Position	Bottom Entry		

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TITLE:
CONTROLS-FD-230V-LME-HL
FD-230V-LME-HL-9-9-1-2-1
4-13

	DATE	NAME
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Chec.	04.08.16	JR

DRAWING No
62053

JOB No
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SHEET No
1 OF 9

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SHEET	GRID REF	TAG NAME	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
3	2-B	-Q1	CONTROL CIRCUIT	ISOLATION	SWITCH
3	2-E	-GND1	PROTECTIVE	EARTH	
3	5-B	-F1	PANEL	LIVE	
4	2-B	-LGPS	LOW GAS	PRESSURE	SWITCH
4	2-D	-S1	BURNER	OFF/ON	SWITCH
4	6-B	-LME	SIEMENS LME	BURNER	CONTROLLER
5	2-B	-APS	AIR	PRESSURE	SWITCH
5	3-D	-AV1	3 WAY	AIR	VALVE 1
5	4-D	-AV2	3 WAY	AIR	VALVE 2
6	2-D	-SV1	START	GAS	VALVE 1
6	3-D	-MV1	MAIN	GAS	VALVE 1
6	4-D	-H3	BURNER	RUNNING	
6	5-D	-MV2	MAIN	GAS	VALVE 2
7	2-D	-B1	IGNITION &	FLAME	SENSING
7	4-C	-T1	IGNITION	TRANSFORMER	
8	1-B	-Q2	FAN ISOLATION	SWITCH	(3 POLE)
8	2-D	-M1	400V/3PH/50HZ	COMBUSTION AIR	FAN MOTOR
8	6-B	-Q3	FAN ISOLATION	SWITCH	(2 POLE)
8	6-D	-M2	230V/1PH/50HZ	COMBUSTION AIR	FAN MOTOR

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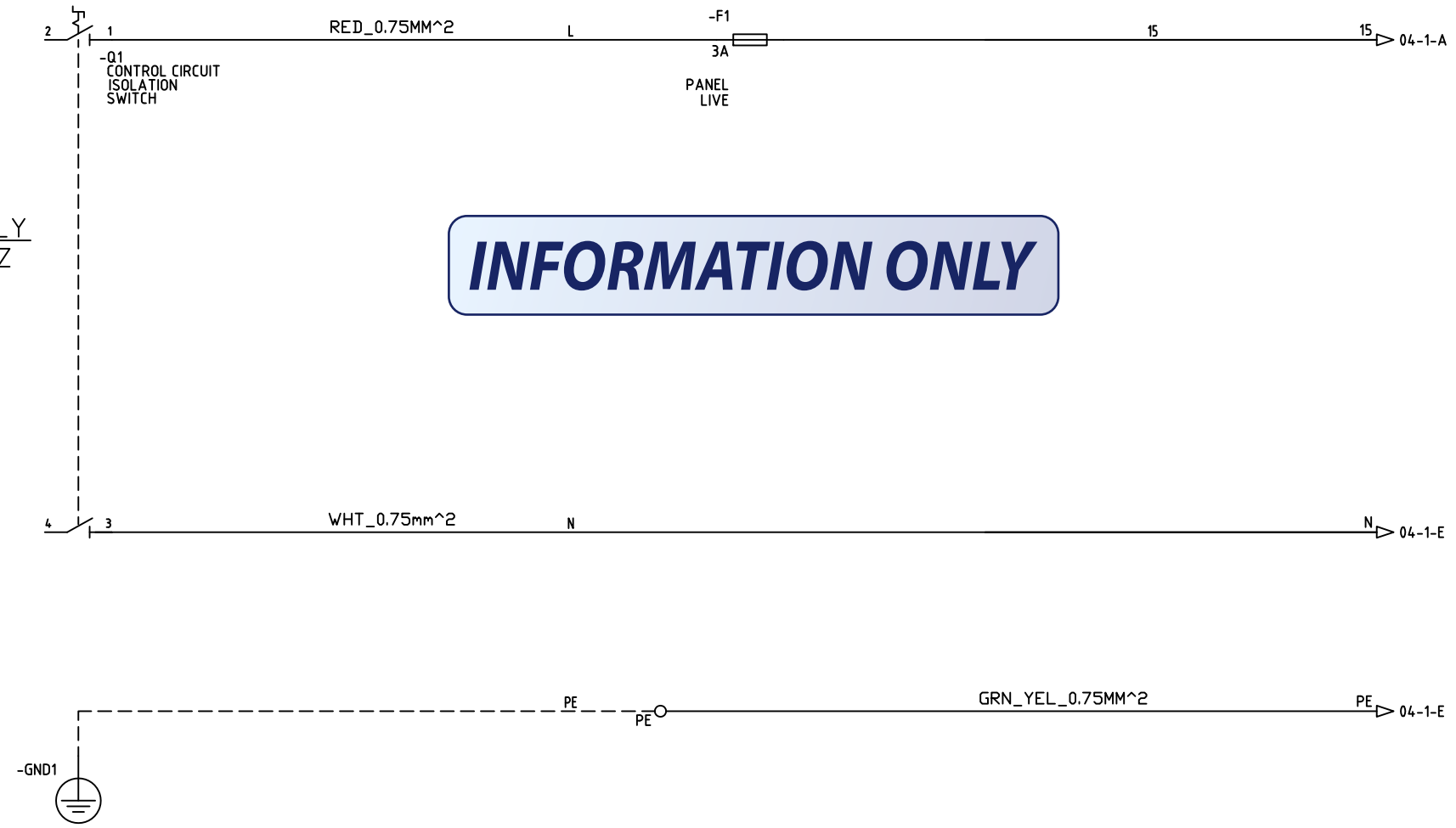

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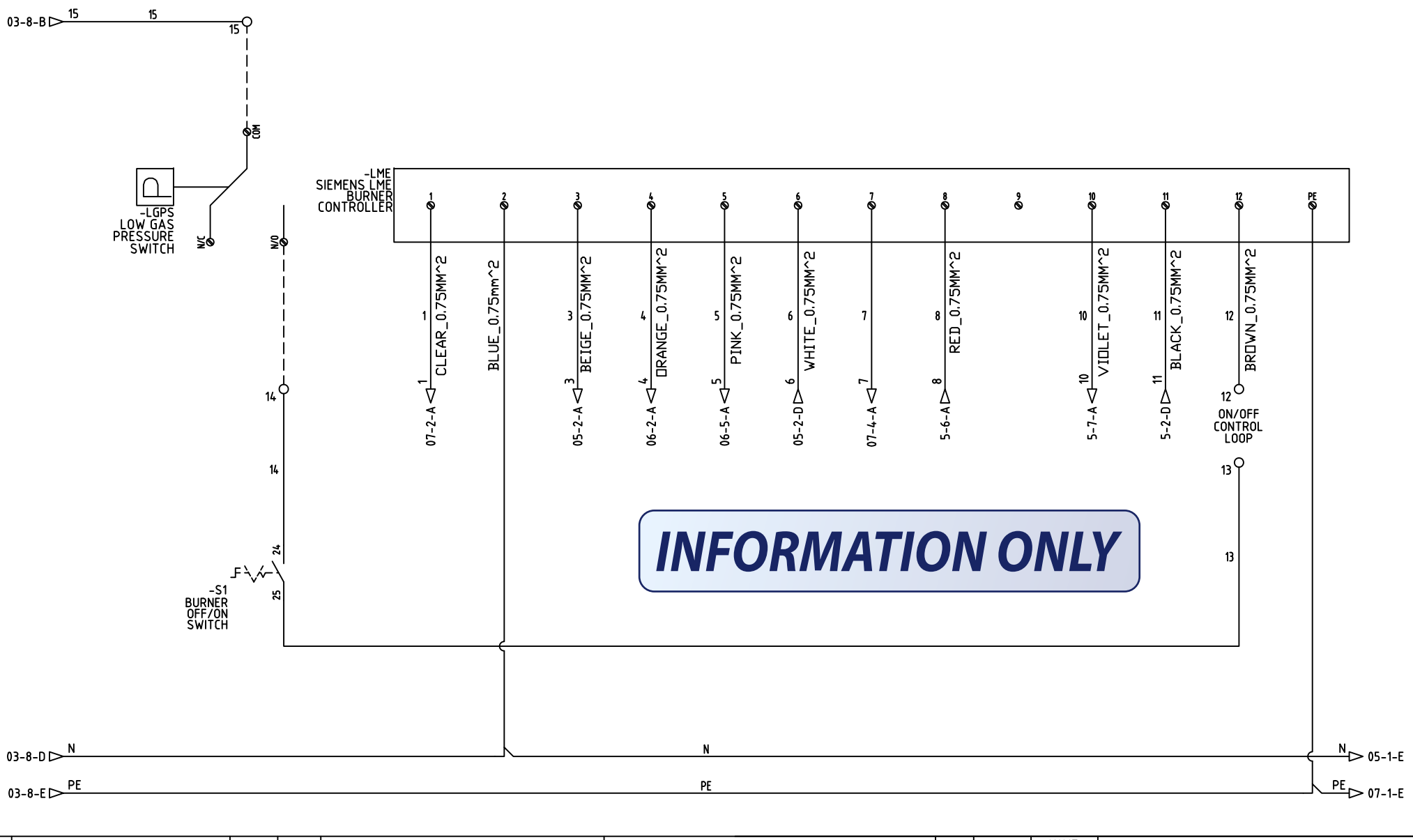

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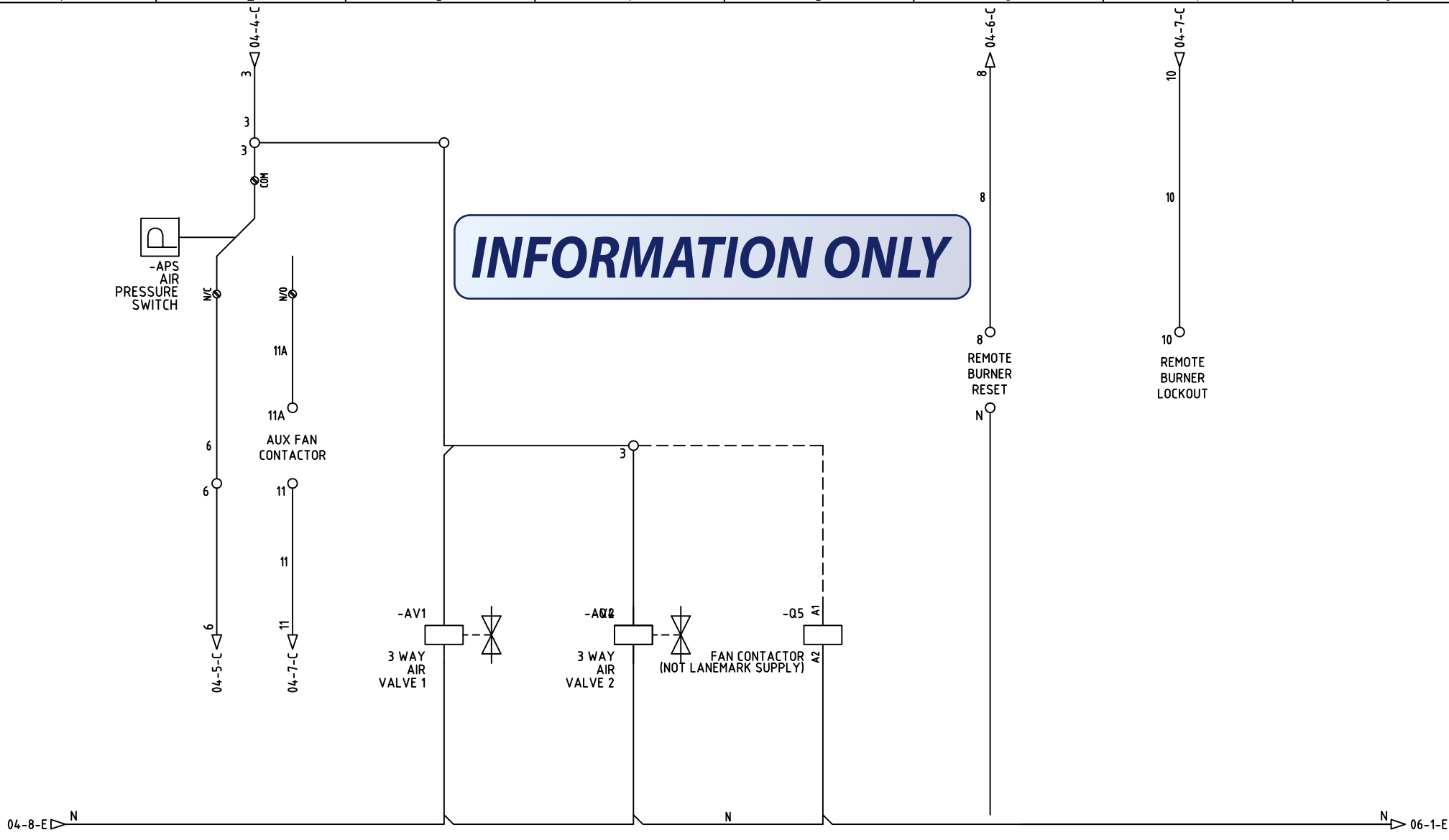

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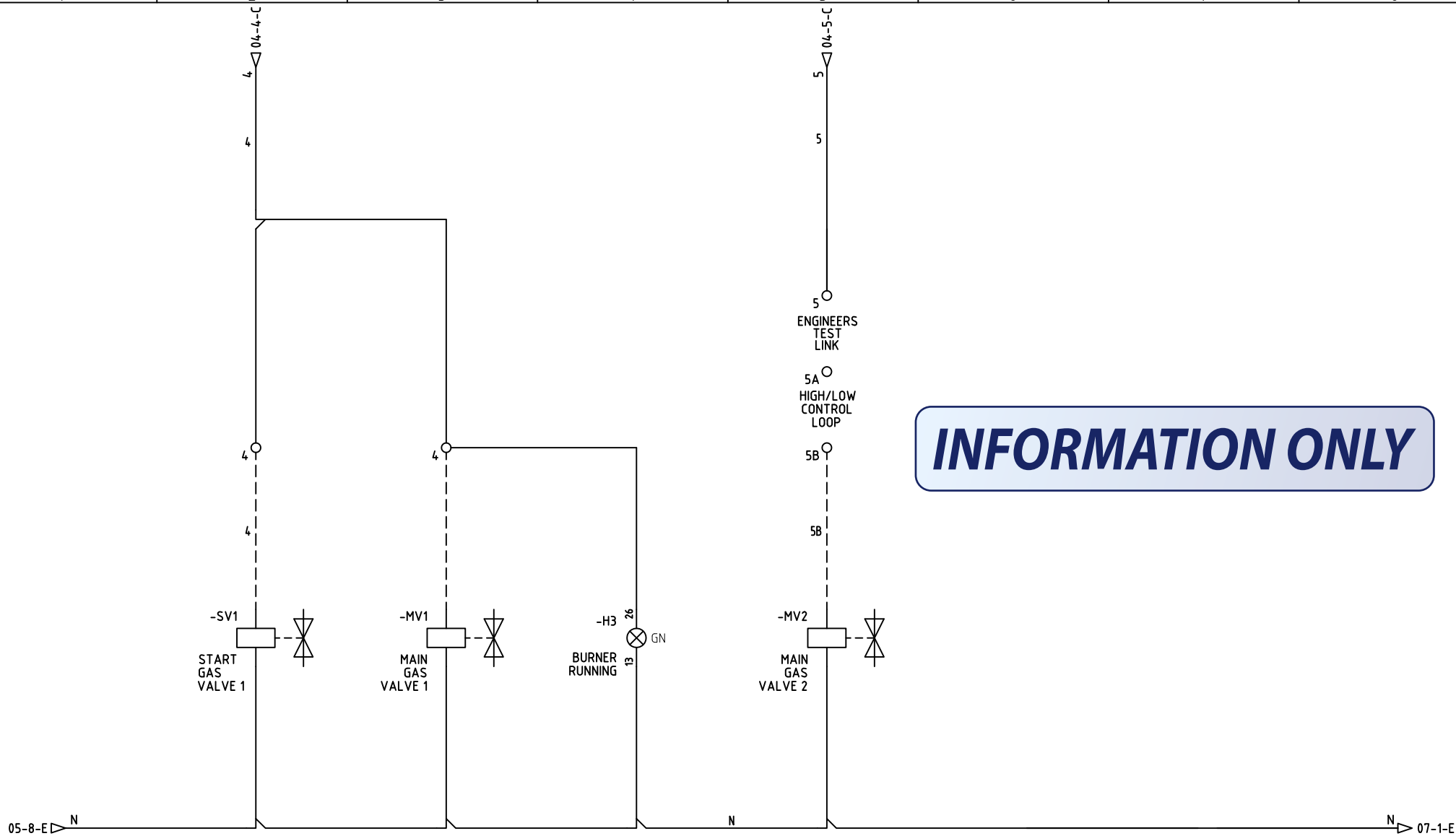

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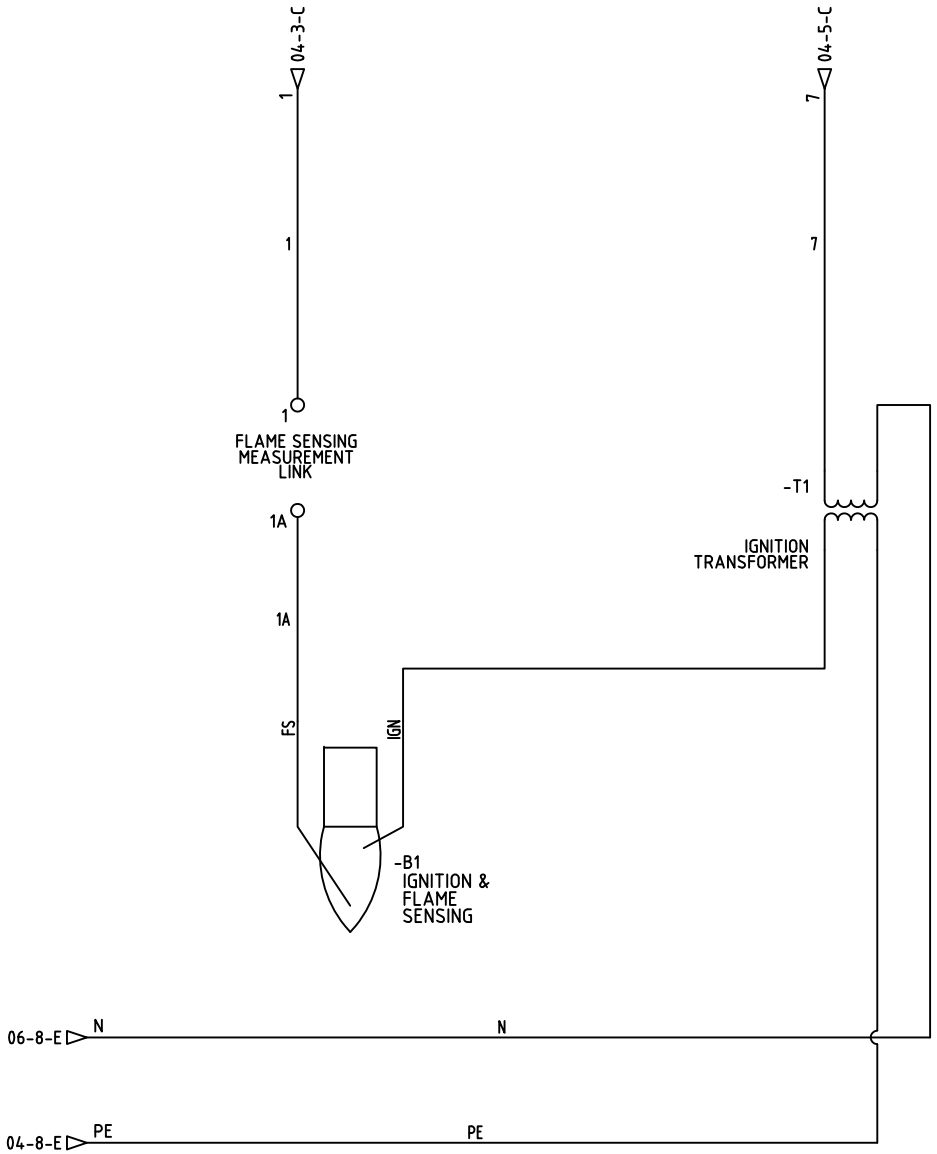

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7 OF 9

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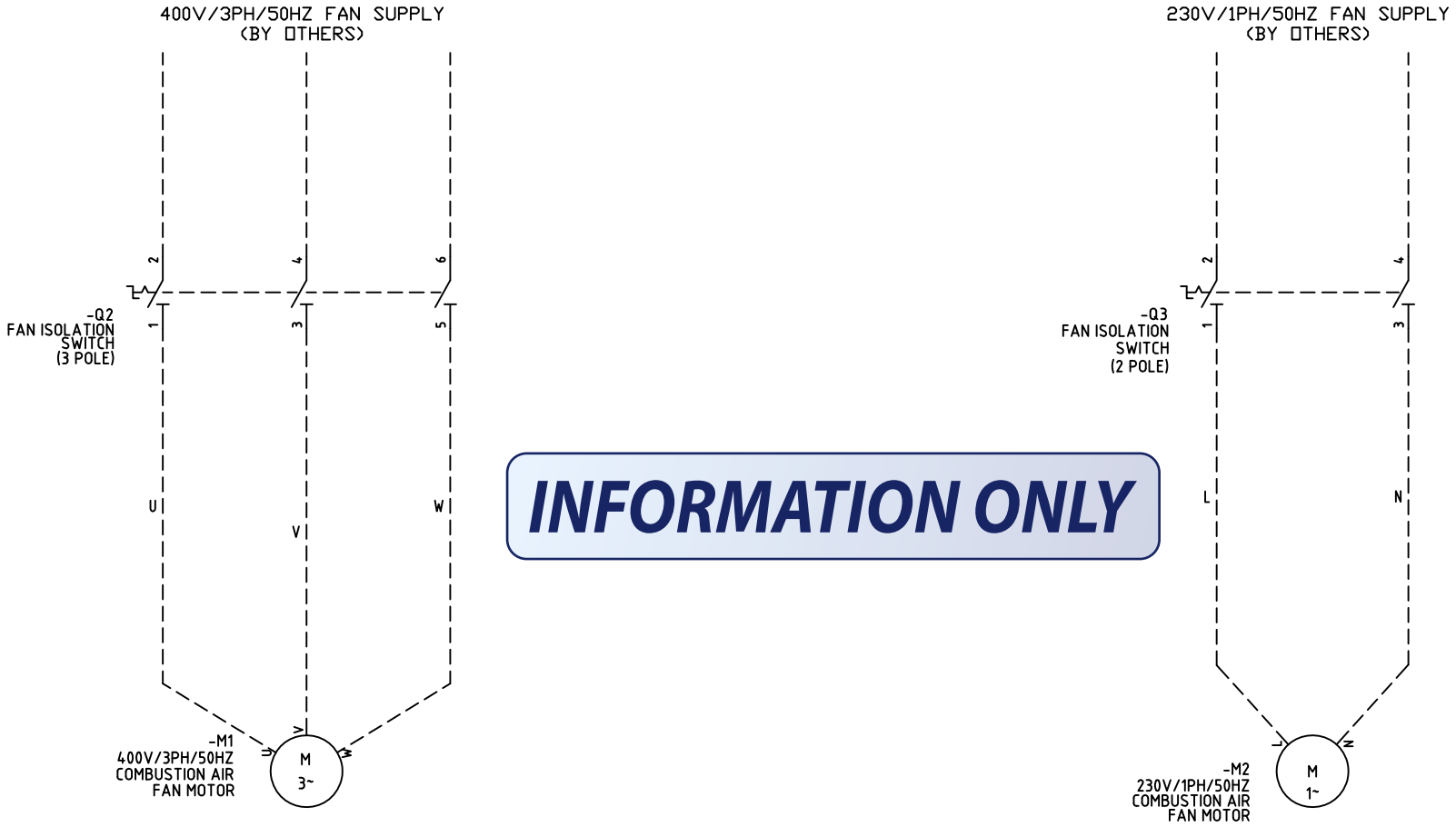

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FAN MOTOR CONNECTIONS
EITHER 400V/3PH OR 230V/1PH
AS APPLICABLE

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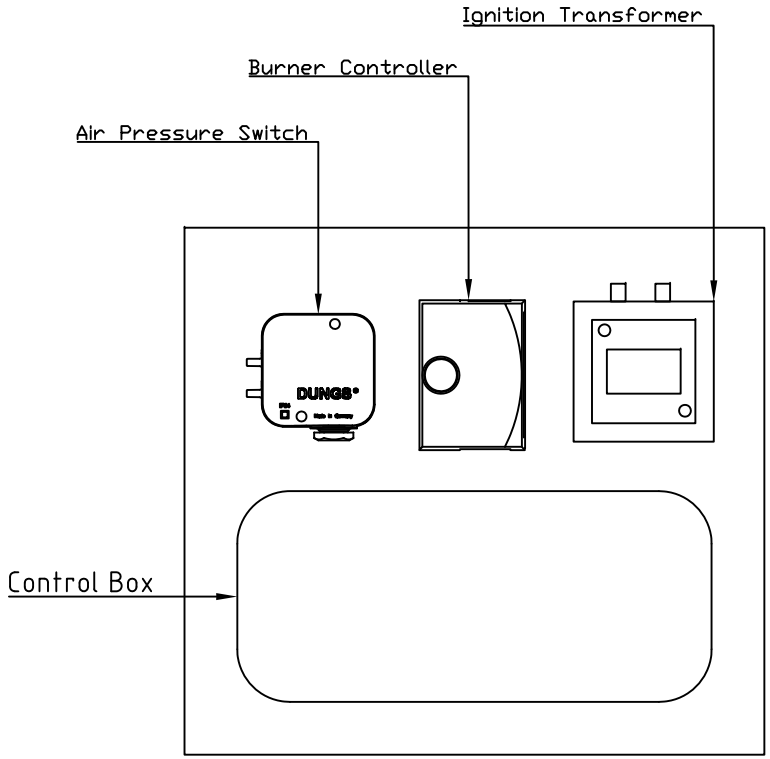

FD GENERAL LAYOUT

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	DATE	NAME
Edit	30.11.15	AJL
Chec.	04.08.16	JR

DRAWING No
62053

JOB No
-

SHEET No
9 OF 9

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SECTION 4

TEMPERATURE AND OTHER CONTROLS DESIGN

TEMPERATURE CONTROL

The burner can be supplied to operate:-

1. On / off at fixed air.
2. High / low at fixed air.
3. High / low with 2 stage air.
4. Modulating gas at fixed air.
5. Modulating gas and modulating air.

to suit the application requirements.

It is anticipated that the burner will be run continuously in low (start gas) fire which can be as set as low as 15 kW (approximately 50,000 Btu/h).

The maximum low (pilot) stage is limited to 30% of the main flame by standards and is restricted by the pilot gas valve to approximately 75 kW (250,000 Btu/h). For higher values of *low fire* a pilot stage / low fire / high fire burner should be specified.

The burner is normally commissioned with the low fire (pilot stage) such that it is not sufficient to hold the process temperature at the Set Point 'SP' and the temperature controller brings the burner back in at high fire to top up the temperature or modulates the gas upwards if modulating valves are used. The low fire (pilot start gas) should not exceed 30% of high fire to comply with the standards to which the burner is built. If the process temperature exceeds the Alarm Temperature 'AL' then the alarm stage of the temperature controller switches the burner from low fire to off.

A second independent temperature controller may have been specified at the design stage to act as Policeman or High Limit Thermostat. Should the process temperature exceed the Set Point and also the normal Alarm Point (possibly because the main temperature controller has failed), then this second thermostat will switch the burner off and not allow automatic restart.

The temperature controllers for on/off or high/low control are typically digital electronic controllers that are programmed for on/off control and the P.I.D and Autotune facility are disabled. It is unlikely that simple mechanical thermostats will be suitable for controlling oven temperature because of the speed of response needed.

For processes that require accurate temperature control a modulating gas valve or modulating burner air inlet damper may be fitted and this will be driven by a:-

1. 0-10 V dc control signal
2. 4-20 mA control signal
3. 3 wire valve positioning signals

Lanemark normally use 24V AC modulating motors on gas valves and the 24V AC power supply is supplied by Lanemark if a control panel is supplied.

For 3 wire valve positioning motors (a simple 24V, 110V or 230V feed is used to open and then to close the modulating motor) the electronic temperature controller must have slave relays placed between itself and the modulating motor.

This is to protect its internal contacts which are generally rated at a fraction of an Amp and not able to carry the associated *in-rush* current.

WIRING OF TEMPERATURE CONTROLLERS

If Lanemark supplied an electronic digital temperature controller and built it into the control panel the wiring diagrams contained in this manual will show this controller.

Generally the only additional field wiring will be to connect the temperature sensor back to the control panel. This must be done in suitable cable and screened.

For simple mechanical thermostats if these were supplied by Lanemark these will require field wiring back to the control panel and interconnecting as shown on the *Interface Wiring Diagram*.

PROGRAMMING TEMPERATURE CONTROLS

If Lanemark supplied temperature controls with a burner a Data Sheet will be contained in this section of the manual detailing how to programme and adjust them.

TEMPERATURE SENSORS

For electronic temperature controllers Lanemark supply Pt100 (platinum resistance) sensors to suit the controller with an industrial style housing. The sensor has a 300mm stainless steel stem and a fixing collar with a ½" BSP male thread.

The oven will require a ½" BSP boss adding to the wall in a position where the sensor will detect a representative temperature. This position must be such that the sensor will not be damaged when work passes through the oven or be shielded form sensing the heat by the work pieces.

A data sheet will be included in this section of the manual if such a sensor was supplied.

OTHER CONTROLS

When specified Lanemark can supply and build other controls into the control panel to suit the application. Typical additional controls are:-

1. Time clocks
2. Hours run meters
3. Fan motor controls (overload / contactor)

This section of the manual will contain Data Sheets on wiring, setting and programming.

SECTION 5

COMBUSTION AIR DAMPER DESIGN

FIXED PLATE AIR DAMPER

A simple plate damper is fastened in the joint between the burner windbox air inlet and combustion fan air outlet.
This damper is factory set fully open so there is no restriction of combustion air from the fan to the windbox for combustion.
If it is necessary to reduce air flow, instructions to adjust this damper can be found in Section 8 of this manual. Commissioning Combustion.

SECTION 6 GAS TRAIN DESIGN

GAS TRAINS

Gas trains are designed by Lanemark to meet the specific application and customer requirements e.g.

1. Type and volume of gas
2. Voltage (110V or 230V)
3. Class of IP protection required
4. Destination Country
5. Special features e.g. pressure switches
6. Modulating gas valve motor requirement
7. Fine filters for some countries supplies

The gas inlet position must be specified at the design stage e.g. 'right hand bottom' to suit the application. Once a gas train is built and delivered to this configuration it must not be modified on site without consulting Lanemark.

Gas trains are suitable for a maximum inlet pressure of 100 mbar / 40 in.wg and IP54 unless specifically ordered to a different specification.

Lanemark will be pleased to advise on special pressure requirements and supply special pressure regulators to suit.

The gas trains on models FD5, FD10, and FD15 are normally supplied prefitted to the burner body and fully prewired.

The gas trains on all FD20 and some special gas trains for smaller burners are normally supplied loose for fitting on site as they are too large to be despatched fitted. A union is used and only has to be remade to refit the gas train.

The gas train electrical connections will have been fully made for testing at Lanemark but will have been removed for transport. The cable cores are tagged with the terminal numbers and should be reconnected with reference to the wiring diagram contained in this manual if needed.

The maximum low (start gas) stage is limited to 30% of the main flame by standards and is restricted by the pilot gas valve to approximately 75 kW (250,000 Btu/h). For higher values of *low fire* a pilot stage / low fire / high fire burner should be specified.

The minimum pilot/low fire rate is typically 15 kW (50,000 Btu/h) depending on the burner model.

WIRING GAS TRAINS

The gas train's gas valves are electrically connected back to the burners control panel. Lanemark generally make this wiring connection and run it in a 3 m flexible PVC conduit. It is disconnected for transport and has to be remade on site. The cable cores are tagged and identified to aid reconnection.

The connections are also shown in the wiring diagram contained in this manual if the manual was despatched with a burner.

DRAWINGS OF GAS TRAINS

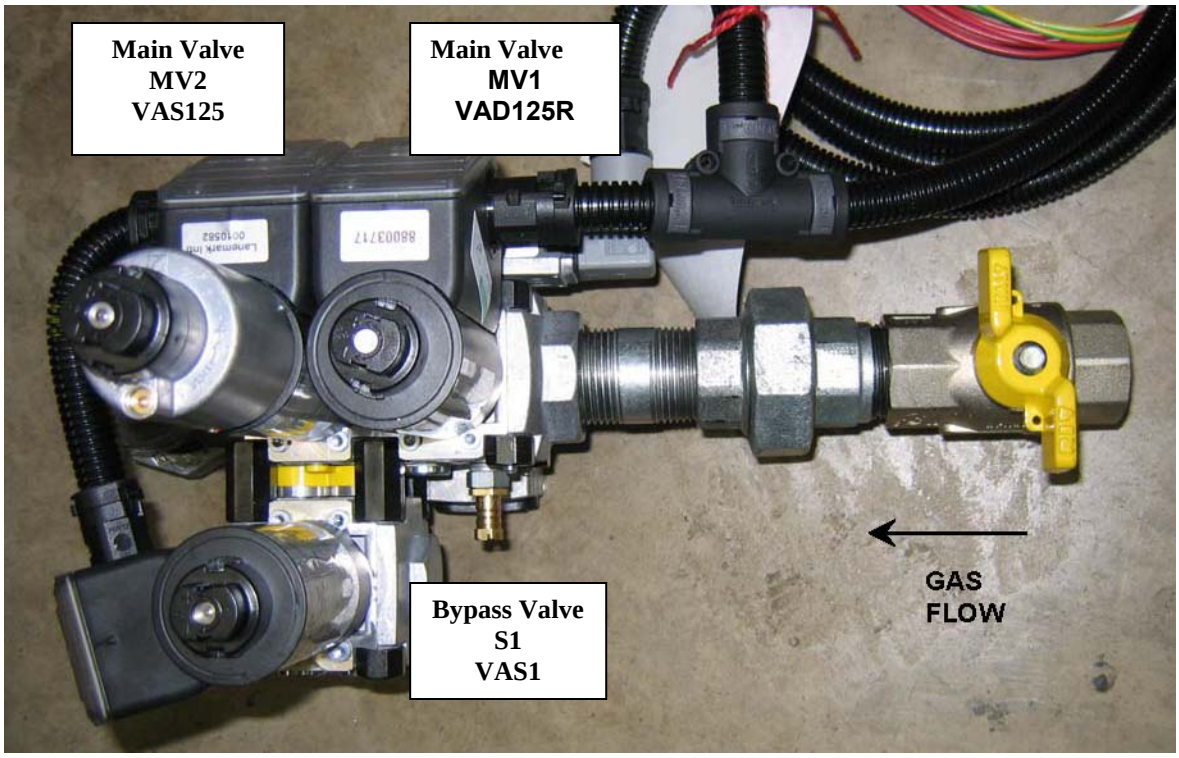
If this manual was sent out with a burner a copy of the gas train drawing will be included in this section of the manual. The gas train drawing number is on the burner's Data Plate and a copy of this Data Plate is stuck in the front of this manual.

SETTING / ADJUSTING GAS VALVES

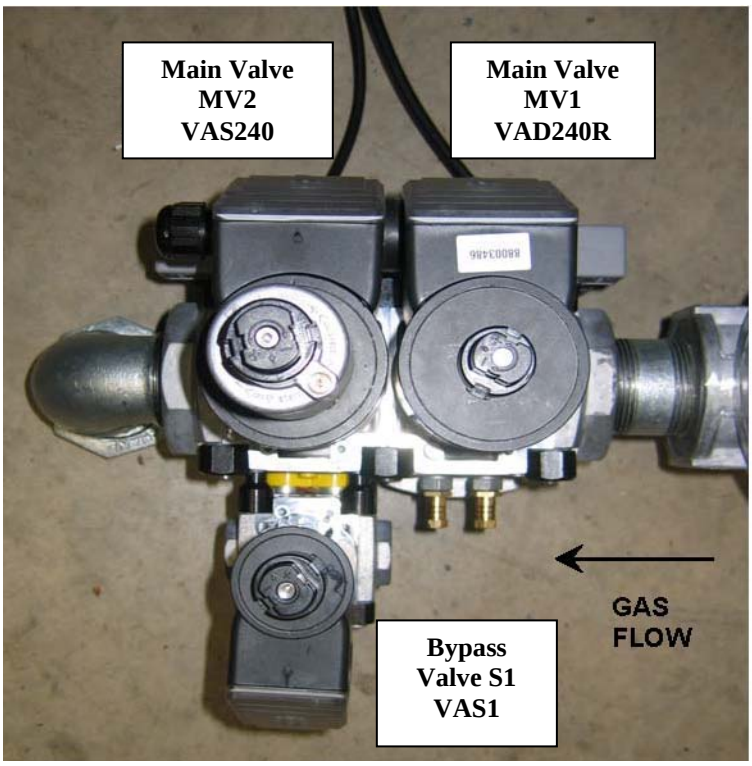
The gas train drawing will show the type of gas valves used. Data sheets for the gas valves and other gas components including modulating motors will be contained in this section of the manual. These data sheets will show the basic adjustments that can be made.

KROMSCHRODER VCD VALVE

1" Gas Train General Layout



1½" Gas Train General Layout

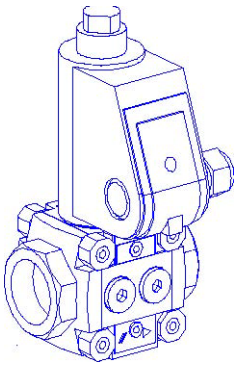


Note: All gas trains are supplied with a Low Gas Pressure Switch as standard. DG40 (5-40mBar)

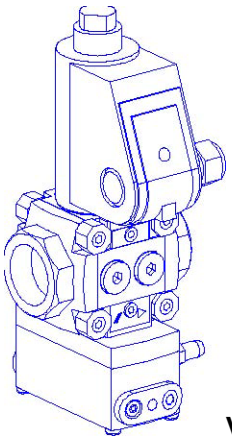
KROMSCHRODER VCD VALVE

Valve Adjustment

Technical Specification



VAS Solenoid valve for safe-guarding gas.



for modulating burner

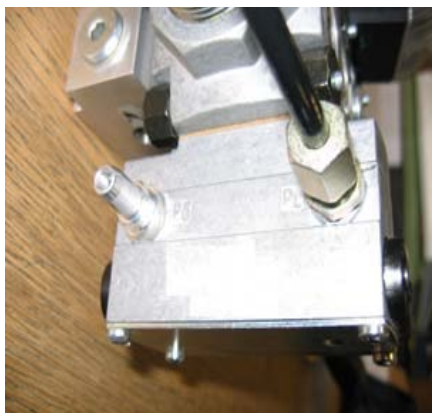
Inlet Pressure **PE**: 10-500mBar
Pressure **PG**: 2.5-25 mBar

Inlet Pressure **PE**: 10-500mBar

VAD Constant Pressure Governor Outlet

VAS The markings on the cover cap can be used for coarse adjustment of the flow rate. A 2.5mm Allen key should be used, 1 turn is equivalent to 0.75mm valve stroke to a maximum of 5 turns.

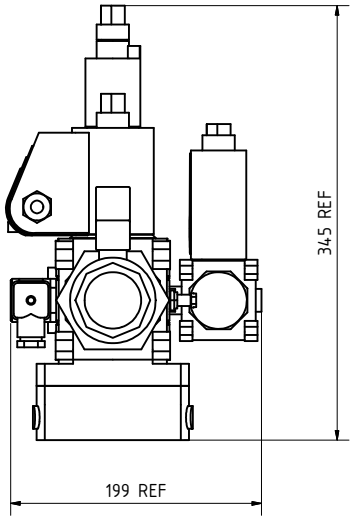
VAD Adjust the pressure to that required using a manometer on **PG**, with a 2.5mm Allen key on the Governor adjustor.

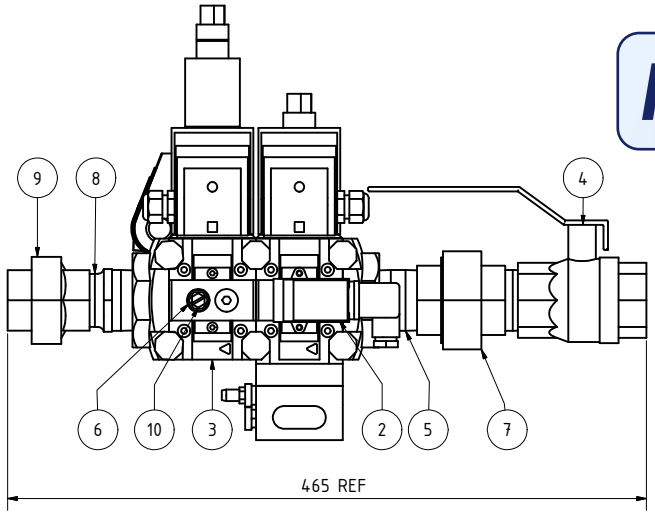


VCD2 GAS VALVE TRAIN

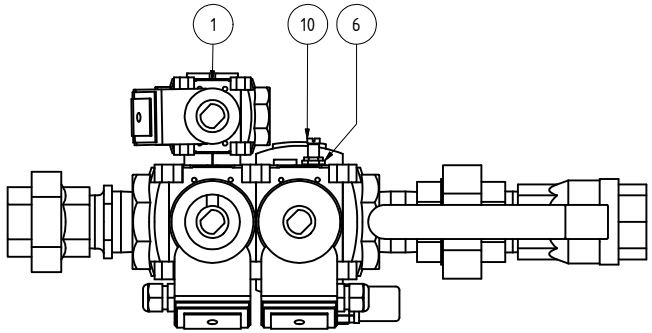
PART NUMBER: 1256708

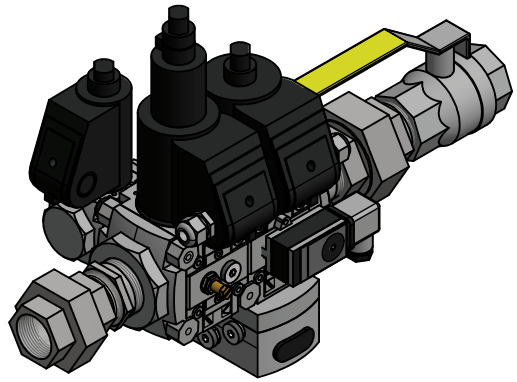
Parts List For 1256708			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	0010595	VAS 125R BYPASS 230V
2	1	0010777	DG40 PRESSURE SWITCH
3	1	0010857	VCD2 1 1/2" 230V GAS VALVE
4	1	0015106	1 1/2" LOCKABLE BALL VALVE
5	1	0021038	BARREL NIPPLE 1 1/2" ST/ST
6	2	0021048	1/4" x 1/8" REDUCING BUSH ST/ST
7	1	0021120	1 1/2" MALE/FEMALE UNION ST/ST
8	1	0021132	REDUCING HEX NIPPLE 1 1/2 x 1 1/4 ST/ST
9	1	0021135	1 1/4" F/F UNION ST/ST
10	2	0022030	PRESSURE TEST POINT 1/8"





INFORMATION ONLY





NOTE: CABLE LENGTH 1.5 METRES
- USING 3 OR 4 CORE CABLE
NOTE: SEE 56997 FOR ALTERNATIVE CONNECTIONS

ISSUE	DESCRIPTION	DATE	BY
09			
08			
07			
06			
05			
04			
03			
02	FIRST	29/01/2016	BAS
01	PROVISIONAL	20/10/2015	BAS

DIMENSIONS ARE IN mm AND DEGREES
TOLERANCE AS STATED OR ±
DRAWING SCALE (1 :3)
PAPER SIZE A2

LANEMARK COMBUSTION ENGINEERING
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DRAWN BY: BAS
DATE: 25/09/2015
CHECKED BY: AJL
DATE: 13/11/2015
ISSUE: 02

Do Not Scale Print
PROJECTION: 1st This is a angle drawing
TITLE: GAS VALVE TRAIN FD10 230V VCD2 1 1/2"
PROJECT No: -
DRAWING No: 56708
SHEET 1 OF 1

DRAWING No: 56708

SECTION 7 INSTALLATION

FITTING THE COMBUSTION TUBE

For high temperature and high velocity applications a burner combustion tube may have been supplied as a loose item and this should first be fitted as shown in Section 7 *Fig 1* to the burner's firing port. Care should be taken that the annular gap around this combustion tube does not become blocked when mounting the burner.

FITTING THE FLAME TUBE

The Flame Tube should be fitted to the oven using 8 off studs fitted to the oven as shown in Section 1 Fig 1 and Section 7 Fig 1. The Flame Tube mounting gasket should first be fitted to complete a gas tight seal.

FITTING THE BURNER

The burner should be fitted to the oven using 8 off studs fitted to the oven as shown in Section 1, *Fig 1* and *Fig 2*. The burner mounting gasket should first be fitted to complete a gas tight seal.

FITTING THE CONTROL PANEL

The control panel will normally be supplied prefitted to the burner. For special applications the control panel may have been designed and supplied loose for remote mounting close to the burner.

In this case the control panel should be fitted within 2 m of the burner body to a cool dry surface so that the flexible conduits reach between the two assemblies.

FITTING THE GAS TRAIN

The gas inlet position must be specified at the design stage e.g. " right hand bottom " to suit the application. Once a gas train is built and delivered to this configuration it must not be modified on site without consulting Lanemark.

The gas trains on FD5, FD10, and FD15 are normally supplied prefitted to the burner body and fully prewired.

The gas trains on all FD20 and some special gas trains for smaller burners are normally supplied loose for fitting on site as they are too large to be despatched fitted. A union is used and only has to be remade to refit the gas train.

MAKING THE GAS CONNECTION

The gas connection should be made to the inlet point on the gas train to the isolating ball valve supplied.
The pipework final connection should be made in such a way that it is possible to isolate the gas with the ball valve provided and then to break the union and remove the complete burner without removing any further gas pipework. The weight of the incoming gas pipework will require independent support and must not be supported off the burner.

The burner must not be put into operation until the gas supply has been purged and proved sound as given under *Design* previously. The burners gas train is suitable for an inlet pressure of 100 m.bar maximum.

If the gas supply system is to be pressure tested the gas train must be isolated first, as a pressure over 100 mBar will destroy the gas valves.

INSULATING THE OVEN

The burner contains many plastic parts and fittings. These can be adversely affected by excessive heat being radiated from hot surfaces and also general ambient heat.

The burner should be protected from such heat typically by insulating the oven in the area of the burner and providing adequate ventilation. Care should be taken not to obstruct with insulation the burner fan air inlet which faces towards the oven.

MAKING THE ELECTRICAL CONNECTIONS

An external wiring interface and a panel internal wiring diagram are contained in *Section 3* of this manual.

THIS APPLIANCE MUST BE EARTHED

All wiring should be in accordance with I.E.E. Regulations (BS7671) and the requirements contained under *Design* given previously.

The voltage requirements for each burner vary to meet the end users specification. If this manual has been sent out with an actual burner (or series of burners built to the same specification) then a Burner Data Plate duplicate label will have been stuck inside the front cover of this manual. This data plate will give the exact as built electrical details for a particular burner.

The high tension ignition and flame detection connections will have been pre-made.

The gas trains on FD5, FD10, and FD15 are normally supplied pre-fitted to the burner body and fully pre-wired.
The gas trains on all FD20 and some special gas trains for smaller burners are normally supplied loose for fitting on site as they are too large to be despatched fitted. The gas train electrical connections will have been fully made for testing at Lanemark but will have been removed for transport. The cable cores are tagged with the terminal numbers and should be reconnected with reference to the wiring diagram contained in this manual if needed.

The 230V or 110V 1 Phase supply to the burners control panel should be made through the 20 mm cable gland from a suitable isolator and fuse as given previously under *Design*. 110V supplies must be *end tapped* not from *centre tapped* transformers.

The 230V 1 Phase or 415V 3 Phase AC 50 Hz supply to the burner's combustion air fan motor should be made from a suitable isolator, motor protection device and contactor as given under *Design e*arlier. The supply should be made into the terminals U – V – W for 3 phase and U – V for 1 phase motors. These are contained in the burner's control panel. The actual motor terminal box will have been prewired back to these terminals by Lanemark.

The supply and motor protection device should be suitable for the motor's power and full load current. These are given on the burner's Data plate a copy of which is included in the front of this manual.

The auxiliary contact on the fan motor contactor, temperature controller and external burner lockout reset input signal should be connected back to the burners control panel. The lockout reset cable must be screened and not allowed to pickup induced voltage.

Alternatively the motor overload and contactor may have been supplied, prefitted and prewired (including the auxiliary contact) by Lanemark if specified. These parts are contained in a separate standalone plastic enclosure. The motor's supply should now be made direct into this enclosure.

HIGH / LOW TEMPERATURE CONTROLS

See *Section 4*. For high / low burners a temperature controller with a Set Point and an Alarm stage should be used with a suitable sensor. The internal contacts of the temperature controller should be suitable to carry the burners full load of 250VA and the in-rush current associated with valves opening and ignition transformers delivering a spark. It is recommended that interposing relays be used rated at 5 Amps.
The controller should not switch quicker than 30 seconds as gas valves should not be cycled rapidly.

The temperature controller may however have been supplied by Lanemark as an optional extra with a suitable sensor which will require site wiring.

The temperature controller should be wired to the control panel as shown in the wiring diagram contained using suitably screened cable for the sensor as necessary.

MODULATING TEMPERATURE CONTROL

For modulating gas burners the type of control signal i.e. 0-10 V dc, 4-20 mA or 3 wire direct control will have been determined at the design stage.

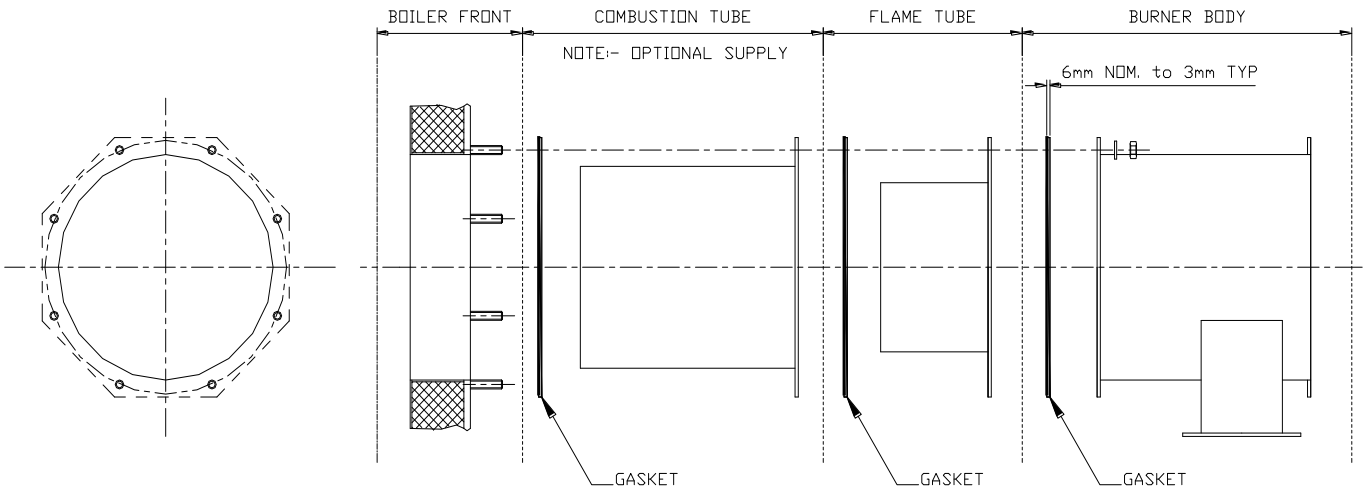
The modulating control signal should be made into the appropriate terminals as shown in the wiring diagram using suitable screened cable. A negative or 0V return is generally required by the temperature control instrument. This should be connected to the 24V AC neutral from the transformer feeding the modulating motor. This will complete the circuit.

For 3 wire direct control of a modulating valve, temperature controllers should have internal contacts suitable for the in-rush current of the modulating motor. Lanemark recommend that interposing relays be used that are rated for 10 Amp. Generally Lanemark supply these interposing relays. The temperature controller should have a minimum ON and OFF switching time of 0.6 seconds to allow the modulating motor (which has a 30 second travel time) to correctly interpret the signal and move the gas ball valve accordingly.

OVER TEMPERATURE PROTECTION

At the design stage it may have been decided that a second totally independent temperature controller to act as a High Temperature Trip Thermostat (Policeman Thermostat) is required because of the nature of the application. Once the overheat temperature has been exceeded the burner is held off until manual intervention occurs to reset this thermostat. This thermostat should be connected into the burners control circuit in such a way as to isolate the electrical supply to the burner.

FIGURE 1 - FITTING DETAIL (EXPLODED VIEW)



FD BURNER INSTALLATION CHECKLIST

Before the burner is ready for commissioning the following should be checked to establish that the installation is complete in accordance with the installation details given in the Manual.

Generally a Mechanical and Electrical Installation Drawing will have been prepared by the customer or his installer and Lanemark would be pleased to receive copies of these drawings for comment.

The gas supply should be turned off while performing these checks and electrical connections should be made with reference to the wiring diagram for connection numbers.

ITEM	DESCRIPTION	
1	The burner and flame tube must be fitted to the oven with their insulating gaskets. If a combustion tube was also ordered this must be fitted first and a slightly larger mounting hole will be required if such a tube is to be used. Sufficient space should be left around the burner for access by the Service Engineer. Typically 1000mm is required in front of the burner and 300mm to the sides, top and bottom.	
2	The burner gas train may have been removed on larger models for packing and transport. If so the installer must refit the gas train and remake the electrical connections from the burner control panel to the gas train. When refitting the gas train it must be replaced so that the gas flows through the gas valves in the correct direction. There is an arrow engraved into the gas valve body to show the correct direction of flow. A flying lead in PVC flexible conduit will be provided by Lanemark and all the cables will have finished tails that are numbered for connection to the Lanemark wiring diagram.	
3	The gas train will have been assembled in accordance with the customers specification with regard to the orientation of the gas train relative to the burner body. The gas train should not be modified on site without consulting Lanemark.	
4	The gas supply should be made to the burner gas inlet connection.	
5	The gas supply system should be proved sound and purged and a Certificate will be required for a new system to prove this was done.	
6	The gas system should be capable of providing the specified volume of Natural Gas or Propane (LPG) Gas. The minimum inlet gas pressure to the burner with the burner running is 17.5 m.bar for Natural Gas and 37.5 m.bar for Propane. The maximum inlet pressure is 100 m.bar for all fuel gases.	
7	The burners own combustion air fan electrical supply (generally 3 phase 400V 50 Hz) should be made to the fan motor through a contactor with a suitably sized overload usually supplied by others via Lanemark electrical terminals U-V-W in the burner control panel. The contactor should have an auxiliary contact to interlock with the burners own controls to prove that the fan is running. Lanemark may have supplied and pre-wired the overload/contactor if specifically ordered in which case the fan motor supply is made into the contactor box. Wiring diagrams are available for the overload/contactor arrangement. N.B. A fan motor isolation switch is fitted in the burner control panel.	

8	Generally the fans are designed to run continuously from a manual selector switch or similar or from a main control panel supplied by others. If the fan is to start only when required by the burner then a ***start*** signal should be connected from the burner to the coil of the fan motor contactor.	
9	The fan should be tested, the overload set and the direction of rotation checked.	
10	Standard FD fans have a drain hole with a closable plastic plug. In normal conditions this plug should be closed. For tropical or very humid conditions the plug should be in the open position and the fan mounted with the drain hole face down.	
11	The temperature control sensor(s) and oven door interlocks, oven pressure switches etc. should be fitted and wired up. These should be wired back to their instruments or to the burner(s) control panel.	
12	The ***fan running*** interlock should be made from the fan contactor auxiliary contact to the burners interlock connections.	
13	The burners power supply and earth should be made from a local isolator with a suitable fuse (or MCB) for protection. This should be rated for a 250 VA load for 110V or 230V as specified.	
14	Temperature / time switches / on/off controls etc. should be connected and tested. Any digital instruments should be configured and the correct temperatures and times set. If the burner is a modulating burner the 3 wire direct valve positioning, 4-20 mA or 0-10 V DC control signal should be connected to the burner as shown in the wiring diagram and the instrument tested to ensure the modulating valve responds to the input signal.	
15	Any remote burner status signals connections e.g. burner ON, LOCKOUT and REMOTE RESET should be wired in to the burners control panel and tested.	
16	The burner body and gas train in particular contain items made of plastic. The front of the oven and any hot structures adjacent to the burner must be insulated by the installer to prevent heat damage to the burner.	
17	If the burner is installed in a confined space the combustion air inlet and extract ventilation systems must be installed and if fans are used they should be tested and interlocked so that the burner cannot run unless these fans are running.	
18	The oven will generally have one or more air inlet dampers and flues which may have dampers. The oven may have a series of recirculation or air inlet or air extract fans. It is the responsibility of the installer to commission these and not the Lanemark Service Engineer. The products of combustion must discharge outside the building. If this is not possible the oven manufacturer or Lanemark should be consulted.	
19	The general area must be made safe for Service Engineers to work in. If burners are installed on the top of ovens then safe ladders, scaffolding or cat walks must be provided.	
20	In the UK the burner must only be put into operation and commissioned by a Service Engineer who is ACS and GAS SAFE registered for Industrial Gas Burners. In other countries local gas regulations must be observed.	

SECTION 8 COMMISSIONING

IN THE UK COMMISSIONING OF GAS APPLIANCES CAN ONLY BE CARRIED OUT BY SUITABLY QUALIFIED TECHNICIANS WHO WILL BE GAS SAFE REGISTERED SPECIFICALLY TO UNDERTAKE WORK ON INDUSTRIAL GAS BURNERS. IN OTHER COUNTRIES LOCAL REGULATIONS MUST BE OBSERVED.

PRECOMMISSONING THE BURNERS ELECTRICAL CONTROL PANEL

THIS APPLIANCE MUST BE EARTHED

These tests can only be carried out by suitably qualified electricians.

Carry out the following electrical safety checks using a multimeter. Do not use a P.A.T (portable appliance tester) as high voltages generated could damage the electronics in temperature controllers and the Burner Controller and give a false reading.

Earth Continuity Check

1. The appliance must be disconnected from the main supply.

2. Set the multimeter to Ohms x 1 scale and zero if necessary.

3. Measure the resistance between the earth connection point in the burner's junction box and the earth connection point from the supply panel or distribution board.

4. If the resistance is greater than 0.1 Ohm then check that the earth cable size is adequate and that all connections are clean, sound and correctly made.

Short Circuit Check

1. The burner must be electrically disconnected from the main supply and the burners own ON/OFF switch must be ON and any temperature controllers or time clocks interlinked should be calling.

2. Set the meter to the Ohms scale x 1 and measure the resistance between the incoming live and neutral terminals in the burner's junction box. If the meter reads zero then there is a direct short circuit and a fault that should be rectified.

3. Set the meter to Ohms x 100 scale and measure the resistance between the burner's earth connection point and the its incoming live terminal. If the resistance seen is less than infinity then there is a fault that requires rectifying.

Polarity Check

Connect the burner control panel to the incoming supply set the meter to read AC Volts by 300V scale.
If an isolating or step down transformer has been used the secondary side must be end tapped and not centre tapped as this can interfere with the operation of the Burner Controller.

1. Measure the voltage between the incoming live and neutral terminals in the burner's junction box and it should read typically 230V AC or 110V as appropriate. The Satronic control box has under/over voltage protection and will not run if the supply is incorrect.

2. Measure the voltage between the incoming neutral and the earth connection in the burner's electrical junction box. The voltage should read less than 15V AC.

3. If these voltages are not seen than a neutral fault or polarity fault may exist. If very sensitive earth leakage trips have been fitted to the electrical installation then some types of multi meter may cause them to trip while attempting to measure voltages to earth.

Resistance to Earth Check

1. The burner must be electrically disconnected from the main supply and the burners own ON/OFF switch must be ON and any temperature controllers or time clocks interlinked should be calling.

2. Set the meter to Ohms x 100 scale.

3. Measure the resistance between the incoming live connection and the earth connection in the burner's electrical junction box. The reading should be infinity and if there is any other reading then there is a fault which should be isolated and rectified.

PRECOMMISSIONING THE BURNERS ELECTRICAL 1 OR 3 PHASE FAN

1. Generally the connections will be checked in a similar way as given previously. Look for 230V to neutral on 1 phase and 400V between phases on 3 phase motors.

2. For 3 phase motors use the manual button on the motor contactor or similar and check the motor is rotating in the correct direction. If not isolate and reverse two of the phase connections.

3. For 1 and 3 phase motors set the overload or motor protection device in accordance with maker's instructions and with reference to the fan motor kW rating and full load current.

N.B. A fan isolator switch is fitted in the burner control panel. See *Fig 1.* Section 3, Page 3 of this manual.

PRECOMMISSIONING GAS

The gas pipework system from the gas meter to the burner should be sound and purged in accordance with the standards given previously. A Test and Purging Certificate will be available to show this was completed. With the gas isolated at the main inlet, main gas train outlet (and pilot line outlet isolating valve if fitted) undertake the following checks to prove that the gas train valves are sound and have not been damaged in transit

LET- BY TEST ON ISOLATING VALVE

1. With reference to the gas train schematic drawing fit a manometer to the inlet pressure test nipple.
2. Open the main isolating gas cock briefly and then close it. The gas trapped between the main isolating gas cock and the first main valve seat should remain at constant pressure for 2 minutes. If loss of pressure is seen then the main valves or the pilot bypass gas valve seats are letting by and it is faulty and must be replaced as given later under *Maintenance*. Replace all test nipples.

TEST RUN OF BURNER WITH LME2 SERIES BURNER CONTROLLER

With the main inlet gas isolating cock turned off and the burners own on/off switch turned off which is located on the burners electrical control box complete the following checks :-

1. Ensure that the oven is put into operation with any recirculating fans or exhaust fans running. The burners own combustion air fan should be available to run and may have been wired back to the burner to get the start signal or it may receive a start signal from an independent main motor control panel.

2. Low inlet gas pressure switches are fitted to the gas train they require adequate inlet gas pressure to operate.

3. Switch on the burners on/off switch (press for approx. 1 second) and any isolators and the Siemens LME controller should start to run. If the controller was left at *Lockout* previously the reset button will glow red and this should be reset by pressing it or the reset switch.

4. The auxiliary contact from the burner's combustion air fan motor starter should be interconnected into the same part of the control system as the burner's air pressure switch. See the wiring diagram. If this connection is missing the controller will lockout exactly as if there was a problem with the air pressure switch. Check this connection or put in a temporary link.

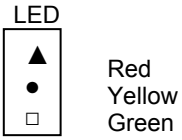
5. The Siemens controller should become live and an orange light should be on the display. This first section will also pull in the burners fan; if the contactor has been wired back to the burners own junction box. The two off 3 way solenoid valves fitted to the pipes going to the air pressure switch will also be energised. The pressure switch will now see the actual fan differential pressure + suction from the oven and will not be venting to atmosphere as previous. The controller has 65 seconds to detect that the fan is running. If the Siemens controller *locks out* at orange light this is because the air pressure switch is set too high. It is set to maximum at the factory. Adjust the switch to 1 m.bar and if the controller again *locks out* at this stage it is because the pressure switch or controller has failed to see that the fan is running. If this happens again investigate as given later under *Fault Finding.*

6. The Siemens controller will continue to the ignition stage were the orange light will start to flash. Here the start (also low fire) gas valves will open (gas should be ON for Test run) and the ignition spark will attempt to light the start flame. At this stage the controller will display a green light to show that the burner is alight.

If the Siemens controller has run to the green light then the burner is ready for commissioning.

SIEMENS LME2 SERIES OPERATION.

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



The multicolor signal lamp (LED) in the lockout reset button is the key indicating element for visual diagnostics and interface diagnostics. Both «EK» and LED are located under the transparent cover of the lockout reset button.

Operation Status Indication.

Status	Colour Code	Colour
Waiting time	○.....	Off
Ignition phase	●○●○●○●○●○●	Flashing yellow
Operation, flame ok	□.....	Green
Operation, flame not ok	□○□○□○□○□○	Flashing Green
External light on startup	□▲□▲□▲□▲	Green-red
Undervoltage	●▲●▲●▲●▲●	Yellow-red
Fault, alarm	▲.....	Red
Error code output	▲○ ▲○ ▲○ ▲○	Flashing red
Interface diagnostics	▲ ▲ ▲ ▲ ▲ ▲	Red flicker light

..... Steady on
o Off

▲ Red
● Yellow
□ Green

After lockout, the red fault signal lamp ▲ will remain on. Diagnostics of the cause of the fault can be seen by pressing the lockout reset button for more than 3 seconds and referring to the Error Code Table in section 10 of this manual.

COMMISSIONING COMBUSTION

All burners are fired at works as part of the final inspection procedure but final settings can only be set on site to suit the application.

The following settings and checks should be made after the precommissioning procedure has been completed.

Note: The air pressure switch is set to maximum prior to despatch.
If the gas pipework is not completely purged of air the burner may lock out on the first attempts at ignition. If lockout occurs the cause can be found by interpreting the lockout blink code from the Siemens controller. The most common faults are air pressure problem or failure to detect the start gas flame. (refer to fault finding section 10).

The start gas flame can be adjusted to give a reliable flame. (The position of the adjuster screw on the start valve is shown in Section 6). To comply with European burner standards it must not exceed 30% of the main flame rate.

To set the main flame fit a manometer to the gas pressure set point on the burner main valve outlet or head. From the burners Data Plate (or the graphs in this section) obtain the gas head pressure required to achieve the required burner output. Set the main gas pressure through the main gas valve. (the governor position is shwn in Section 6) There may be a protective cover over the adjuster screw.

Once the gas pressure has been correctly set for main flame the combustion should be set. On many ovens and processes it is not possible to measure combustion but the following figures are typical for high fire settings if the burner were to be installed on an indirect heat exchanger or similar.

Natural Gas

Oxygen	(O2)	6.0 %
Carbon dioxide	(CO_2)	8.5 %
Carbon monoxide	(CO)	100ppm (maximum)

Propane Gas

Oxygen	(O_2)	6.5 %
Carbon dioxide	(CO_2)	9.5 %
Carbon monoxide	(CO)	100ppm (maximum)

The flue gas temperature when the system is up to its operating temperature will depend entirely on the characteristics of the system.

The combustion air is set by adjusting the position of the combustion air damper blade. This is normally set to fully open for most applications. If the burner however is not being used to deliver its full potential output there could be too much air if the damper is set fully open. *Figure 3* is a graph of differential air pressure against burner output. It can be used as an approximate guide to setting the damper for other settings other than full open.

The fan fixing nuts have to be slackened off to move the air damper blade and must always be retightened afterwards. Once set the start gas and main flame gas pressures should be rechecked as the damper can have a slight influence on the gas pressure.

SETTING THE AIR PRESSURE SWITCH

The air pressure switch should be set when the burner is in high fire with the combustion air fan and any other fans fitted to the oven running. And with the air damper set.

The pressure switch should be set to typically 70% of the measured air pressure or 1 m.bar less than the measured air pressure. If the pressure switch is set too close to the measured pressure then there is a possibility that a nuisance lockout could occur. If the pressure switch is set too low then there is the possibility that the pressure switch would not switch the burner off if there was a problem e.g. a partially blocked flue.

The pressure switch should never be set to minimum because it can stick. **An air pressure switch must never be set too low to sacrifice safety for reliability**.

1. Fit a differential manometer to the two air pressure test points on the burner's back plate.
2. With the burner running to the air prepurge stage the pressure switch should be turned *up* to test that the air pressure switch prevents the burner from firing and that it locks out. If the pressure switch cannot be turned up high enough to cause a lockout, then hold a piece of paper or similar over the burner's fan air inlet to mimic loss of air.
3. With the burner running turn off the main gas isolating cock and check that the burner locks out due to loss of flame signal.
4. Note: If a Low Gas Pressure Switch is fitted and there is insufficient gas pressure to make the switch the burner will turn off, but will not lock out.
5. To test that the burner will lock out due to loss of flame signal remove the plug cap from the flame probe and run the burner until it locks out.
6. With the burner running in main flame the inlet gas pressure should checked to ensure it is within specification :-

Natural Gas

100 m.bar (40 in.wg) maximum
17.5 m.bar (7.0 in.wg) minimum and typical

Propane Gas

100 m.bar (40 in.wg) maximum
35 m.bar (14 in.wg) minimum and typical

If the inlet pressure is above the maximum an additional regulator must be fitted. If the inlet pressure is below the minimum then the local Gas Supply Authority should be contacted to establish the cause. If the inlet pressure is unstable (the pressure may fall at times of peak demand) then as the burner has been commissioned relative to the standard inlet pressures problems may well occur during periods of low pressure.

On Propane systems ***overpressure cut out*** with vents and ***under pressure cut out*** devices must be fitted. The settings of these should be checked for suitability and recorded.

Setting Gas Pressure Switches

If low inlet and high outlet gas pressure switches have been fitted these should be set and their operation checked.
A low inlet gas pressure switch will be set to 5 m.bar below the minimum inlet pressure specified above. A high outlet gas pressure switch should typically be set to 3 m.bar above the normal high fire gas pressure.

The slow opening adjuster on the main gas valve (if fitted) may need adjusting to slow the opening down or a pressure pulse may occur on normal opening and trip the pressure switch.

Modulating Motors On Gas Ball Valves

If a modulating motor is fitted to a ball valve the motor end stop must be set so that when it is at its fullest closed position, there is still sufficient gas flow, to light reliably and sustain a stable flame. The temperature controller should be set and the correct response of the modulating motor to the control signal should be checked. See the Data Sheet on the motor that will be contained in this manual.

Final Checks

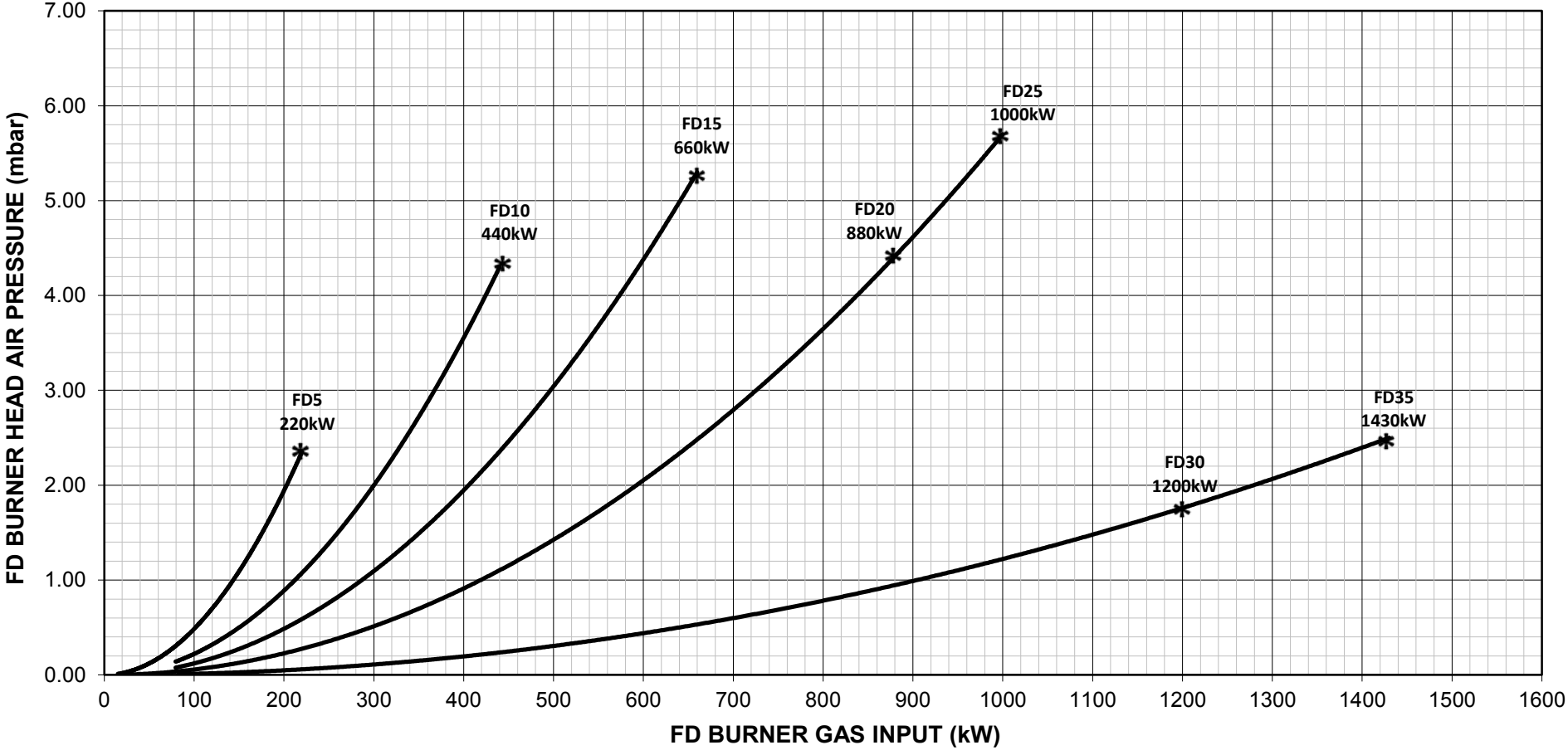
Check the operation of any mechanical or electronic temperature controllers. Record the set points and for electronic temperature controllers record the set-up parameters. Generally the burner should not be called to start more than 6 times an hour and should not switch from high flame to pilot / low flame more than 60 times an hour.
Check that there is adequate ventilation for safe combustion as given under *design considerations* previously.
The owner/operator of the burner system should be instructed in the basic operation of the burner and its controls.

FINALLY replace all pressure test points and complete a commissioning form similar to the sample contained in this manual.

IMPORTANT: IF FOR ANY REASON THE COMMISSIONING HAS NOT BEEN FULLY COMPLETED OR IF THERE IS A PROBLEM WITH THE GAS SUPPLY , FLUE, VENTILATION OR SAFETY CONTROLS THEN THE SYSTEM SHOULD NOT BE LEFT CAPABLE OF BEING RUN. THE OWNER / OPERATOR OF THE BURNER SYSTEM SHOULD BE MADE AWARE BEFORE LEAVING SITE.

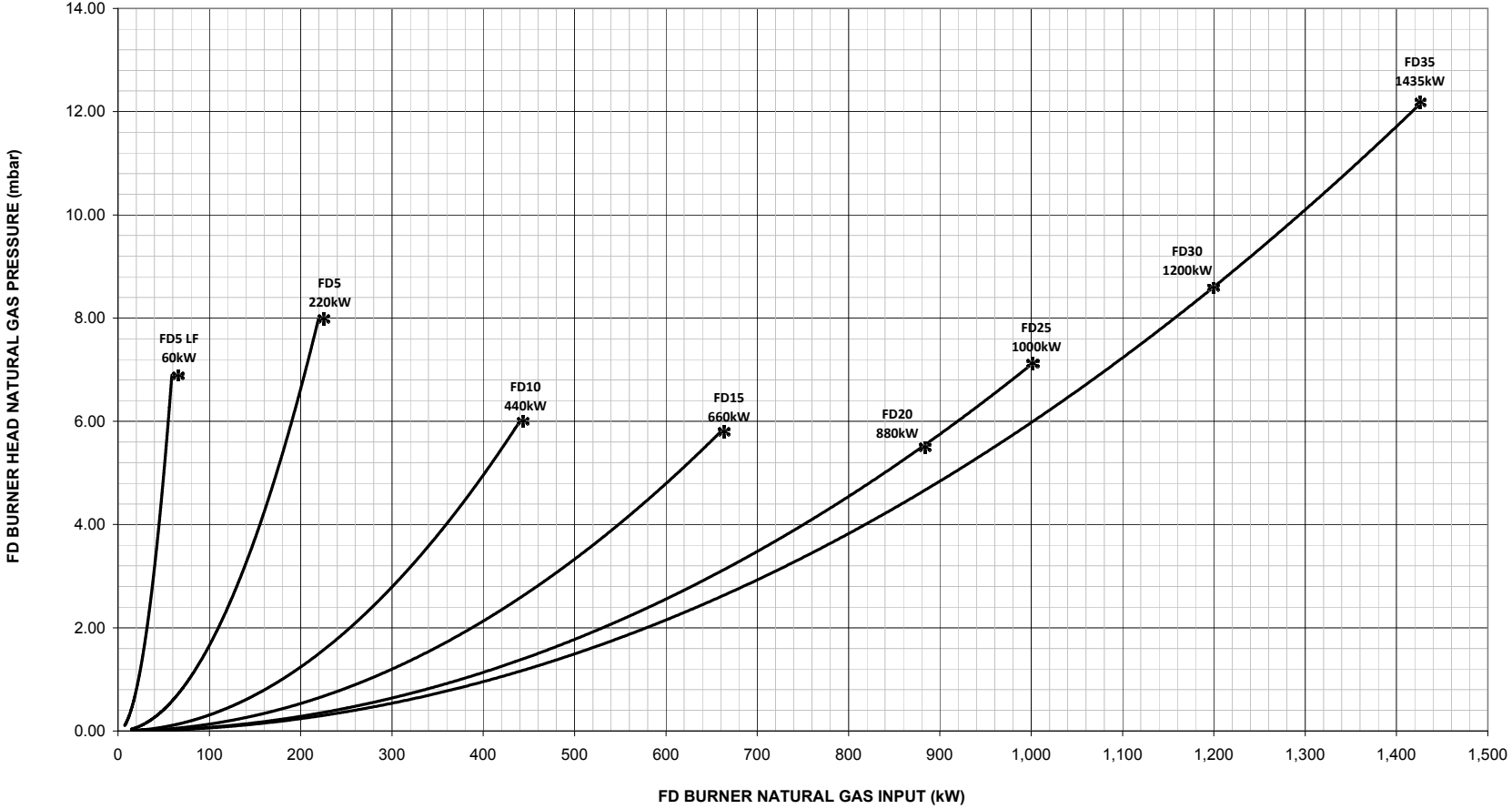
LANEMARK
FD BURNER GAS INPUT v AIR PRESSURE

Issue Date: 20/11/15



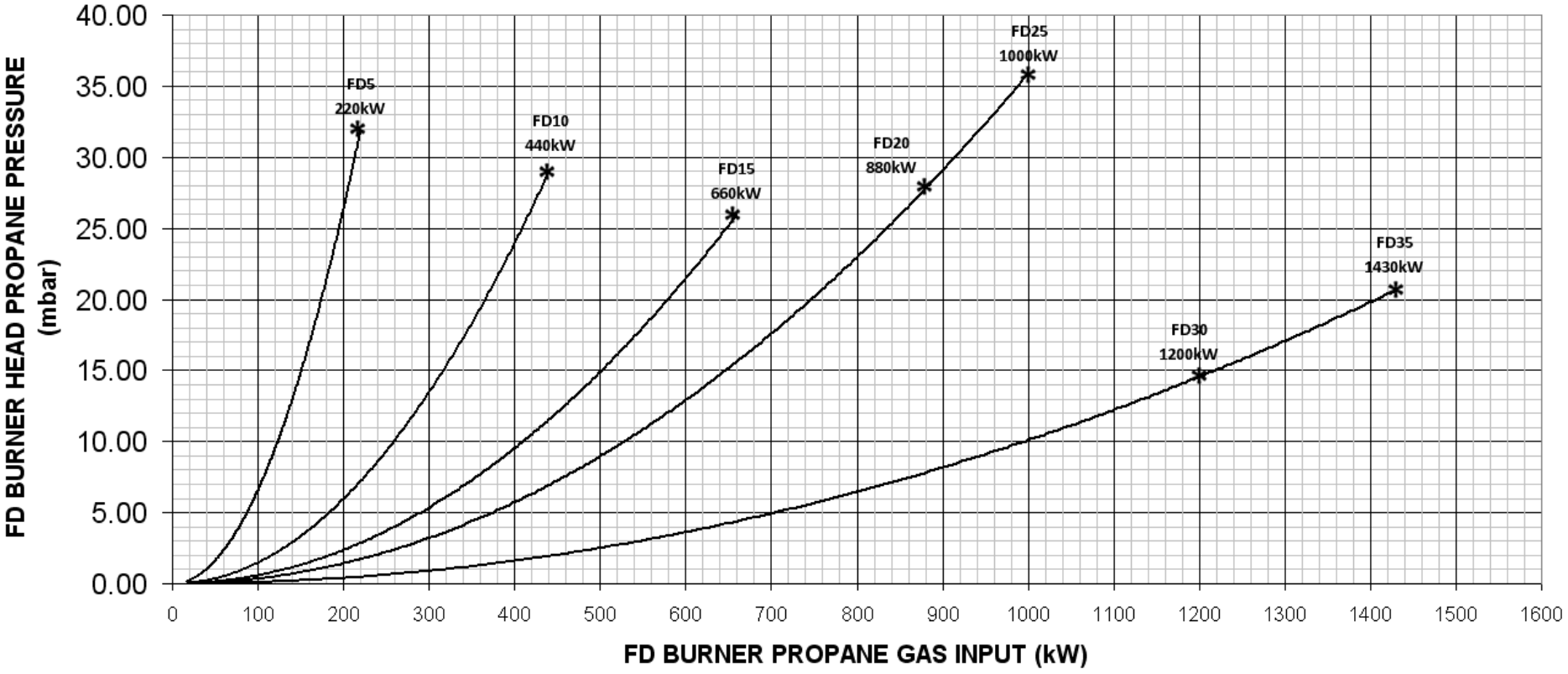
LANEMARK
FD BURNER GAS INPUT v GAS PRESSURE
NATURAL GAS

Issue Date: 20/11/15



LANEMARK
FD BURNER GAS INPUT v GAS PRESSURE
PROPANE

Issue Date: 20/11/15



SECTION 8: FD BURNER COMMISSIONING REPORT FORM

CUSTOMER NAME: ……
SITE ADDRESS: ……

BURNER MODEL: ……**SERIAL No:** …… **GAS TYPE:** ……
CONTROL PANEL VOLTAGE:……**V GAS TRAIN TYPE:** ……..
BURNER MOTOR POWER ……**kW VOLTAGE:**……**V RUN CURRENT:**……**Amp**
(The above can be found on the burner data plate stuck to the burner body and also a duplicate may be stuck in the inside cover of this manual)

PRECOMMISSIONING CHECKS:

1 BURNER EARTHED:…….. **Y / N**
2 BURNER CONTROL PANEL ELECTRICAL INSTALLATION CHECKED:…..…….. **Y / N**
3 BURNER FAN MOTOR ELECTRICAL INSTALLATION CHECKED:…… **Y / N**
4 FAN MOTOR OVERLOAD SET (COLD) TO: ……**Amp**
5 GAS INSTALLATION SOUNDNESS TESTED AND PURGED:…… **Y / N**
6 BURNER GAS TRAIN SOUNDNESS TESTED:…… **Y / N**
7 BURNER DRY RUN COMPLETED:…… **Y / N**

COMMISSIONING CHECKS

1 AIR INLET DAMPER SETTING	**% OPEN**				
2 AIR PRESSURE SWITCH SETTING	**mBar**				

PILOT / LOW FIRE SETTINGS

1 BURNER HEAD PRESSURE	**mBar**				
2 COMBUSTION CHAMBER PRESSURE	**mBar**				
3 WIND BOX DIFFERENTIAL AIR PRESSURE	**mBar**				
4 FLAME SIGNAL STRENGTH					
5 OXYGEN	**$\%O_2$**				
6 CARBON DIOXIDE	**$\%CO_2$**				
7 CARBON MONOXIDE	**%CO**				
8 NET FLUE GAS TEMPERATURE	**°C**				
9 PROCESS TEMPERATURE	**°C**				
10 GAS FLOW RATE	**m^3/h**				

HIGH FIRE SETTINGS

1 BURNER HEAD PRESSURE	**mBar**				
2 COMBUSTION CHAMBER PRESSURE	**mBar**				
3 WIND BOX DIFFERENTIAL AIR PRESSURE	**mBar**				
4 FLAME SIGNAL	**(neons on or microamps)**				
5 OXYGEN	**$\%O_2$**				
6 CARBON DIOXIDE	**$\%CO_2$**				
7 CARBON MONOXIDE	**%CO**				
8 NET FLUE GAS TEMPERATURE	**°C**				
9 PROCESS TEMPERATURE	**°C**				
10 GAS FLOW RATE	**m^3/h**				

(It may not be practical to take some of the above readings depending on the application)

NOTES:

SIGNED: **FOR:** **DATE:**

SECTION 9 MAINTENANCE

CLEANING AND MAINTENANCE

A BURNER IN THE UK MUST ALWAYS BE COMMISSIONED BY A SUITABLY QUALIFIED TECHNICIAN WHO HAS BEEN SPECIFICALLY GAS SAFE & ACS REGISTERED TO DO THIS WORK. IN OTHER COUNTRIES LOCAL REGULATIONS MUST BE COMPLIED WITH.

Maintenance should be carried at intervals depending on the hours run and the application of the burner. For burners running continuously this could be up to four times a year but never less than once a year.

CLEANING THE BURNER HEAD ASSEMBLY

1. Isolate the gas supply at the service gas cock provided as part of the gas train. Isolate all electrical supplies to the burner. Isolate and make safe all other fuel and electrical supplies to the oven. Isolate the burner combustion air fan using the isolation switch upon the terminal rail inside the burner control panel,(see *Fig 1* section 3 of this manual).

2. Remove the ignition and flame detection connections from their probes that are part of the burner back plate.

3. Break the gas union to the burner gas train. Remove the 8 bolts holding the burner body back plate to the burner body.

4. It should now be possible to remove the burner head assembly and the burner back plate with the gas train attached.

5. If the burner is left unattended at this stage the incoming gas pipe must be capped off. It must not be left isolated on the gas cock alone.

6. The burner head will typically have a light covering of dust on the cone and associated pipework. This should be removed with a lint free rag or a soft brush and vacuumed up if necessary. This dust should be treated with care. A disposable mask and safety goggles should be worn to prevent the possibility of inhaling this dust or getting any dust in the eyes.

7. The burner electrodes should be checked for their serviceability and generally they will be replaced yearly.

8. The electrodes should be set as shown in *Fig 1*.

9. Visually inspect the flame tube and combustion tube, if fitted for heat damage.

10. Replacement of the burner head assembly is the reverse of the above.

11. After each service visit the integrity of the gas safety valves and the soundness of any gas pipework disturbed must be shown to be safe, as given previously under *Precommissioning Gas*. The burner settings must be checked as given previously under *Commissioning* and a written record made.

CLEANING THE FAN IMPELLER

1. Isolate the gas supply at the service gas cock provided as part of the gas train. Isolate the burner combustion air fan using the isolation switch located on the terminal rail in the burner control panel. Isolate all electrical supplies to the burner. Isolate and make safe all other fuel and electrical supplies to the oven.

2. If the electrical connection to the fan motor junction box has been run in flexible conduit it may be possible to remove the impeller and motor assembly without disconnecting this. The electrical supply must be isolated. If this electrical supply has been made through fixed conduit then it will require disassembling once the supply has been isolated.

3. Release the four screws that hold the fan impeller mounting plate to the body of the fan scroll. Lift the impeller assembly away from the fan scroll and with a lint free rag or soft brush remove any dust or debris. This dust should be treated with care. A disposable mask and safety goggles should be worn to prevent the possibility of inhaling this dust or getting any dust in the eyes.

4. The weight of the fan impeller and motor assembly must not be supported on the flexible electrical conduit.
5. Replace the fan impeller assembly as the reverse of the above.

6. If any electrical connections have been disturbed they must be checked for correct reassembly as given previously under *Precommissioning Electrical*.

GAS TRAIN AND CONTROLS

The following checks should be made annually.

1. The operation and soundness of the isolating gas cocks on the gas train should be checked. This should be done by pressure testing up to the seal of these ball valves and establishing that there is no loss of pressure in a similar way to that used for testing the main gas valve seats.

2. The gas soundness of the gas train gas valves and associated pipe work should be checked as given previously under *Precommissioning Gas*.

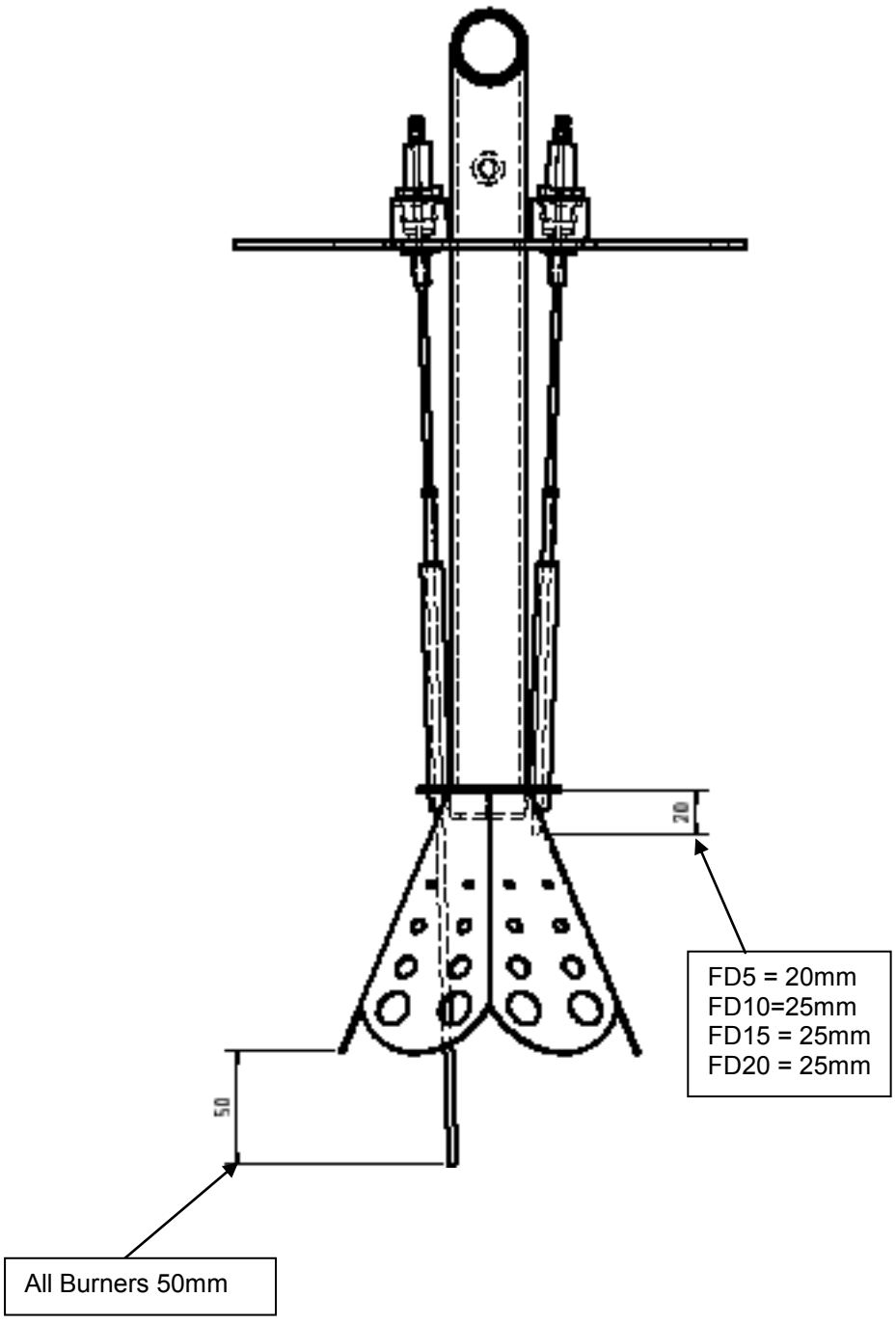
3. The setting of the air pressure switch and the lockout function of the Satronic control box to an incorrectly set pressure switch and lack of pilot stage gas should be rechecked. This should be done as given previously under *Commissioning Dry Run*.

4. The gas train and control panel should be visually inspected to look for obvious signs of damage or deterioration.

COMBUSTION FAN FILTERS

1. A combustion air fan filter is available as an option upon most FD burners. If fitted, ensure the fan is isolated, slide the filter out from the housing and inspect. Replace with new as required.

Fig 1 **FD BURNER HEAD AND ELECTRODES**



SECTION 10 FAULT FINDING

FAULT FINDING GENERAL - SIEMENS LME2 SERIES BURNER CONTROLLER

SYMPTOM	FAULT	ACTION
Burner's Siemens controller at *lockout* or not attempting to start.	Burner fault or safety interlocks holding the burner off. The supply voltage is above/below the nominal supply voltage value (110 or 240V) and the Siemens controller will not operate. The remote burner lockout reset has been continuously switched on. Burner fan isolator switch is off.	Refer to the later section specifically on burner control faults. Correct the supply voltage. Release the reset switch. Check switch in burner panel is on.
Process temperature rising above the required temperature.	Thermostat is set incorrectly. Thermostat is not sensing a representative process temperature. Thermostat is not switching down to low fire or modulating downwards. Low fire is set too high.	Reset thermostat. Check the actual temperature in the area of the sensor. Check the wiring and settings of electronic controls and replace if necessary. Reduce low fire
Process temperature fails to reach the required temperature.	Thermostat is set incorrectly. Thermostat is holding burner in low fire or not modulating upwards. The burner performance has not been matched to the process requirement. The process conditions have been changed since commissioning. High fire coil has failed.	Reset thermostat. Check the wiring and settings of electronic controls and replace if necessary. Recommission the burner. Recommission the burner. Replace coil.
Evidence of poor combustion conditions e.g. sooting or smells.	Original commissioning settings have been altered. **Do not use equipment**	Recommission the burner.

FAULT FINDING TEMPERATURE CONTROLLERS

SYMPTOM	FAULT	ACTION
Burner runs to ignition and the temperature controller switches the burner off and it attempts to cycle again.	The ignition spark is interfering with the electronics of the temperature controller.	Check that the ignition spark plug cap is an original part or replacement and suppressed with a 5 kilo ohm resistor.

FAULT FINDING GAS VALVES

SYMPTOM	FAULT	ACTION
1st valve or governor will not open.	High pressure gas trapped between 1st and 2nd main valve seats and locking up 1st valve.	Remove test point between seats. Tap valve to release 1st valve seat. Open up by-pass valve to allow more gas to flow.
2nd main valve not opening.	The throughput restrictor has been fully or almost fully closed. The slow opening adjuster is set to the *slowest* opening. Coil failed.	Open up the through put restrictor and increase the speed of lift of the slow opening adjuster. Replace coil.
No pilot/start gas.	The adjuster on the pilot / start gas valve closed or nearly fully closed. Pilot valve coil failed.	Use the adjuster to increase the pilot/start gas flow. Replace coil.

FAULT FINDING BURNER CONTROLS SIEMENS LME2 SERIES CONTROLLER

The burner faults can be diagnosed by looking at the flashes on the Siemens LME2 Series Controller.

SYMPTOM	FAULT	ACTION
No operation or light in the rest button even when pressed.	No power supply to the controller.	Check terminal 12 in the base of the controller is at 110V (or 230V as appropriate) and that terminal 2 is a neutral. If voltage is present replace the box.
Burner at lockout and showing flame error.	Siemens Controller is seeing a flame signal. Fault on remote reset. Controller is faulty. Faulty controller.	Look for flame being present due to the gas valves having failed to close. Check that terminal 8 is not being held at permanent neutral which initiates remote reset of the controller. Replace controller.

After lockout the red fault signal lamp LED within the reset button will remain steady on. In that condition, visual diagnostics of the cause of the fault according to the Error Code Table (next page) can be activated by pressing the lockout reset button for more than 3 seconds.

If the reset button is accidently pressed again for more than 3 seconds this will activate interface diagnostics. (the slightly red light of the display flickers) This can be deactivated by pressing again the lockout reset button for more than 3 seconds. The instant of switching over is indicated by a yellow light pulse.

Control on but no lights on the Siemens controller .	Control circuit not complete. Air pressure switch is in the normally open position i.e. it is sensing air when an air flow signal should not be present.	Check for continuity between terminals 12B, 12A, 12. Check that any interlocks fitted in this circuit are calling. Look at the wiring to the air pressure switch and establish if the air pressure switch has stuck at normally open (n/o), if so replace the switch. If the oven has its own fan the draught from this fan may be holding the air pressure switch at normally open. There are 2 off 3 way air valves fitted into the 2 off air sensing pipes and these should be venting the air pressure switch to atmosphere. Check that these 3 way valves are not fitted in the wrong direction or have stuck in the wrong position. Check that the pipes are not blocked
Burner starts but *locks out* after the orange light has been on	The air pressure switch has not detected that the burner fan is running and moved across to the normally open position within 65 seconds.	Check that the fan motor auxiliary contact has pulled in across terminals 11-11A. Check that the 2 off 3-way air valves are being energised and not venting the air pressure being created to atmosphere. Check that the air pressure switch contacts are changing across. Use a manometer to measure the actual differential air pressure being created and compare this to the pressure switch setting.
Lockout after the orange light and when the light is green.	Air pressure switch has returned to the normally closed position.	Check with a manometer the air pressure being seen and the operation of the switch. Check the 3 way air valves are venting the pressure being generated.
Pilot flame established but lockout after orange flashing light.	Failure to detect the start gas flame.	Check the ionisation current. It should be a minimum of 3 microamps dc for a flame rod or 3 microamps for a U.V cell. Check the position of the detection probe and the connections to it. Check if the pilot flame is too weak or being over aired. If UV cell clean the sight glass. Replace controller or U.V cell.

Pilot flame NOT established lockout at green.	Failure to provide gas and or air. Failure to provide a spark.	Check that the gas supply is on and that the start gas valve is opening and that gas pressure is reaching the burner head. Check that the pilot stage is not being over aired or under gassed and producing a mixture that will not light. Check the ignition probe spark gap. Check that the probe is not earthing and the connections are OK. Check that the ignition transformer is being energised via terminal 7.
Lockout after green light.	Unstable pilot flame. Weak flame signal. Unstable main flame as main valves open. Weak main flame signal.	Check the flame signal strength as given previously and look for a dip in signal. Adjust the start gas rate or the air damper as appropriate. Check the position of the flame sensing probe and the connections. Put a manometer on the burner head test point. Look for the gas pressure increasing progressively. If the pressure increases rapidly when the main valve opens, check for excessively high inlet gas pressure. Check the setting and operation of the governor. Check that the flame detection probe is positioned as given in this manual.

FAULT FINDING BURNER CONTROLS SIEMENS LME2 SERIES BURNER CONTROLLER

The burner faults can be diagnosed by looking at the colour display on the Siemens Burner Controller..

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 o.k.	□.....	Green
Operation, flame not o.k.	□ ❍ □ ❍ □ ❍ □ ❍ □ ❍	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

Error code table		
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» is welded in normal position
4 blinks	On	Extraneous light when burner startup
5 blinks	On	Time out «LP» - «LP» is 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).

LEGEND `AL' Error Message (alarm)`TSA' Ignition Safety Time. `LP' Air Pressure Switch

NOTE: With 10 & 14 Blink faults there is no lockout indication.

SECTION 11 COMPONENT REPLACEMENT

COMPONENT REPLACEMENT

COMPONENT REPLACEMENT IN THE UK CAN ONLY BE CARRIED OUT BY SUITABLY QUALIFIED TECHNICIANS WHO HAVE BEEN GAS SAFE & ACS REGISTERED TO DO THIS WORK. IN OTHER COUNTRIES LOCAL REGULATIONS MUST BE COMPLIED WITH.

ONLY ORIGINAL EQUIPMENT SPARES SUPPLIED BY LANEMARK INTERNATIONAL SHOULD BE FITTED TO THESE BURNERS TO ENSURE THE SAFE AND CORRECT OPERATION OF THE BURNER.

ISOLATE THE GAS SUPPLY AT THE SERVICE GAS COCK PROVIDED AS PART OF THE GAS TRAIN. ISOLATE ALL ELECTRICAL SUPPLIES TO THE BURNER.

FD 'E' AND FD 'C' BURNERS

The controls on the FD 'E' are all mounted on a plate. For the FD 'C' they are all mounted inside the control panel which will require opening first. For the FD 'C' the 3-way air valves are located behind the control panel which will require opening and hinging forward to gain access to them and their coils.

To remove the burner head on the FD 'C' the control panel will have to be hinged forward and down before the head can be removed.

IGNITION AND FLAME DETECTION PROBES

1. To replace the ignition and flame detection probe set follow the instructions as given previously in this manual under M*aintenance – cleaning the burner head assembly.* It should be possible to release the fixing screw and remove and inspect an electrode without removing the burner head assembly. See the drawing under M*aintenance* for the correct electrode setting.

BURNER HEAD ASSEMBLY

1. To replace the burner head follow the instructions as given previously in this manual under *Maintenance – cleaning the burner head assembly.*

FAN IMPELLER AND MOTOR

1. The fan impeller and motor are available as individual spares. They are not balanced and may be replaced as individual items. Similarly an assembled spare motor, backplate & fan impellor is available as a spare which allows the fan casing to be left in position.

2. Remove the electrical connections to the motor junction box and if the burner is to be left unattended these connections must be left in a safe condition.

3. Release the four screws that hold the complete fan assembly to the body of the fan scroll. Lift the fan assembly away from the fan scroll noting the air dampers approximate position.

4. Replace the fan assembly as the reverse of the above using a new gasket if necessary.

5. The electrical connections must be checked for correct reassembly as given previously under *Precommissioning Electrical*.

6. After such work the integrity of the gas safety valves and the soundness of any gas pipework disturbed must be shown to be safe, as given previously under *Precommissioning Gas*. The burner settings must be checked as given previously under *Commissioning* and a written record made.

GAS VALVE COILS

Warning - Solenoid coils run hot in operation, allow sufficient time to cool before removal.

1. Remove the electrical connections to the gas valve by removing the push on plug caps or the connections to the valve terminal blocks. Make a note of the position of the connections to aid replacement later.

2. Remove the coil from the body of the gas valve by releasing the fixing nut or retaining clip on the top of the gas valve. This fixing may be located under a plastic cover.

3. Fit a new coil as the reverse of the above. Ensure that the replacement is the same voltage as that removed.

4. After such work the integrity of the gas safety valves and the soundness of any gas pipework disturbed must be shown to be safe, as given previously under *Precommissioning Gas*. The burner settings must be checked as given previously under *Commissioning* and a written record made.

GAS VALVES BODIES

1. Remove the electrical connections to the gas valves by removing the push on plug caps or the connections to the valve terminal blocks. Make a note of the position of the connections to aid replacement later.
2. Fit a temporary earth continuity connection and then break the gas unions on the burner gas train.
3. Remove the faulty gas valve body and replace using a new “O” Ring or replace pipework using a proprietary gas jointing compound. Ensure that the direction of gas flow through the gas valve is correct by looking for the *direction arrow* stamped on the casting.
4. Replace the complete gas train assembly as the reverse of the above.
5. After such work the integrity of the gas safety valves and the soundness of any gas pipework disturbed must be shown to be safe, as given previously under *Precommissioning Gas*. The burner settings must be checked as given previously under *Commissioning* and a written record made.

BURNER PROGRAMMER

1. Release the fixing screw holding the Burner Programmer box (Satronic, Siemens, Honeywell or similar) to its base and pull the box out.
2. Replace as the reverse of the above.
3. The burner settings must be checked as given previously under *Commissioning* and a written record made.

IGNITION TRANSFORMER

1. Release the live, neutral and earth electrical connections from the ignition transformer.
2. Unscrew the ignition cable from the transformer.
3. Release the fixing screws and remove the ignition transformer complete.
4. Replace as the reverse of the above. Care must be taken that a good connection is made with the ignition cable onto the transformer body.
5. The burner settings must be checked as given previously under *Commissioning* and a written record made.

MODULATING MOTOR

1. Remove the plastic cover over the motor and release the electrical connections.
   Note where these electrical connections go.
2. The shaft of the ball valve will have an *index* mark. Note the position of this mark relative to the clamp that grips it.
3. Release the clamp and the screws holding the motor body.
4. Turn the motor over and note how the splined shaft is aligned relative to its indexing mark. A Data Sheet for the motor is contained in this manual giving more details of this. Note how the small switches on the Printed Circuit Board are set as these determine the direction of travel and the type of control signal used.
5. Set the splined shaft and switches on the new motor as per the old motor.
6. Refitting is the reverse of the above.
7. The burner settings must be checked as given previously under *Commissioning* and a written record made. In particular the bottom end stop of the modulating motor must be set sufficiently open to allow enough gas to pass for reliable starting of the burner.

3-WAY AIR VALVE

1. Release the electrical plug cap from the coil of the valve.
2. Release the retaining nut from the stem of the valve and the coil can now be lifted away.
3. If the valve body itself is faulty the body can be released from the plastic tubes by releasing the push on pipe connections. A screwdriver should be used to push the collars inwards then the pipe can be pulled out.
4. Release the valve body if necessary by releasing the backnut holding the valve to the backplate.
5. Replace as the reverse of the above.
6. If the 6mm plastic pipes have been disturbed care should be taken that these have been replaced correctly and a good air tight seal made.
7. The burner settings must be checked as given previously under *Commissioning* and a written record made.

AIR PRESSURE SWITCH

1. Remove the plastic cover over the pressure switch and release the electrical connections and the switch fixing screws.
2. Replace as the reverse of the above.
3. The burner settings must be checked as given previously under *Commissioning* and a written record made.

AIR PRESSURE SWITCH

1. Remove the plastic cover over the pressure sw itch and release the electrical connections and the sw itch fixing screws.

2. Replace as the reverse of the above.

3. The burner settings must be checked as given previously under *Commissioning* and a w ritten record made.

SECTION 12 SPECIAL FEATURES

If any Special Features were designed and supplied with a burner details will be contained in this section. This could be Data Sheets for special components and additional operating and commissioning instructions.

SECTION 13 RECOMMENDED SPARES

If this manual was sent out with a burner then the Recommended Spares list will be contained in this section of the manual for the burner and any accessories e.g. Temperature Controllers.

LANEMARK
COMBUSTION ENGINEERING

Job No: J*****

Part No	Description	FD10EN-3

ESSENTIAL SPARES

0010771	KROMSCHRODER GAS VALVE COIL VA1 (230V)
0010773	KROMSCHRÖDER GAS VALVE COIL VA2 (230V)
0010777	KROMSCHRÖDER GAS PRESSURE SWITCH DG40/VC-6W (5-40mbar)
0012028	DUNGS AIR PRESSURE SWITCH LGW3A2 (0.4-3mbar)
0013023	MCT IGNITION TRANSFORMER (230V)
0013032	NGK IGNITION ELECTRODE CAP LB05E
0013033	NGK FLAME SENSE ELECTRODE CAP LB05F
0013041	CONTROL BOX FUSE (3.15A) 20x5mm
0013443	SIEMENS BURNER CONTROL BOX LME21.350 (230V)
0014091	FD10 PANEL FILTER (290 X 290 X 25mm)
0016216	FD10 MK6 IGNITION ELECTRODE
0016217	FD10 MK6 FLAME SENSE ELECTRODE

OTHER SPARES

0010031	3-WAY AIR VALVE ASSEMBLY (230V)
0010595	KROMSCHRÖDER BYPASS GAS VALVE VAS1 (230V)
0010857	KROMSCHRÖDER GAS VALVE VCD2 1 1/2" 230v excl. LGPS
0016202	FD10 MK6 IGNITION ELECTRODE ASSEMBLY
0016203	FD10 MK6 FLAME SENSE ELECTRODE ASSEMBLY
0016228	FD MK6 BULKHEAD ELECTRODE
1140572	FD10 FLAME TUBE ASSY 210mm
4220410	FD10 COMBUSTION TUBE ST.ST 410mm

INFORMATION ONLY

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E-mail: info@lanemark.com Web site: http://www.lanemark.com
Company Registration No.05471903 VAT No. GB 185 5272 84
Place of Registration: England & Wales
Directors: P.R. Collier, J.S. Foster, A.E. Thompson

SECTION 14 HEALTH AND SAFETY

C.O.S.H.H (CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH)

The burner as delivered including packaging contains no chemicals or substances that represent a hazard to health during installation or operation if installed in accordance with these instructions.

GASKETS

The gaskets as supplied as original equipment are ceramic fibre with binder. They are pre-cut to shape and prefitted to the burner. These gaskets do not need cutting on site.

For service work when fitting new gaskets, use gloves and protective goggles and do not allow this material to come into contact with the skin, eyes or inhale or ingest it.

PAINTS

During first operation there may be a faint smell but if the burner is operated in an area ventilated in accordance with this manual this represents no hazard.

SEALENTS

Gas tight joints are made with a proprietary gas jointing compound and no other chemical sealants are used. Gaskets are fixed with silicone based adhesive.

HEALTH AND SAFETY

The following should be considered when installing, operating or servicing this burner.

LIFTING

The weight of the burner and fan or heat exchanger should be assessed before lifting commences. The gas train may be removed if necessary to reduce the weight of the burner and so aid safe lifting.

Two persons may be required to lift larger fans and heat exchangers.

Burners, fans and heat exchangers should not be left unsupported.

SHARP EDGES

Any sheet metal edge that does not have a safety edge or protective covering should be handled with gloves.

ELECTRICAL

THIS BURNER MUST BE EARTHED

The burner must only be installed and maintained electrically by trained competent electricians.

GAS

In the UK this burner must only be installed and maintained by trained technicians who are GAS SAFE & ACS registered specifically for industrial gas burners. In other countries local regulations must be complied with.

RECYCLING

The burner is made from:

Mild and stainless steel sheet and tube.
Aluminium / cast iron castings.
Copper wire and windings.
Plastic switches, terminals, controls etc.

These burners contain the minimum of welding and they can easily be unassembled into their main material group. Approximately 95% by weight can be recycled.

DISPOSAL OF PACKAGING AND BURNER

The cardboard box and polyurethane packing can be recycled or disposed of to an appropriate facility.

The burner body can be stripped down and the materials recycled or disposed of to an appropriate facility.

Lanemark International Ltd would be pleased to receive back by prior arrangement the burner or its packaging for recycling.

SECTION 15 NOTES

NOTES

CUSTOMER NAME: ……………………………………………………………………………………………………
SITE ADDRESS: ……………………………………………………………………………………………………

BURNER MODEL: ……………………**SERIAL No:** ……………………… **GAS TYPE:** …………………………
CONTROL PANEL VOLTAGE:……………**V** **GAS TRAIN TYPE:** ………………………………….……………..
BURNER MOTOR POWER …………….**kW** **VOLTAGE:**……………**V** **RUN CURRENT:**…………….**Amp**
(The above can be found on the burner data plate. Affixed to the burner body, In the burner control box and a copy in this manual)

DATE	NOTES	SIGNED