



BMM Heaters Limited

Compact HM Range

Installation, Service and User Manual

Indirect gas fired warm air heater type B22, C4 & C5

Please read this document prior to the installation and servicing of this equipment.

Failure to follow these instructions can cause damage to property, injury or death to person.

Work should only be carried out by suitable qualified personnel and Corgi registered.

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Model:

Serial No:

This manual is compatible for On/Off, Modulating and High/Low these can be differentiated by the last letter in the model reference. Modulating units will end in a (M) and High/Low units in HL for example:

- HMA(M) is a modulating unit
- HMA(HL) is a two stage high low
- HMA is the On/Off model.

Section 1: Introduction

The instructions refer to appliances designed to operate in the UK and Ireland.

Appliances designed for other countries can be provided on request.

This appliance must be installed in accordance with the local and national codes in force and used only in a sufficiently ventilated space, as specified in these instructions.

Before installation, check that the local gas distribution systems, nature of gas and pressure, and adjustment of the appliance are compatible.

When installed within the United Kingdom the total installation must comply with the recommendations and requirements of the British Standard BS 6230:2005 "Specification for the installation of gas-fired forced convection air heaters for commercial and industrial space heating (2nd and 3rd family gases)"

This appliance is suitable for outside installation, if installation within a weather proof enclosure.

Terms and Definitions

Indirect Fired

The term 'Indirect Fired' indicates that the products of combustion are kept isolated from the main supply air stream. The burner fires into a combustion chamber, the resultant products of combustion are directed into a heat exchanger and from there to an external flue, which discharges into the atmosphere.

Factory Test

All heaters produced by BMM Heaters Ltd will be subjected to various tests before they are dispatched. Each heater is individual so the data will differ between each unit. The relevant data can be found on the data plate attached to the heater.

External Heaters

The construction of the unit will consist of double skin panels and be fully water proof: the burner compartment will be adequately ventilated via two combustion air grills.

Burner Types

BMM Heaters Ltd will use a series of in-shot gas fired burner in multiple forms, depending on output required. This burner will be either on/off, high/low or modulating control.

Fuel Type

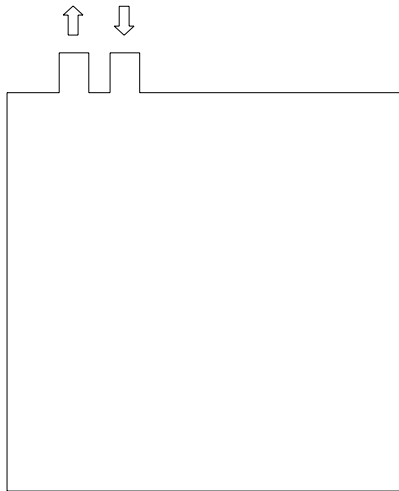
HM Compact Range are designed to work on G20 I2H Natural gas; however if this gas is unavailable please contact us.

Flue Type

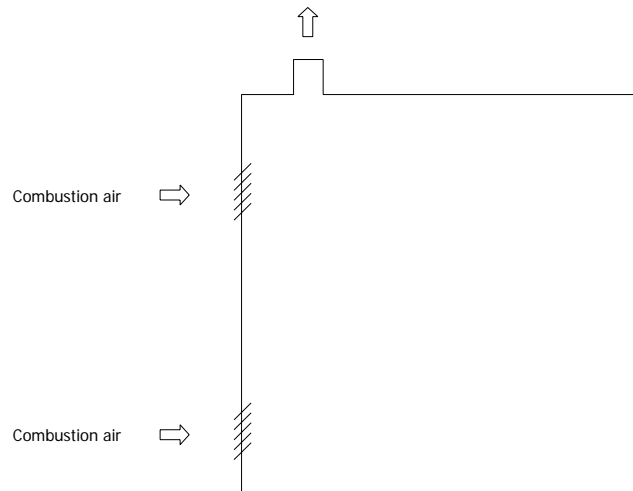
The HM Compact Range heater is approved for the following flue type:

- **Type C4 & C5** - Horizontal and Vertical flue (Two piped)
- **Type B22** - Vertical or horizontal flue for combustion air vents (Single piped)

C & B type appliance - Internal & External installed



C - type 4 & 5 suitable for indoor and outdoor (if fitted outside this unit must be installed within an AHU)



B-Type appliance has high and low level gills installed on the front panel, this appliance is suitable for outdoor installation.

Section 2: Heater Safety

The Installation of this appliance must be done by a registered installer/contractor suitably qualified in the installation and service of gas fired heating equipment.

WARNING!

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the installation, operation and service manual thoroughly before installing or servicing this appliance.

Note:

To Installer: Please take the time to read and understand these instructions prior to any work servicing or installing this appliance. Installers must leave a copy of this manual with the end user/owner.

To Owner: This manual must be kept in a safe place in order to provide necessary information for service engineers at a later date.

Section 3: Installers Responsibilities

- ◆ To install the heater, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. BMM Heaters recommends the installer contact a local Building Inspector, Fire Officer or Insurance Company for guidance.
- ◆ To use the information given in the manual together with the local and national codes to perform the installation.
- ◆ To install the heater in accordance with the Clearances to Combustibles of this heater.
- ◆ To plan for the installation of supports, flues and air intakes.
- ◆ To provide access to burners for servicing.
- ◆ To provide the owner with a copy of this installation, commissioning, operation and service manual.
- ◆ To never use a heater as a support for a ladder.
- ◆ To ensure that there is sufficient ventilation in the area to comply with the requirements of all relevant local and national codes.

Section 4: Technical Data

HMA Technical Table 1

MODEL		35	50	60	70	85	95
Nominal heat output	kW	35	45	60	70	85	95
Nominal heat input	kW	39	50	67	78	95	105
Minimum heat output	kW	17.5	25	30	35	42.5	47.5
Gas consumption	m ³ /h	3.75	4.8	6.44	7.51	9.13	10.20
Gas connection	bsp	¾"	¾"	¾"	¾"	¾"	¾"
Min inlet gas pressure	mbar	17.5	17.5	17.5	17.5	17.5	17.5
Max inlet gas pressure	mbar	30	30	30	30	30	30
Burner Pressure	mbar	8.7	8.7	8.7	8.7	8.7	8.7
Injector Size	mm	2.87	3.16	3.16	3.16	3.16	3.16
Number of tubes	#	4	4	5	6	7	8
Flue diameter	mm	100	100	100	100	130	130
Combustion air inlet	mm	100	100	100	100	130	130
Electrical	volts	230	230	230	230	230	230
Current (burner only)	amps	3	3	3	3	3	3
Net weight	kg	260	260	313	368	427	442
Maximum air volume	M ³ /sec	2.65	3.53	4.41	5.30	6.18	7.06
Minimum air flow	M ³ /sec	0.82	1.05	1.4	1.65	2.00	2.2

HMB Technical Table 2

MODEL		35	50	60	70	85	95
Nominal heat output	kW	35	45	60	70	85	95
Nominal heat input	kW	39	50	67	78	95	105
Minimum heat output	kW	17.5	25	30	35	42.5	47.5
Gas consumption	m ³ /h	3.75	4.8	6.44	7.51	9.13	10.20
Gas connection	bsp	¾"	¾"	¾"	¾"	¾"	¾"
Min inlet gas pressure	mbar	17.5	17.5	17.5	17.5	17.5	17.5
Max inlet gas pressure	mbar	30	30	30	30	30	30
Burner Pressure	mbar	8.7	8.7	8.7	8.7	8.7	8.7
Injector sizes	mm	2.87	3.16	3.16	3.16	3.16	3.16
Number of tubes	#	4	4	5	6	7	8
Flue diameter	mm	100	100	100	100	130	130
Combustion air inlet	mm	100	100	100	100	130	130
Electrical	volts	230	230	230	230	230	230
Current (burner only)	amps	3	3	3	3	3	3
Net weight	kg	245	245	293	344	401	456
Maximum air volume	M ³ /sec	2.65	3.53	4.41	5.30	6.18	7.06
Minimum air flow	M ³ /sec	0.82	1.05	1.4	1.65	2.00	2.2

• Calculations are worked out using the calorific value 10.7 kWh/m³ - 1007 mbar - 15 °C

Each appliance has been range rated; burner pressures can be found on the data plate and the burner pressure once commissioned must be entered in the actual.

Section 5: Heater Installation

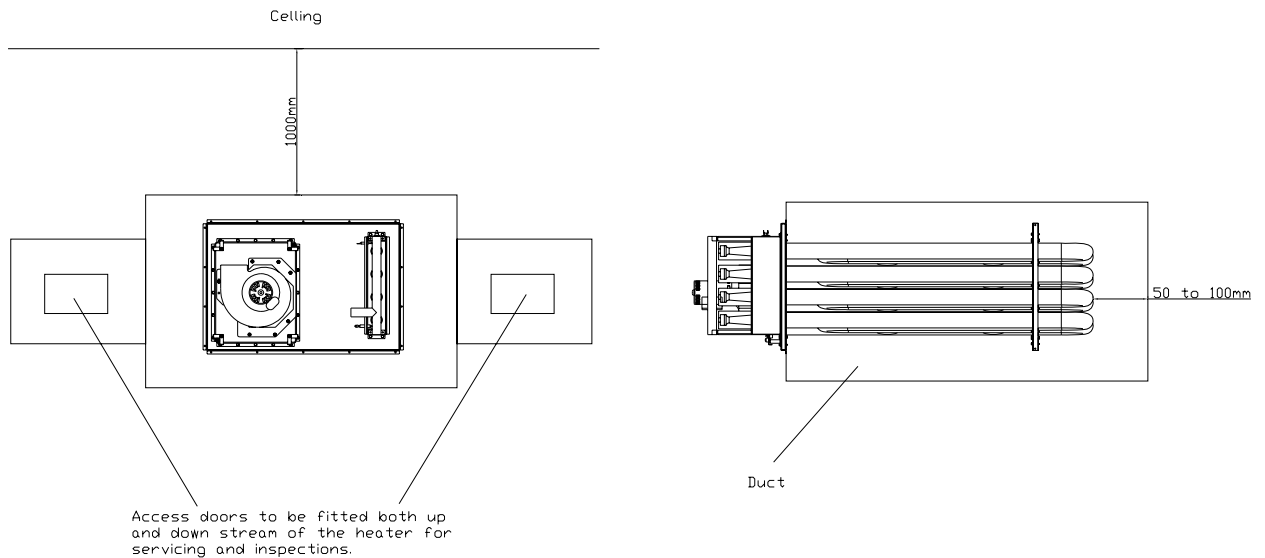
This appliance must be installed in accordance with the rules in force. Before installation, check that the local distribution conditions, nature of gas and pressure and to make sure the appliance is compatible.

When the heater is installed within Great Britain the whole installation must comply with the requirements and recommendations of BS 6230:2005 "Installation of gas fired forced convection air heaters for commercial and industrial space heating".

The air heater must be installed in accordance with the rules in force and the relevant requirements of any fire regulations or insurance company's requirements appertaining to the area in which the heater is located, particularly where special risks are involved, such as areas where petrol vehicles are housed, where cellulose spraying is carried out, in wood working departments etc.

Clearances and Positioning:

The following clearances for installation and servicing must be observed.



To the Front	Equal to the depth of the heater.
To the Rear	1 Metre
To at least one side	1 Metre
Above the heater	1 Metre

Clearances

A minimum of 500mm upstream and downstream must be allowed for, due to the radiant heat. Filters must be fireproof, if fitted and a motor shield is required over the main supply fan motor if directly in front of the heater.

When installing the heater, minimum clearance is required around the heater.

If the heater is to be fitted at a height, then the structure of the gantry must be capable of the heaters weight (which can be found in section 4, table 1, 2), also a safe working platform and access must be allowed for; to enable easy and safe working access.

Note: The front of the heater is the side on which the burner is fastened.

When designing a system, allowance must be made so equipment can be serviced after installation and for the fitting of any spares, which may be required. The BMG is designed to be installed within an Air Handling Unit or ductwork.

The appliance is designed to work in a maximum ambient temperature of 40°C. The Air Heaters are mounted direct on the floor and do not need any fixing. The base on which the heater is positioned should not be less than 150mm (6 inches) thick and must be constructed of non-combustible material.

Any combustible material adjacent to the heater and the flue system must be placed or shielded as to ensure that its temperature does not exceed 65°C.

WARNING!

No air heater shall be installed where there is a foreseeable risk of flammable particles, gases, vapours or corrosion inducing gases or vapours being drawn into either the heated air stream or the air for combustion. In such cases installation may only proceed if the air to be heated and the air for combustion are ducted to the heater from an uncontaminated source, preferably outside the building.

If this heater is to be suspended then the weight in table 1, 2 in section 4 must be taken into account.

Section 6: Air Supply

Ductwork

All delivery and return air ducts, including air filters, jointing and any insulation or lining must be constructed entirely of materials, which will not contribute to a fire, are of adequate strength and dimensionally stable for the maximum internal and external temperatures to which they are to be exposed during commissioning and normal operation. In the selection of materials, account must be taken of the working environment and the air temperatures which will result when the overheat limit thermostat is being commissioned. Where inter-joint spaces are used as duct routes, they should be suitably lined with fire-resisting material.

A full and unobstructed return air path to the air heater must be provided.

If the air heater is to be installed in a plant room, the return air and warm air discharge arrangements must be such as to avoid interference with the operation of the flue by the air circulation fan. The return air intake and the warm air outlet(s) should therefore be fully ducted, in the plant room, to and from the heater, respectively. The openings in the structure of the plant room through which the ducting passes must be fire stopped.

In addition, where there is a risk of combustible material being placed close to the warm air outlets, suitable barrier rails should be provided to prevent any combustible material being within 900mm (3 ft) of the outlets.

Airflow

It is essential that the correct amount of air is provided through the heater and should be evenly distributed when entering the heater. All pressure calculations/resistances for air are ambient with the heater in the "off" position.

Adjustable by pass plates.

HM Compact models fitted into larger cabinets for internal or external use should be fitted with adjustable air balancing plates or a simple restriction damper. If the work is not going to be carried out by BMM Heaters Ltd then we recommend that the installer ensures that it can be altered to give guaranteed minimum equal air over the heat exchanger. (See Minimum and Maximum air flow volumes in section 4 table 1, 2).

Section 7: Overheat Protection Device

Overheat protection is fitted in case the air flow falls below the minimum necessary for safe operation of the heater, which may be caused by failure of the supply fan motor or belt failure, dirty filters or inlet damper failure. If the air flow falls too low, the high limit will trip out and will require manually resetting. If this happens on a regular basis it must be investigated by a competent registered engineer as this could cause serious damage to the heater. The over heat is set 20°C above the running temperature after 30 minutes.

If the heater is supplied without a fan in module form then the fan stat on the L4064 will have to be wired by others. Otherwise BMM Heaters will wire the fan control, please see dedicated wiring diagram supplied with this heater.

WARNING!

If the heater has a Honeywell combined thermostat installed then the jumper link must be removed from the replacement thermostat.

Heat exchanger damage may be the result.

Failure to follow these instructions can result in death, injury, property damage or product damage.

Once the overheat is set to the correct operating temperature the commission engineer must seal the overheat stat.

Ensure that the fan and limit settings are as follows:-

Fan On 35°C

Fan Off 25 °C

Limit 20 °C above normal running temperature no greater than 100 °C

Section 8: Flue System & Ventilation

Always ensure that adequate combustion air is provided to suit the total installation of all combustion equipment in accordance with BS6230 or BS5440. The ventilation rates for B-Type appliances can be found on page 13 in this manual.

Flue pipe runs may be horizontal or vertical and terminate either through the wall or roof.

The flue dia can be found in Section 4 table 1, 2

The maximum flue length of C appliances is 12 metres in total & the maximum flue length for a B appliance is 12 metres. Note! 1 x 90° Elbow = 1metre length and 1 x 45° bend = 500mm length

All flue pipes must be sealed. Using seamless, aluminum or stainless flue pipe as supplied by BMM Heaters Ltd or equivalent. Please ensure that the manufacturer's instructions are followed.

B-Type Appliance

If the air heater is a B-Type appliance then the air for combustion will be taken from either the room or outside via combustion air grills fitted on the burner compartment. The installer must make sure there is adequate ventilation and that it complies with BS6230 & BS5440; plus any other relevant regulation & fire regulation.

All joints must be sealed to prevent products of combustion from entering the building.

If the flue is to pass through a combustible part of a building then the flue pipe will require a non-combustible sleeve with an air gap of at least 20mm. The flue must be installed at least 150mm away from any combustible material.

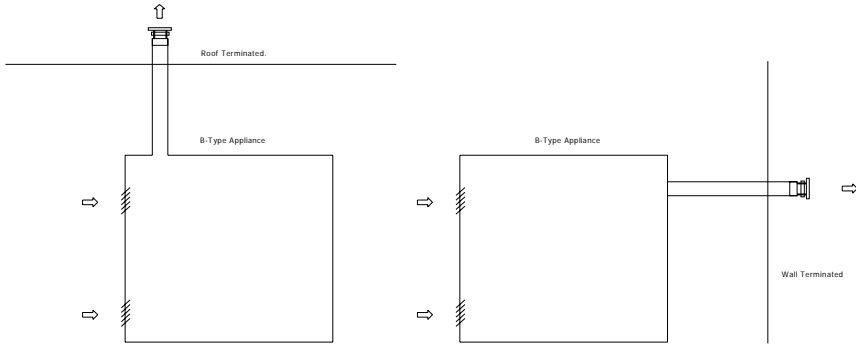
The temperature of any combustible material must not exceed 65°C when the heater is in operation.

When maximum flue runs are unavoidable or when the flue is subjected to cold air and condensation is unavoidable then provisions must be made to remove condensation at a point to which it can be directed into a drain or gully.

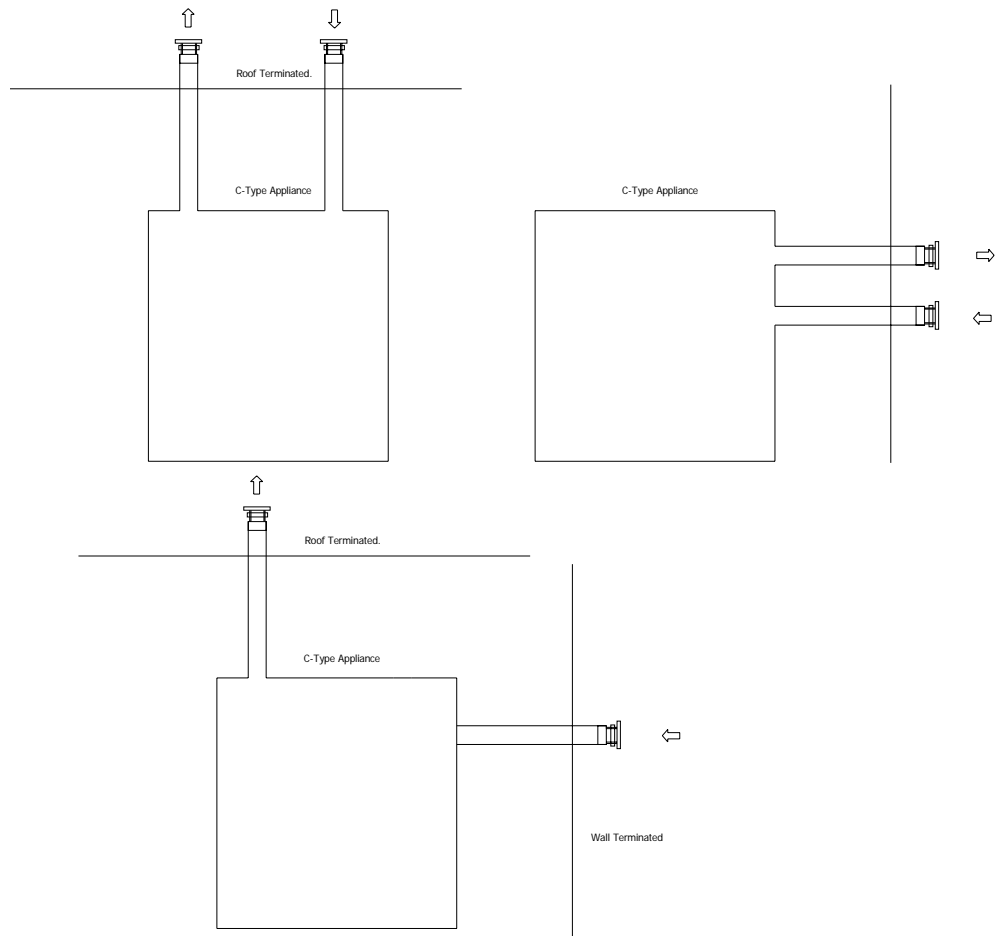
Note!

The condensate drain must be connected in Non-corrodible material not less than 20mm diameter. Copper must not be used for condensate drains.

B Type Appliances



C Type Appliances



On both B & C type flues a terminal guard must be fitted over the terminal if the wall terminal is below 1.8 metres from floor level and the fresh air intake must be at least 500mm from floor level.

A terminal Guard can be provided by BMM Heaters if required, please contact our sales office for a price and availability.

When installing as a C5-Type appliances the ducts must not be fitted on opposite wall and must be fitted on either the same wall or a walls at right angles to each other.

C-Type flues the distance between the exhaust terminal and fresh air terminals must be at least 700mm apart.

If a common flue system is used the minimum size required is 200mm and the size will increase prorata to the size of the heater flue.

Note! The fresh air duct and exhaust duct must be the same size and must not exceed the maximum flue runs allowed.

Ventilation for B Type Flued appliances.

Where the heater is to be installed in a plant room, the heater requires the plant room housing to have permanent air vents communicating directly with the outside air, at a high level and at a low level. Where communication with the outside air is possible only by means of high level air vents, ducting down to floor level for the lower vent(s) should be used. Air vents should have negligible resistance and must not be sited in any position where they are likely to be easily blocked or flooded, or in any position adjacent to an extraction system, which is carrying flammable vapour.

Grilles or louvers should be designed so that high velocity air streams do not occur within the plant room.

The ventilation should be installed to in accordance with local and national codes.

Ventilation Requirements:

The space in which the heater is situated must be adequately ventilated, see below for the minimum ventilation area at low and high levels.

Low Level: 540cm² plus 4.5cm² per kW after 60kw.

High Level: 270cm² plus 2.25cm² per kW after 60kw

Ventilation for C Type Flue Appliances.

No additional combustion air is required; however provisions for ventilation to cool the plant room may be required.

Section 9: Gas Piping

All Gas Pipe-work to the appliance should be installed in accordance with current regulations, local and national codes and must be connected with an acceptable gas isolation valve and union, so that the burner maybe removed to aid servicing and inspection of the burner.

Size and Connection

The following considerations are to be taken into account:

- a) A union and gas ball valve must be fitted to the inlet connection on the heater, so that the heater can be isolated or removed without having to isolated the whole gas supply to the building.
- b) Pipe work smaller than the inlet gas connection should not be used.
- c) The gas supply pipe is adequately sized to carry correct volume of gas from the gas meter to the heater(s).
- d) The heat input and gas flow rates for each heater can be found in section 4 table 1, 2, 3 and 4 to aid in the design of gas supply pipe work.
- e) All gas pipe work and electrical connections must be adequately supported and must not support any of the heaters weight or rely on the strength of the burner gas pipe work.
- f) Unless the heater is suspended or movement is apparent, the BMM Heater must be connected with medium, heavy or copper pipe; otherwise the use of an approved flexible connection between the isolating valve and the heater can be used. We recommend that the flexi hose is one size bigger than the heater connection to reduce any pressure loss.

The minimum inlet gas pressure for natural gas should be 20 mbar.

Please note: We require a minimum of 17.5mbar at the inlet when running and a maximum of 75mbar, if this is exceeded then an external to the appliance governor must be fitted.

Important: The complete installation must be purged and tested for gas soundness in accordance with local, national codes and a registered engineer.

The gas connection sizes can be found in section 4 Table 1, 2

Section 10: Condensate Drains

When maximum flue runs are unavoidable or when the flue is subjected to cold air and condensation is unavoidable then provisions must be made to remove condensation at a point to which it can be directed into a drain or gully.

Note!

The condensate drain must be connected in Non-corrodible material not less than 20mm diameter.

WARNING!

Do not use plastic connections, as the temperature may be high at the outlet to the drain. Copper pipe must not be used.

Important

Condensing heaters may be subject to local regulations with respect to the discharge of condensate.

Section 11: Electrical Connections

All external wiring must be in accordance with current IEE Regulations and local regulation which apply.

The method of connection to the mains electricity supply should allow complete electrical isolation of the heater and the supply should serve the heater only. The mains isolator should be provided adjacent to the heater in an easily accessible position. The isolator must have contact separation of at least 3 mm on all poles.

The electric and controls terminations are located on the front of the Heater housed in an interface panel. All heaters are compatible for inter-facing with building management systems and 0-10v DC is required as standard on Modulating heaters.

All wiring and control cables must be ran in conduit and correct size glands used etc.

All appliances must be earthed.

Each heater manufacture is individually made to suit the customer so a dedicated circuit will be attached to this manual. BMM Heaters will also attach a circuit within the interface panel.

Table 3: Electrical Data

Model	Motor size Three phase	Motor size Single phase	Motor rated supply fuse (Three phase)	Motor rated supply fuse (Single Phase)	Burner Voltage
35	N/a	500 w	N/a	5 Amps	240v 1ph 50Hz
45	500w	500 w	10 Amps	5 Amps	240v 1ph 50Hz
60	750w	1.1kW	10 Amps	10 Amps	240v 1ph 50Hz
70	750w	1.1 kW	10 Amps	10 Amps	240v 1ph 50Hz
85	750w	1.1 kW	10 Amps	10 Amps	240v 1ph 50Hz
95	1.1 kW	N/a	10 Amps	10 Amps	240v 1ph 50Hz

Controls: BMM Heaters can supply controls for these heaters upon request. Please confirm with us the type of controls prior to connecting to check compatibility.

Note: All heaters have been electrically tested at BMM Heaters factory.

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

Section 13: Heater Controls

The heater can be used with most Building Management Systems; However BMM Heaters can supply a control panel which includes a thermostat, timeclock and frost protection. The Instruction and product information will be supplied with the control unit, if you require a control panel please contact BMM Heaters and quote the part number.

On/Off Burner

The heater interface panel connections:

1. 240v & N supply
2. T1 & T2 is the enable, T1 & T2 must break when up to the temperature required. All interlocks to be wired in series with T1 & T2. (The burner must be interlocked with the supply fan)
3. T3 - Lockout 240v

Please note!

The supply fans require a 10min overrun after burner shutdown to cool the heat exchanger to prevent damage to the heat exchanger.

If you require any further information or you have any special requirements, please contact our technical department.

Modulating Burner

The heater interface panel connections:

1. 240v & N supply
2. T1 & T2 is the enable; T1 & T2 must break when up to the temperature required. All interlocks to be wired in series with T1 & T2. (The burner must be interlocked with the supply fan)
3. T3 - Lockout 240v
4. Modulating valve terminal 1 - 0v
5. Modulating valve terminal 2 - 24vac
6. Modulating valve terminal 5 - 10vdc

Please note!

The supply fans require a 10min overrun after burner shutdown to cool the heat exchanger to prevent damage to the heat exchanger.

If you require any further information or you have any special requirements, please contact our technical department.

WARNING!

Electrical Shock Hazard

Use extreme caution while working on this appliance.

Failure to follow these instructions can result in death or electric shock.

Only competent engineers should carry out work on this appliance.

Section 12: Commissioning

COMMISSIONING MUST BE CARRIED OUT BY A COMPETENT REGISTERED ENGINEER (CORGI), ALSO TO BE USED WITH BURNER COMMISSIONING DETAIL SEE BURNER INSERT

Operating & Safety Instructions

1. This Heater does not have a pilot. It is equipped with a direct spark ignition device that automatically lights the gas burner. DO NOT try to light burners by hand.

2. BEFORE OPERATING, leak test all gas piping up to heater gas valve. Smell around the unit area for gas.
DO NOT attempt to place heater in operation until source of gas leak is identified and corrected.

3. Do not attempt to operate unit, if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to trying to start the unit.

Start-up

1. Turn thermostat or temperature controller to its lowest setting
2. Turn off gas supply at the manual shut-off valve
3. Turn off power to the unit at the disconnect switch.
4. Remove access panel or open door to unit vestibule housing the gas heater.
5. Check the inlet pressure is a 20mbar and carry out a tightness test on the gas pipe work; once test is completed carry on with commissioning.
6. Open all manual gas valves
7. Turn power on

8. Set thermostat or controller to its highest position to initiate call for heat and maintain operation of unit.
9. Draft inducer will run for a 15 to 30 second pre-purge period (See Sequence of Operation provided)
10. At the end of the pre-purge the direct spark will be energized and gas valve will open
11. Burners ignite.

• **Failure to Ignite**

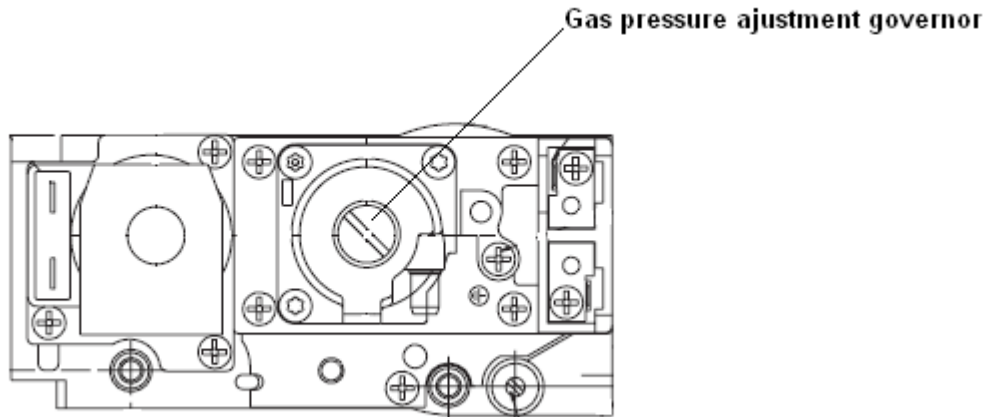
1. On the initial start-up or after unit has been off long periods of time, the first ignition trial may be unsuccessful due to need to purge air from manifold at start-up.
2. If ignition does not occur on the first trial, the gas and spark are shut-off by the ignition control and the control enters an inter-purge period of 15 to 90 seconds, during which the draft inducer continues to run.
3. At the end of the inter-purge period, another trial for ignition will be initiated.
4. Control will initiate up to three ignition trials on a call for heat before lockout of control occurs.
5. Control can be brought out of lockout by turning thermostat or controller to its lowest position and waiting

Check & Adjust Manifold Pressure

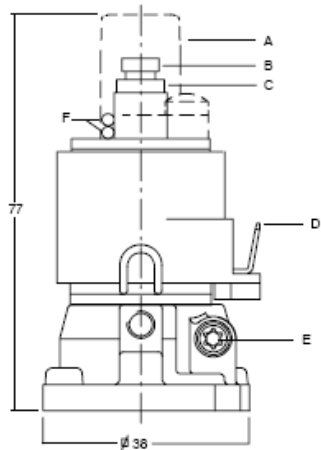
The burner pressure should be taken after the burner has been running for ten minutes.

- For 2 stage and modulating control systems manifold pressure should be 3 mbar low fire. Adjust Lo Regulator on 2 stage gas valve, if necessary. After that the burner high fire manifold pressure should increase to 8.75 mbar.
- For On-Off units the manifold pressure should be 8.75 mbar.

The burner pressure is adjusted by turning the multi block governor in either a clockwise rotation to increase the pressure or in an anti clockwise rotation to decrease the pressure. Once the pressure has been set it must be sealed with the use of paint or temper sealant.



Setting the Modureg.



- A. Cap
- B. Adjustment Screw (7mm) for minimum Pressure setting
- C. Adjustment Screw (9mm) for maximum Pressure setting
- D. 6.3 mm AMP Terminals
- E. M5 pressure feedback connection (if used)
- F. "O" - Ring x 2

Adjustment, checkout and maintenance

Important - Adjustments should be made by qualified persons only.

Allow time for pressure to stabilize before making adjustments. It is recommended that the Modureg is operated a few times to ensure correct setting.

Take care that after any adjustment cap and "o" - ring are mounted.

The maximum pressure setting must first be adjusted because any adjustment of maximum pressure setting influences minimum pressure setting.

Adjusting maximum pressure setting (see fig 1)

- Disconnect pressure feedback connection (if applicable).

- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner pressure (measuring point must be as near to burner as possible)
- Energize modulating coil, operator, set control in operation and wait until an outlet pressure is recorded on pressure gauge.
- Turn the maximum rate adjustment screw clockwise for increasing or counter-clockwise for decreasing the maximum pressure setting if adjustment is needed.
- Check minimum pressure setting and readjust if necessary
- Mount cap and "O"- ring and reconnect pressure feedback connection (if applicable)

Adjusting minimum pressure setting (see fig 1)

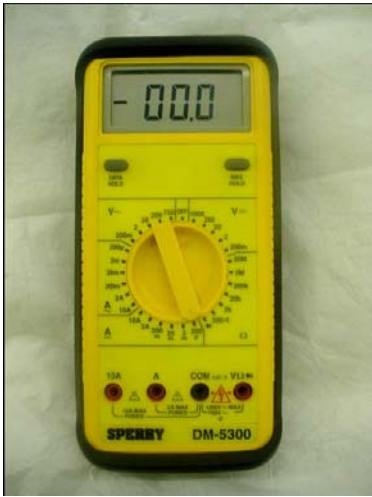
- Disconnect pressure feedback connection (if applicable).
- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner pressure (measuring point must be as near to burner as possible)
- Disconnect electrical connection of Modureg
- Energize operator, set control in operation and wait until an outlet pressure is recorded on pressure gauge.
- Turn the minimum rate adjustment screw clockwise for increasing or counter-clockwise for decreasing the minimum pressure setting if adjustment is needed.
- Check if main burner lights easily and reliable at minimum pressure.
- Mount cap and "O"- ring and reconnect pressure feedback connection (if applicable)

Checkout

After any adjustment, set appliance in operation and observe through a complete cycle to ensure that burner system components function correctly. Once set this unit requires sealing.

The flame signal strength must be checked as below.

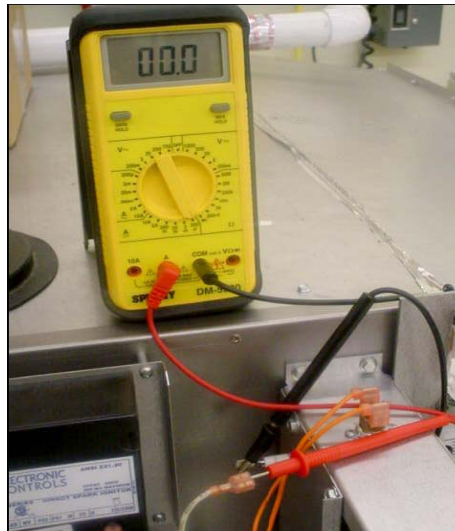
1.) A quality Volt-Ohm-Amp Meter with a scale capable of reading microamperes is required. Typically meters with only milliamp scales cannot provide necessary reading sensitivity.



Digital VOAM with DC
scale
Microampere scale

Set meter to read lowest DC microamp

2.) Disconnect flame sensor lead from flame sensor on burner tray. Test leads need to be connected in series.



3.) Connect Red test lead between A (amp) on meter and flame sensor lead terminal. Connect the Black test lead to COM connection on meter and to flame sensor tab.

Digital VOAM with DC Microampere scale Set meter to read lowest DC micro amp scale

4.) Initiate operating cycle. When burners ignite, flame signal in micro amps will register on meter readout.

Flame signal should be greater than 1.0 micro amp. Flame rod should be straight and located 22mm in front of the burner face, as received from the factory. No adjustment of flame rod position should be made unless it has been bent during handling.

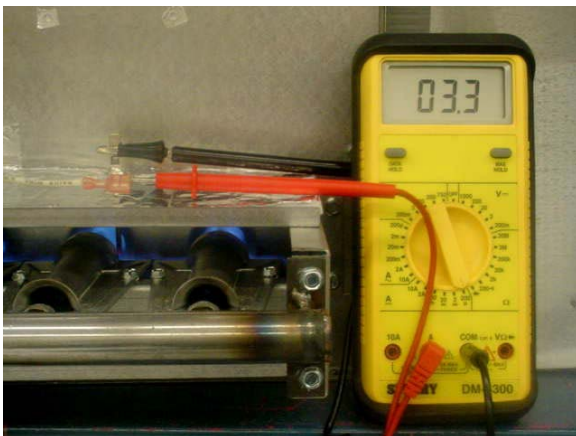
5.) A reading between .5 and 1.0 micro amp is marginal for the operating control. If flame sensor is immersed in burner flame and a marginal signal is obtained, a poor ground connection is indicated. Identify cause of poor ground and correct.

6.) If the flame rod is not in contact with the burner flame, check that burners are secured properly to bracket.

Then check gas pressure at start-up (gas manifold pressure should be 3mbar.). If manifold pressure is correct, check for partial blockage in gas orifice or flame holder of sensor burner. Clean and replace as necessary.

7.) If start-up is satisfactory and low flame signals are obtained during operating cycle check as follows:

a. If draft inducer is operating at high-speed (2800 rpm or higher) gas manifold pressure must be 3mbar. to 8.75mbar



Typical flame current readings are greater than 1.0 micro amp for HM burners

Note: The flame sensor is not a thermal device and therefore its temperature does not directly affect the flame signal reading. The flame sensor does not have to "glow" to produce a suitable flame signal.

After running the unit for a period of one hour you will be able to get a running temperature from the fan limit side of the stat. When you have this you must set the over heat to 20°C above the running temperature. The supply fans should be shut down once, when the burner is running, to try the overheat protection device and the fans must be switched on as soon as it locks out on over heat. Once satisfied the commission engineer must seal the overheat device.

All gas nipples are to be replaced and checked for tightness and checked with leak detection fluid.

A leak detection test is to be done with leak detection fluid and electronic leak detector on the gas train while the burner is running, to see if there are any leaks in the burner gas train and a soundness test is to be done on all gas work.

Finally make a full record of combustion data on commissioning sheet provided; a copy is to be presented to the customer and to BMM Heaters on completion of work. The commissioning sheet should include the following:-

- (a) Model and serial numbers.
- (b) Heater running temperature and over heat settings.
- (c) Full thermal input.
- (d) Governor pressure settings (pilot for start gas and main for full fire).
- (e) Gas flow rates for full fire.
- (f) Burner damper setting and pressure switch settings.
- (g) Flame signal strength on full fire.
- (h) Exhaust gas O², CO², CO and temperature.

19. After setting all air pressure switches and valves etc, you must mark the position or lock off if possible.

Please note BMM Heaters provide a full commissioning service if required. Also if you require further information call BMM Heaters technical department.

TYPICAL FLUE GAS READINGS

O² - 5% to 6%

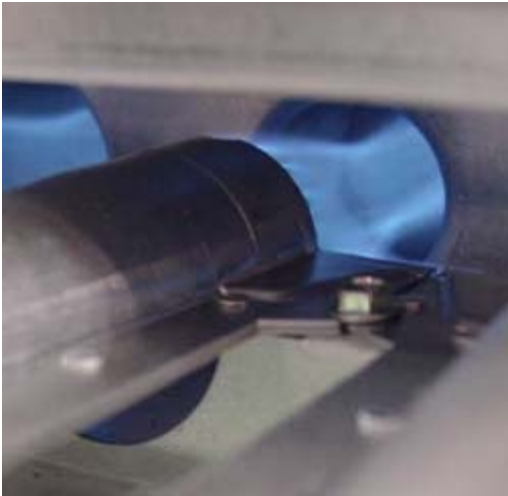
CO² - 9.5% to 8.8%

CO - up to 100 PPM (Typical approx 1 PPM)

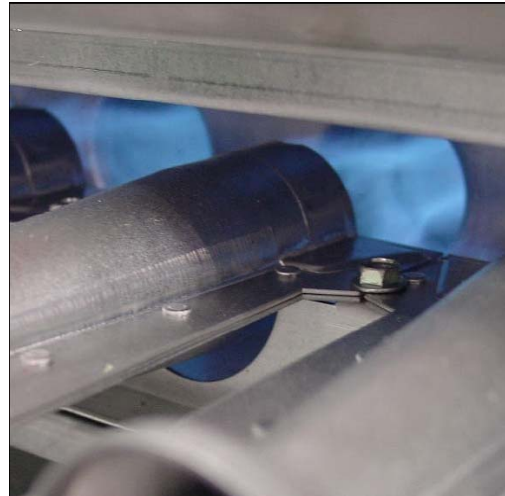
Flue Stack Temperature - Up to 250°C Nett

Burner Flames

Prior to completing the start-up, check the appearance of the main burner flame. See Figures below for flame Characteristics of properly adjusted Natural gas systems.



Burner Flame @ Start-up 3 Mbar. Manifold Pressure Draft Inducer - High Speed



Burner Flame @ High Fire 8.75 Mbar Manifold Pressure Draft Inducer - High Speed

Figure 6A Figure 6B

1. The burner flame should be predominately blue in color and well defined and centered at the tube entry as shown in Figures above. Distorted flame or yellow tipping of natural gas flame, may be caused by lint and dirt accumulation inside burner or at burner ports, at air inlet between burner and manifold pipe, or debris in the main burner orifice. Soft brush or vacuum clean affected areas.

Poorly defined, substantially yellow flames, or flames that appear lazy, indicate poor air supply to burners or excessive burner input. Verify gas supply type and manifold pressure with rating plate.

Poor air supply can be caused by obstructions or blockage in heat exchanger tubes or vent discharge pipe. Inspect and clean as necessary by to eliminate blockage. Vacuum any dirt or loose debris.

Clean heat exchanger tubes with stiff brush. Poor flame characteristics can also be caused by undersized combustion air openings or flue gas recirculation into combustion air supply. Increase air opening size or re-direct flue products to prevent re-circulation.

Reduced air delivery can also be the result of fan blade slippage, dirt accumulation the fan blade or low voltage to draft inducer motor. Inspect draft fan assembly and be sure fan blade is secure to motor shaft. Check line voltage to heater.

Section 13: Servicing

INSTRUCTION FOR THE SERVICING OF THE HM RANGE

PLEASE NOTE SERVICING MUST ONLY BE CARRIED OUT BY A COMPETENT REGISTERED ENGINEER (CORGI)

BEFORE CARRYING OUT ANY WORK ON THE UNIT SEE THAT THE ISOLATING SWITCH IS IN THE 'OFF' POSITION AND THE GAS SUPPLY IS SHUT OFF.

BMM HEATERS ONLY RECOMMEND THE USE OF PARTS SUPPLIED OR RECOMMENDED BY OURSELVES.

INFORMATION IS FOR GUIDANCE OF QUALIFIED SERVICE ENGINEERS ONLY

Note: We recommend that the Heater is fully serviced every year and re-commissioned. If the flue gas passages in the heat exchanger, the combustion chamber or flue fan are blocked, the Heater can overheat causing the unit to shut down on the overheat thermostat.

To clean the Heat exchanger:

(a) The burner assembly

Burner Removal (With gas and electrical supply isolated):

- Disconnect the electrical supply to the burner
- Disconnect gas valve plugs.
- Unscrew gas union assembly at inlet to gas train and remove gas train assembly.
- Remove fixing screws holding burner to heater front and lift away burners.
- Fully service burner and replace electrodes, if required
- The flue fan must be clean and check for corrosion.
- Brush any deposits from all of the flue ways using a brush. Also brush down the heat exchanger tubes.
- Remove any soot from the heat exchanger with a vacuum cleaner.
- Inspect soundness of combustion chamber/heat exchanger.

- Replace all items in reverse order.
- Once servicing is complete the heater must be re-commissioned.

Note: Regarding External Heaters

If the heater is housed within an Air Handling Unit, there will be sufficient room to allow servicing. Servicing as per our standard internal procedures.

Please note in extreme weather conditions, always ensure any electrical connections etc are protected and do not allow water onto them.

If stand alone external heater, there will be a door, which is hinged up over to allow protection to the engineer from weather conditions

Wet Conditions

If it is found that the area in which the heater is installed has become wet/flooded, the heater must be electrically isolated immediately and an investigation to find out if any water has penetrated into the heater controls. If so, ensure they are dried out properly before re-installing the electric supply.

Burner Maintenance:

The in-shot gas burners require inspecting and cleaning on an annual basis, we also recommend that the injectors are checked at the same time.

Only suitable cleaning agents can be used to clean this product, flammable liquids i.e. thinner must not be used to clean this equipment. Polish and standard cleaning agent from your local heating parts center can be used.

Servicing Heat Exchanger:

Heat Exchanger of multi-tube construction, once the burner has been removed the heat exchanger tubes can be cleaned and inspected.

Flue Fan:

The flue fan impeller must be cleaned and check for corrosion on a regular annual basis.

Recommended intervals:

Weekly check:

Check that there are no apparent leaks.

Clean air filters if fitted, if of the washable type, or replace where necessary.

Quarterly check:

As weekly check, and also:

Check the tension of the main fan belt(s).

Check the flue for condensation.

Remove the Burner Inner Assembly - clean and replace.

Annual Inspection:

Clean heat exchanger surface and inspect heat exchanger.

Clean and inspect flue fan.

Inspect and align fan and motor pulleys. Check the tightness of the motor bolts.

Adjust fan belts for tension.

Inspect and adjust electrical connections.

Check all wiring and tube connections.

Remove the burner inner assembly - clean and replace.

The modureg must be checked annually (if fitted)

Start the Heater and check CO readings, stack temperature efficiency and CO level.

Check the combustion air supply and check the smoke reading.

Overheat/Limit control:

Note!

The injectors in this appliance can only be clean with compressed air, the use of any other object ie drill bit etc could widen the injector causing the unit to over fire and could cause damage to the heater or to person.

The limit control provides protection for the heater, should the temperature rise above a safe level. If an overheat condition occurs, the limit control will shut down the burner and hold it off until the manual reset button is pressed.

NOTE: If the limit requires re-setting more than once after first re-set, then a competent engineer must be called to investigate further.

Fan setting - 35°C ON (If required)
- 25°C OFF

High Limit - 20°C above normal running temperature no greater than 100°C

Important: When integrated with building management system, the fan will be operated via their controls and all interlocks must be fitted to ensure the burner cannot start until the supply fan is running. On burner shutdown the supply fan overrun will continue running for 10 - 15 minutes to dissipate residual heat.

WARNING!!

If cracks have been found on the heat exchanger tube, the heat exchanger must be replaced before putting the unit back on line.

Supply Fan Assembly:

Inspect the fan blades to see they are not damaged and that there is no excessive building up of deposits that could give an imbalance via access panel on the side of the heater. If necessary clean the fan blades.

The main fan bearings are permanently sealed and do not require lubrication.

Check belts for signs of wear and replace if required.

Gas control valves maintenance:

No regular maintenance is required on these devices. Please refer to section 16 for removal or replacement of parts.

WARNING!

Replace faulty gas valve with genuine BMM Heater replacement part; failure to do so could result in death, injury and damage to property.

Note! Check all gas pipes and joints to ensure there are no cracks or gas leaks. Any cracks in the pipe work or joint must be repaired.

Fan control:

The burner should start its safety sequence and then fire up. When the heater achieves 35°C the supply fan will cut in and your heater is up and running. When the space is up to temperature the burner will stop and the supply fans will run on until the fan control reaches 25°C and then the supply fan will shut down. The heater will then switch on and off as required via the day thermostat and time clock. If your heater fails to start, check burner lockout and high limit resets as referred to in fault findings, if any further investigation is required or the heater repeatedly locks out then a Corgi registered engineer must be called to investigate further.

Please Note: You must not electrically isolate the heater when in full fire, always wait until the burner stops and the supply fan over runs to dissipate the heat before electrically isolating.

For summer ventilation switch on/off switch to off and set fan switch from auto to manual.

Cleaning Of Heater:

The heater can be cleaned externally using a damp cloth with a light detergent. Please note: this is on the outer panel only, away from all of the electrics. No substance can be used that will cause harm to the surface of the metal, or remove paint etc.

Please Note: You must not use water on unpainted galvanized finished surfaces.

Section 14: Removal and Replacement Parts

Honeywell gas valve

1. Isolate electric and gas.
2. Remove Din Plugs by using a terminal screwdriver to undo locking screw.

3. Undo valve flanges with Phillips screw driver, Lift out valve assembly.
4. Replace and re-assemble in reverse order, taking care that the O rings are in position.
5. Check for gas soundness and re-commission heater.

Fan and limit stat

1. Isolate electric supply.
2. Remove outer casing and disconnect wires. The wires are held in by spring terminals which will release by pushing a small screwdriver into the slot next to the wiring termination.
3. Remove fixing screws, which secure stat to front of panel, carefully withdraw stat from heater and remove casing.
4. Re-assemble in reverse order and check settings, adjust if required to fan on 35°, fan off 25°, high limit 90°.

Supply Fan

1. Isolate electric supply.
2. Remove front lower access panel.
3. To remove fan belt, slacken both adjustment bolts on motor plate by turning anti-clockwise.
4. Remove rear panels (opposite side to burner).
5. Undo x 4 bolts and remove shelf assembly.
6. Undo x 4 bolts on the fan assembly and then the fan can be withdrawn.
7. Re-assemble as reverse.

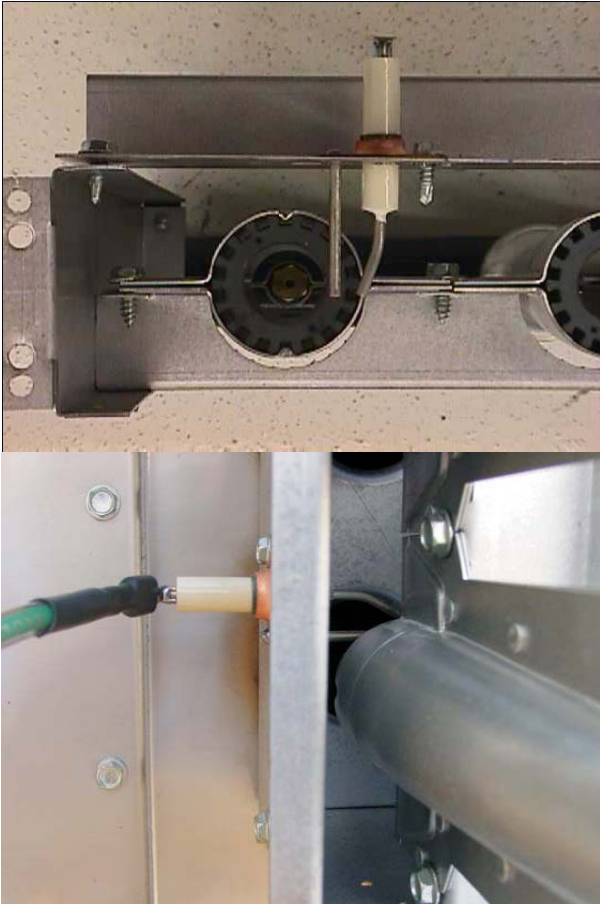
Main Supply fan

1. Isolate electric supply.
2. Remove front lower access panel.
3. To remove fan belt, slacken both adjustment bolts on motor plate by turning anti-clockwise.
4. Disconnect fan motor electrics.
5. Remove motor on motor plate and undo x 4 bolts, Note, you will require x 4 locking nuts on replacement.
6. Re-assemble in reverse order.
7. Re-tighten the supply fan belt until 12mm movement is obtained.
8. Check fan rotation is correct.

Ignition Probe

HM Series

Spark Igniter Location & Spark Gap Setting



Care should be taken if igniter gap needs to be adjusted to avoid cracking the ceramic sleeve around the high voltage electrode. Always adjust gap by bending the ground rod. 3mm +/- 0.75mm

Igniter in burner housing

Recommend Tools to be used.

- a) Spanner 10mm, 13mm and 17mm
- b) Screwdriver - Terminal, medium flat blade and Phillips medium
- c) Stillsons - 14" and 18"
- d) Allen keys - standard metric set, 1.5mm - 10mm
- e) Side cutters/pliers
- f) Multi-meter
- g) Manometer
- h) Flue - brush for exchanger tubes

Section 15: Spare Parts

Spares List:

Item	Part No
Fan & Limit Stat	JTL 13A or Honeywell
Spark Electrode	10101
Ionization Probe	10201
Flue fan	10301
Gas Valve	10401
In-shot burner	10501
Control box	10601
Relay	10701
Modulating Valve	10801
Burner tube	10901
Flue Fan Relay	11001
Terminal Guard	11002
Control Panel	11003

Further parts or alternative parts can be supplied by BMM Heaters Ltd.

BMM Heaters Ltd reserve the right to upgrade or alter spare part at there discretion.

All components can be purchased from BMM Heaters.

WARNING

Only use parts recommended by BMM Heaters or other wise stated in this manual.

You must first contact BMM Heaters if you want to use alternative parts.

Section 16: Troubleshooting

Note!

Please refer to controller supplement supplied with this manual where more specific troubleshooting will be found.

Fault	Cause	Check
Burner Lockout	Burner fault, check sector lockout occurred on controls box	Refer to burner supplement finding chart
Overheat trip	Dirty filters, low supply air	Filters, supply fan belts, damper operations
Burner held off	No enable signal	Check BMS/Controls back via T1 & T2 in heater interface panel
Main fan runs continuously	Electrical	Summer/Winter switch set to summer(Manual) Fan thermostat set to low Fault Fan/Limit stat
Main fan Fails to run	Electrical	Fan Motor faulty Fan/Limit stat faulty Contactor faulty Motor on overload

Section 17: Users Instructions

Servicing, installation and commissioning must only be carried out by a competent person

This appliance requires servicing at least an annual service.

The outside of this cabinet can be clean using polish or a damp cloth, products which are high corrosive when in contact with metal should be used.

WARNING!

If you smell gas:

- 1. Open all windows and door.**
- 2. DO NOT try to light any appliance.**
- 3. DO NOT use electrical switches.**
- 4. DO NOT use any telephone in your building.**
- 5. Leave the building.**
- 6. Immediately call your local gas supplier after leaving the building; follow the gas supplier's instructions**
- 7. If you cannot reach your gas supplier, call the fire department**

USERS INSTRUCTIONS

Once the controls have been fully installed and proved with the Heater (all interlocks proved etc), the supply air has been balanced and only when the Heater has been fully commissioned by a qualified registered engineer (Corgi), you are now able to use your Heater safely.

Easy Lighting and Shutting Off Instructions

Burner Start up

1. Ensure Burner and Heater On/Off Switch is on.
2. Fan switch is in auto position. If the heater is controlled via a BMS then the supply fan should be running before the burner can start.
3. Make sure the time clock and thermostats are calling for heat or that the BMS is giving enable signal to terminals 1 & 2 in our interface panel.

Burner Shut down

1. Ensure Burner and Heater On/Off Switch is off.
2. Fan switch is in auto position.

3. The fans should run on for at least 10 min or till the fan limit is below 25°C to cool heat exchanger.

Make sure the time clock and thermostats are not calling for heat or that the BMS is not giving enable signal to terminals 1 & 2 in our interface panel.

WARNING!

In Emergency only! Use electrical isolator and the gas isolation valve to isolate the appliance.

Do not use electrical isolator to switch this appliance off in normal use, as the fan is required to run on to cool the heat exchanger failure to do so will cause damage to this appliance.

Simple Fault Finding

Some possible reasons for the heater not operating are:

1. Gas supply not turned ON.
2. Electrical Supply not turned ON.
3. The time and/or Thermostats may not be ON.
4. The Limit stat may have operated due to an interruption of electrical supply or fault with the distribution fan.

WARNING!

If the limit thermostats persistently operate, there is a fault which must be investigated by a qualified engineer registered with corgi. This Heater should not be electrically isolated during normal operation; doing so without a fan run on for 10 min will cause serious damage to the heater.

Simple Fault Finding (burner faults)

If the burner fails to ignition for any reason, it will go to lockout. This will be indicated by the red light on the heater (if fitted) or digitally shown on a display screen.

Remove power from heater or remote reset; call a registered engineer if this does not rectify the problem.

Lockout should not occur during normal operation of the heater and indicates there is a fault condition which must be corrected.

WARNING!

**Do not store or use petrol or other flammable vapours and liquids in the vicinity of this or any other appliance.
Some objects will catch fire or explode when placed close to the heater.
Failure to follow these instructions can result in death, injury or property damage.**

