



# The Powrmaster TE Range

## Users, Installation & Servicing Instructions Gas & Oil Fired Heaters

Direct Drive Fans

<b>TESTED</b>	
<b>STAGE 1</b>	<b>Full mechanical, construction, assembly and electrical sequence check</b> <input type="checkbox"/>
<b>STAGE 2</b>	<b>Full functional test in accordance with Quality System Procedures</b> <input type="checkbox"/>
<b>Heater Model</b> _____	<b>Final</b> <input type="checkbox"/>
<b>Heater Serial No.</b> _____	
<b>Type of Gas</b> _____	

**WARNING: THIS APPLIANCE MUST BE EARTHED**

# Certificate of Guarantee

## Dear Customer

This is to certify that this heater is guaranteed for two years parts and one year labour from the date of original commissioning. The heater must be commissioned within 4 weeks of installation.

The heat exchanger, where fitted, is guaranteed (parts only) for a further eight years, chargeable on a sliding scale basis, price relative to age.

## To make a claim

In the first instance you must contact your appliance supplier, or installer and provide:-

1. The appliance type and serial number.
2. The original commissioning documentation.
3. As much detail as possible on the fault.

Your supplier, or installer, will then contact Powrmatic to make a guarantee claim on your behalf.

## Conditions of Guarantee

1. The heater must have been installed by a competent recognised installer, and in accordance with the manufacturers instructions, building regulations and local regulations.
2. The heater has been professionally commissioned, within 4 weeks of installation, and a copy of the Commissioning Sheet returned to Powrmatic.
3. The heater has been maintained on a yearly basis by a competent servicing company.
4. The heater has been used in accordance with the manufacturers instructions.
5. The correct specification fuel has been used
6. No unauthorised repairs or modifications have been made.
7. Powrmatic 'General Conditions of Sale' have been observed.
8. Except for the obligation of Powrmatic Ltd to perform warranty repairs during the guarantee period, Powrmatic will not be liable in respect of any claim for direct or indirect consequential losses, including loss of profits or increased costs arising from loss of use of the heater, or any event arising there from.

## Exclusions

1. Gaskets and fan belts are not included in the guarantee

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**Important: This certificate must  
be kept with the appliance**

Failure to provide a copy of the Commissioning Sheet invalidates the heater warranty

### Installed

Date: \_\_\_\_\_ Signed \_\_\_\_\_ Installer

### Commissioned

Date: \_\_\_\_\_ Signed \_\_\_\_\_ Commissioning Engineer

# Users Instructions

## 1. Checks before lighting the Air Heater

The following checks must be made before lighting the heater(s)

- Ensure that the Auto/OFF switch on the heater panel is switched to OFF
- Ensure that the electrical supply to the heater is switched ON.
- Check that the MC200 is calling for heat (See MC200 User Instructions).
- Check that any other controls are calling for heat and, if there is a Summer/Winter mode, it is set to Winter.
- Check that the overheat (Limit) thermostat has not operated.

## 2. Lighting the Air Heater

### 2.1 Gas-fired Heaters

- Switch the Auto/OFF switch to Auto.
- The main air fans will start. Note that, with the exception of the TE21, the fan start may be staggered in which case the second fan will not start until the first is running.
- The burner air fan will run and after a pre purge period of approximately 30 seconds the ignition spark will be generated. TE21

The main gas valves will open and the main burner will be established

TE 31, 41 & 61

The start gas valves will be opened and a start gas flame established. When a start gas flame is established the main gas valves will be energized and the start gas flame will expand to main flame.

**NOTE:** If the main burner or a start gas flame fails to establish the burner will go to lockout and the lockout indicator / reset button on the burner control box will be illuminated. To restart the burner push the lockout reset button. Additional, more easily accessible, controls may be fitted that mimic the lockout indicator and reset button functions.

If the unit will not light after four or five attempts then shut down the unit and call in a service engineer.

### 2.2 Oil-fired Heaters

**NOTE:** If it is not possible to light the heater after 2/3 attempts contact the local service company.

- Switch on the electrical supply at the isolator.
- The main air fans will start. Note that, with the exception of the TE21, the fan start may be staggered in which case the second fan will not start until the first is running.
- The burner air fan will run and after a pre purge period of approximately 30 seconds the ignition spark will be generated and the oil valve opened. The main burner will then fire.

**NOTE:** If the burner fails to light it will go to lockout and the lockout indicator / reset button on the burner control box will be illuminated. To restart the burner push the lockout reset button.

If the unit will not light after two or three attempts then shut down the unit and call in a service engineer.

## 3. To Shut Down the Air Heater

- For Short Periods:  
Set the MC200 to OFF (See MC200 User Instructions).
- For Long Periods:  
Set the MC200 to OFF. Wait approximately 4-5 minutes

for the residual heat in the heat exchanger to be dissipated and then turn off the gas or oil supplies and electric supplies to the heater.

## 4. Description of Operation

**Important:** All heaters must be controlled by the fitted controls and not by use of the main switch in the electrical supply to the heater.

TE heaters are designed for the main air fans to run continuously thereby continually circulating the air in the building. The burner start up sequence will commence when the MC200 calls for heat. The burner air fan will run and after a pre purge period the burner will light.

When the MC200 is satisfied the burner will be turned off. On Hi/Lo and Modulating units the firing rate of the burner will be adjusted automatically by the MC200 to suit the heat demand.

### 4.1 Summer / Winter Modes

Summer: The heater fans alone will run at the dictate of the MC200 to provide air movement.

Winter: The heater will operate normally.

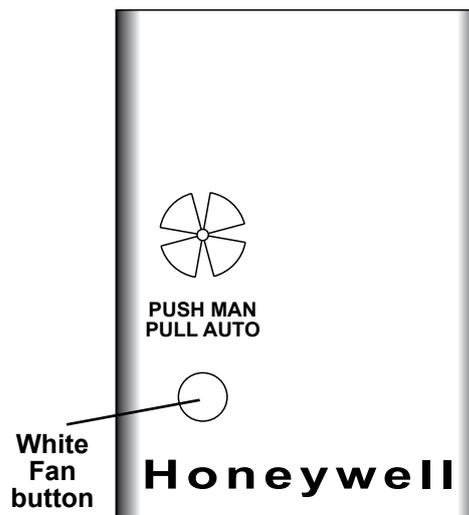
## 5. Fan and Limit Control

The fan and limit controls are mounted towards the top of the side panels of the heat exchanger section .

### i) Main Air Fan MAN / Auto

When the white button (Refer to Figure 1 below) is pushed in the fans will run continuously i.e not controlled by any external controls e.g. Timeclock. When the white button is pulled out the fans will start and stop automatically in conjunction with the burner. See Section 4.

Fig 1. Fan Thermostat



### ii) Limit Thermostat

This operates if high temperatures within the heater are detected, the burners are turned off and a red indicator light on the front of the heater is illuminated. The fault condition must be identified and rectified and the thermostat manually reset. Remove the black cover cap and press the exposed button to reset. When the unit has cooled push the reset switch on the front of

the heater to reset the limit thermostat interlock relay, the red indicator light will go out and the unit is operational again.

Note: The limit thermostat(s) can only be reset once the unit has cooled down.

Unless the cause of the fault condition is readily obvious, for example a power cut whilst the heater was operating, a service engineer should be contacted.

## **6. Maintenance**

Regular servicing is essential to maintain efficient, reliable and safe operation of the heater. Users are strongly recommended to have the heater serviced at least annually and preferably at the end of the heating season.

## **7. IMPORTANT**

Free access must be maintained to and around the heater for servicing purposes and the air supply to the heater must not be restricted in any way. Combustible materials must not be stored adjacent to the heater.

All Powrmatic heaters use gas, or oil, and electricity to power them, they may also contain moving parts such as pulley belts. It would be hazardous to tamper with or attempt to service unless you are a competent person in the field of Gas and Electrical work.

If you have any safety questions reference the servicing and installation of any of our heaters please do not hesitate to contact our head office for expert advice.

Your safety is paramount to us.

### **For gas fired heaters only:**

If at any time a gas leak is suspected turn OFF the gas supply - DO NOT USE A NAKED FLAME - and contact the local gas undertaking immediately.

### **Gas Safety (Installation & Use) Regulations**

It is law that all gas appliances are installed, adjusted and, if necessary, converted by qualified persons\* in accordance with the latest edition of the above regulations. Failure to install appliances correctly can lead to prosecution. It is in your own interests and that of safety to ensure that the law is complied with.

\* An approved class of person listed on the gas register.

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## 1. INTRODUCTION

The Powrmatic Powrmaster TE range of gas fired forced draught, closed flue, fanned circulation air heaters cover a heat output range of 88 kW (300,000 Btu/h) to 806 kW (2,750,000 Btu/h) and are intended primarily for heating commercial or industrial premises.

### Fuel Types

Gas fired units are certified for use on Natural Gas, Group H - G20, Group L - G25 and Propane - G31.

Oil fired units are supplied as standard for use with 35sec fuel and can be supplied for use with 28sec fuel as an option.

In accordance with guidelines from our burner supplier, Riello, the burners fitted to Powrmatic oil-fired heaters are suitable for fuels with a bio content of up to 10% only.

For fuels with a bio content of more than 10%, please consult our Technical Department.

The heaters are for floor mounting, freeblowing applications only.

TE heaters are also available as /EA variants which are suitable for siting externally.

TE heaters have a double axial fan assembly fitted upstream of the combustion chamber / heat exchanger assembly to circulate the air being heated and the system design is for the fans to run continuously thereby constantly circulating the air in the building.

Each fan is directly mounted onto the drive motor shaft and the speed is governed by an inverter. Heaters are fitted as standard with fully automatic monoblock On/Off forced draught gas burners and monoblock gas control assemblies. High/Low or

modulating burners are available as options.

Unless otherwise specified each heater is fitted with an MC200 electronic time and temperature control.

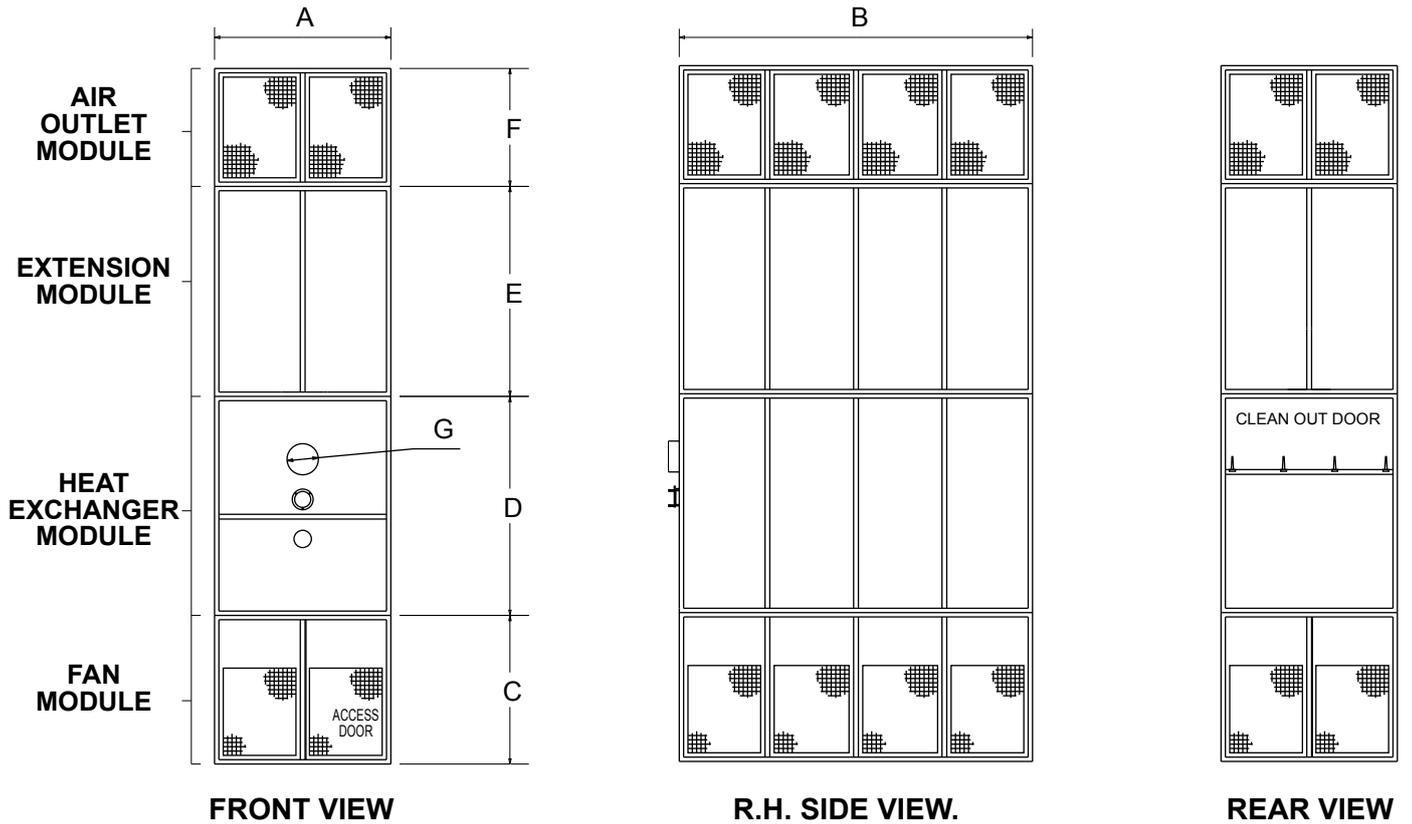
Each air heater must be connected to a closed flue system only.

### Gas Safety (Installation & Use) Regulations

It is law that all gas appliances are installed, adjusted and, if necessary, converted by qualified persons\* in accordance with the current issue of the above regulations. Failure to install appliances correctly can lead to prosecution. It is in your own interests and that of safety to ensure that the law is complied with.

\* An approved class of person listed on the gas register.

2 Technical Data  
2.1 Dimensions



Note: TE 21 Fans and Combustion chamber/Heat exchanger are in one section

Table 1. Dimensions (S.I. Units)

Model		A	B	C	D	E	F	G
TE21	mm	1010	1568	1873 in Total		1873	1416	150
TE31	mm	1162	2025	1213	1574	1778	660	200
TE41	mm	1518	2991	1213	1975	1899	959	300/350
TE61	mm	2026	4058	1721	2534	2432	1365	

Specifications, Burner Pressures and Electrical Data.

TE heaters are designed to suit individual applications. Please refer to the enclosed specification sheet for the data specific to the heater supplied.

Note: The number of extension modules (0 - 2) depends on the application.

### 3. General Requirements

#### 3.1 Gas Fired Heaters

##### 3.1.1 Related Documents

The installation of the air heater(s) must be in accordance with the rules in force and the relevant requirements of the Gas Safety Regulations, Building Regulations and the I.E.E. Regulations for Electrical Installations.

It should also be in accordance with any relevant requirements of the local gas region, local authority and fire authority and the relevant recommendations of the following documents.

##### Institution of Gas Engineers & Managers

**IGE/UP/1 (Ed.2)** Strength and tightness testing and purging of industrial and commercial gas installations.

**IGE/UP/1A (Ed.2)** Soundness testing and direct purging of small low pressure industrial and commercial gas installations.

**IGE/UP/1B (Ed.2)** Tightness testing and direct purging of small Natural Gas installations.

**IGE/UP/2** Gas installation pipework, boosters and compressors on industrial and commercial premises.

**IGE/UP/4 (Ed.2)** Commissioning of gas fired plant on industrial and commercial premises.

**IGE/UP/10 (Ed.3)** Installation gas appliances in industrial and commercial premises.

##### British Standards & Codes of Practice

**BS 9999** Code of practice for fire safety in the design, management and use of buildings

**BS 6230:** 2011 Installation of Gas Fired Forced Convection Air Heaters for Commercial and Industrial Space Heating.

##### 3.1.2 Service Pipes

The local gas undertaking should be consulted at the installation planning stage in order to establish the availability of an adequate supply of gas. An existing service pipe must not be used without prior consultation with the local gas undertaking.

##### 3.1.3 Meters

A gas meter is connected to the service pipe by the local gas undertaking or a local gas undertaking contractor. An existing meter should be checked, preferably by the gas undertaking, to ensure that the meter is adequate to deal with the total rate of gas supply required.

##### 3.1.4 Installation Pipes

Installation pipes should be fitted in accordance with IM/16:1988. Pipework from the meter to the air heater must be of adequate size. Do not use pipes of a smaller size than the inlet gas connection of the heater. The complete installation must be tested for soundness as described in the above Code. The complete installation must be tested for soundness as described in BS 6230.

##### 3.1.5 Boosted Supplies

Where it is necessary to employ a gas pressure booster the controls must include a low pressure cut off switch at the booster inlet. The local gas undertaking must be consulted before a gas pressure booster is fitted.

#### 3.2 Oil Fired Heaters

##### 3.2.1 Related Documents

The installation of the air heater(s) must be in accordance with the rules in force and the relevant requirements of the Building Regulations and the I.E.E. Regulations for Electrical

Installations.

It should also be in accordance with any relevant requirements of the local authority and fire authority and the relevant recommendations of the following documents.

OFTEC Technical Book 3: Domestic & Commercial requirements for oil storage and supply equipment.

OFTEC Technical Book 4: Oil fired appliances & system installation requirements.

OFTEC Easy Guides to non domestic oil feed pipes and oil storage.

#### 3.3 Air Supply

In buildings having a design air change rate of less than 0.5 /h, and where TE heaters are to be installed in heated spaces having a volume less than 4.7 m<sup>3</sup> /kW of total rated heat input grilles shall be provide at low level as follows:-

The total minimum free area shall not be less than 270cm<sup>2</sup> plus 2.25 cm<sup>2</sup> per kilowatt in excess of 60 kW rated heat input.

The air vent(s) should have negligible resistance and must not be sited in any position where it is likely to be easily blocked or flooded or in any position adjacent to an extraction system which is carrying flammable vapour.

#### 3.4 Air Distribution System

Care should be taken to avoid impeding the air throw with racking, partitions, plant or machinery etc.

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

Care must be taken to ensure that return-air intakes are kept clear of sources of smells and fumes, and in special circumstances where there is any possibility of pollution of the air by dust, shavings etc., precautions must be taken by carefully positioning return air intakes and by the provision of screens to prevent contamination.

#### 3.5 Electrical Supply

Wiring external to the air heater must be installed in accordance with the I.E.E. Regulations for Electrical Installations and any local regulations which apply. Wiring should be completed in flexible conduit.

TE heaters require a 400V - 3N, 50Hz supply. The method of connection to the main electricity supply must facilitate the complete electrical isolation of the air heater(s) and the supply should serve only the air heater(s).

The isolator must have a contact separation of at least 3mm in all poles. The method of connection should be provided adjacent to the air heater(s) in a readily accessible position.

See the accompanying wiring diagram for the heater electrical connections.

## 4. Installation of Air Heater(s)

### 4.1 General

**Before installation, check that the local distribution conditions, nature of gas and pressure (or oil type), and adjustment of the appliance are compatible.**

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.

The following minimum clearances for installation and servicing must be observed.

To the front	1.0m
To the rear	The depth of the heater
To the side	1.0m
Above the heater	1.0m

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

#### **IMPORTANT:**

1.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. In certain situations where only airborne particles are present it may suffice to fit filters on the air inlet ducts of the heater. Advice in these instances may be obtained from Powrmatic Ltd.

### 4.2 Location

The location chosen for the air heater must permit:

- the provision of a satisfactory flue system and an adequate air supply.
- adequate space for servicing and air circulation around the air heater.

The heater(s) must not be installed in conditions for which it is not specifically designed e.g. where the atmosphere is corrosive or salty, and they are not suitable for outdoor use unless the /EA style is specified. /EA heaters must be installed on a plinth such that there is a minimum distance of 0.5m between ground level and the lowest point of any air inlet grilles.

Where the location of the air heater is such that it might suffer external mechanical damage e.g. from overhead cranes, fork lift trucks, it must be suitably protected.

TE heaters are for normal operation within an ambient temperature range of -10 to 25°C.

### 4.3 Installation

TE heater installation may only be completed by Powrmatic Ltd or their appointed representatives. The heaters must be installed on a level noncombustible floor capable of supporting the weight of the heater.

### 4.4 Combustion & Ventilation Air Supply

There shall be provision for a supply of air for combustion.

#### 1) Installation in the heated space

In buildings with a design air change rate of 0.5 /h or greater, additional natural or mechanical ventilation is not necessary.

In buildings not having a design air change rate of 0.5 /h the following apply.

#### **Natural Ventilation**

Grilles having a free area of at least 2cm<sup>2</sup> per kW of rated heat

input shall be provided at low level i.e. below the level of the heater flue connection.

#### **Mechanical Ventilation**

Must ensure that the space air change rate is at least 0.5/h, must be of the 'input' type and interlocked to ensure the heaters cannot work if the input system is not working.

#### 2) Installation in plant rooms or enclosures

This type of installation is not applicable to TE heaters.

### 4.5 Flue System

A single wall tee piece is supplied with each heater and must be fitted to the flue outlet socket on the heater. A closed chimney system that conforms to the requirements of EN1856-1 and has a designation appropriate to the application must be connected to the outlet of this tee. The cross sectional area of the chimney serving the appliance must be not less than the area of the flue outlet of the air heater. The chimney must have a minimum height, from the heater to the flue terminal, of 2m. Horizontal runs of flue must be minimised but where they are unavoidable the ratio of vertical to horizontal flue should be not less than 3:1.

If necessary a single offset using two 45° bends can be included to avoid obstructions. The minimum equivalent resistance of the flue system should not be less than 0.0mb, the maximum not greater than 0.5mb. Details of how to calculate the resistance of the flue to be installed are given in Appendix A.

In order to minimise condensation the use of twin wall chimney is recommended. With high efficiency heaters some condensation in the chimney, particularly at the terminal, is unavoidable and in addition there can also be rain water ingress. Use of a chimney system having joint seals will minimise any leakage from the flue system. The heater tee is provided with a collection tray and the outlet from this should be run to a drainage point e.g. a gully. The condensation pipe from the collection tray to the disposal point should be of non-corrodible material of not less than 22mm (3/4") size.

Facilities should be made for disconnecting the chimney pipe(s) from the air heater(s) for inspection and servicing purposes.

The chimney outlet must be fitted with a terminal and where the heater chimney is less than 200mm (8") in diameter an approved terminal must be used.

The chimney must be supported independently of the air heater. The chimney must terminate in a freely exposed position and must be situated so as to prevent the products of combustion entering any opening in a building in such concentration as to be prejudicial to health or a nuisance..

The chimney terminal must be installed not less than:

- 300mm below an opening e.g. window, air brick etc.
- 200mm below eaves or gutter.
- 300mm from an internal or external corner.
- 1200mm from a surface facing the terminal.
- 1500mm vertically from another terminal on the same wall.
- 300mm horizontally from another terminal on the same wall.
- 2000mm from ground level.

### 4.6 Fuel Connection

#### 4.6.1 Gas Connection (if applicable)

A servicing valve and downstream union must be fitted at the inlet to the air heater gas controls assembly to facilitate servicing.

The gas supply to the air heater must be completed in solid pipework and be adequately supported.

#### **Warning**

When completing the final gas connection to the heater do not place undue strain on the gas pipework of the heater.

#### 4.6.2 Oil Connection (if applicable)

Refer to the supplied burner installation instructions for details regarding oil supply options.

## 4.6 Electrical Connections

Wiring external to the air heater must be installed in accordance with the I.E.E. Regulations for Electrical Installations and any local regulations which apply. Wiring should be completed in flexible conduit.

Heaters are for use with 230V, 1N, 50Hz or 400V, 3N, 50Hz supplies (*see heater data plate*).

The method of connection to the main electricity supply must:-

- facilitate the complete electrical isolation of the heater(s) that will prevent remote activation of the heater during servicing.
- be in a readily accessible position adjacent to the heater(s).
- serve only the heater(s).
- have a contact separation of at least 3mm in all poles. See the wiring diagram for the heater electrical connections. All units are fully pre-wired and only require final connections for the incoming mains supply. The electrical supply must be run to a point adjacent to the heater and be suitably terminated to provide an isolation point that will prevent remote activation of the unit during servicing. The heater electrical panel is located at the front of the heater and cable entry points are provided in the adjacent heater framework. Reference must be made to the enclosed data sheet to ascertain the electrical loading of the air heater(s) being installed so that cables of adequate cross-sectional area to safely carry that load are used for the electrical installation. The length of the conductors between the cord anchorage and the terminals must be such that the current carrying conductors become taut before the earth conductor if the cable or cord slips out of the cord anchorage. All external controls must be of an approved type. See the wiring diagram accompanying these instructions.

## 5. Commissioning & Testing

Note: TE41 & TE61 - Turn key for electrical panel access door locks may be used to operate door electrical interlock for commissioning purposes.

### 5.1 Electrical Installation

Checks to ensure electrical safety must be carried out by a qualified person.

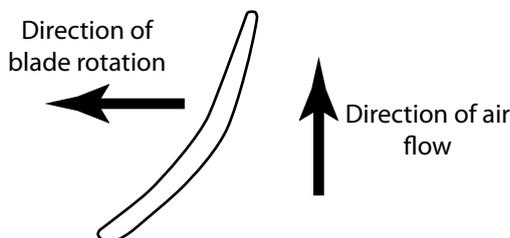
### 5.2 Gas Installation

The whole of the gas installation, including the meter, should be inspected and tested for soundness and purged in accordance with the recommendations of the applicable IGE documents.

### 5.3 Fan Rotation

1. Whilst the main electrical supply is isolated and **locked off** inspect the fan blades and ascertain the required direction of rotation. See below.

Fig 1 Direction of Fan Rotation



1. Reinststate the electrical supply Turn the AUTO-OFF-MAN switch to 'MAN'. Depending on the current state and setting of the MC200 the mains fans may start immediately. If they do not switch MC200 control (see MC200 manual supplied) to 'Summer' mode and then press the fan button on the front cover.
2. Ensure that the fan direction of rotation corresponds with the direction of rotation arrow on the fan blades. If necessary turn the AUTO-OFF-MAN switch to 'OFF', turn OFF the main isolator and reverse the direction of rotation by interchanging any two of the 3ph main supply leads at the terminal strip in the electrical panel.
2. If appropriate reset the MC200 to Winter mode.

## 5.4 Lighting the Air Heater

### 5.4.1 Gas Controls Assembly - Soundness Check

1. Ensure the gas service valve at the inlet to the gas controls assembly is shut.
2. To prove soundness of the first main safety shut-off valve and first start gas safety shut-off valve:-
  - a) Connect pressure gauge to the inlet pressure test point on the main valve block or inlet pipework.
  - b) Open gas service valve and allow pressure to stabilise before shutting it again. The valves are sound if no pressure drop is observed. If a pressure drop is observed do not proceed until the fault has been rectified. Remove pressure gauge and refit sealing screw in pressure test point.

### 5.4.2 Sequence Check

1. Refer to the burner instructions supplied with the heater.

### 5.4.3 Final Adjustment

1. Remove the sealing screw from the pressure test point located on the side of the gas inlet to the burner head and attach a pressure gauge. Remove the sample point cover plug from the outlet flue length and insert a CO<sub>2</sub> measuring instrument.
2. Remove the link in the main electrical control panel to isolate the main gas valves.
3. Turn "ON" the main electricity supply and check that the following sequence of events occur.
  - i) Burner fan runs.
  - ii) Ignition spark is heard.
  - iii) Start gas valves open.
  - iv) Start gas flame is established.
4. Check that the start gas pressure agrees with that in Tables 3.1 or 3.2. If necessary adjust the start gas pressure (See Data Sheet).
4. Turn "OFF" the main electricity supply.
5. Reconnect the main gas valves electrical link.
6. Turn "ON" the main electrical supply and the burner will run through its sequence until main flame is established. Check that the main burner gas pressure agrees with that on the specification sheet. If necessary adjust the main burner gas pressure (See Data Sheet and also Burner Manual for method).
7. Measure the CO<sub>2</sub> content of the flue gases. If it is necessary to adjust the combustion air ratio controls, to obtain a reading of 9.0 - 9.5%, refer to the Burner Manual.
8. Remove pressure gauge, refit sealing screw in pressure test point and flue sample point cover plug.

### 5.4.4 Final Soundness Test

1. After making final gas rate checks all joints on the gas controls assembly must be tested for soundness using leak detection fluid.

## 5.5 Controls

The general layout of the control panel is as shown opposite. The MC200 controller is mounted in the access door of the electrical panel.

### 5.5.1 Inverter Drives

This will have been set prior to the heater being despatched. A data sheet of the settings used is included for future reference.

### 5.5.3 MC200

See the MC200 instructions separately supplied.

## 5.6 Hand Over

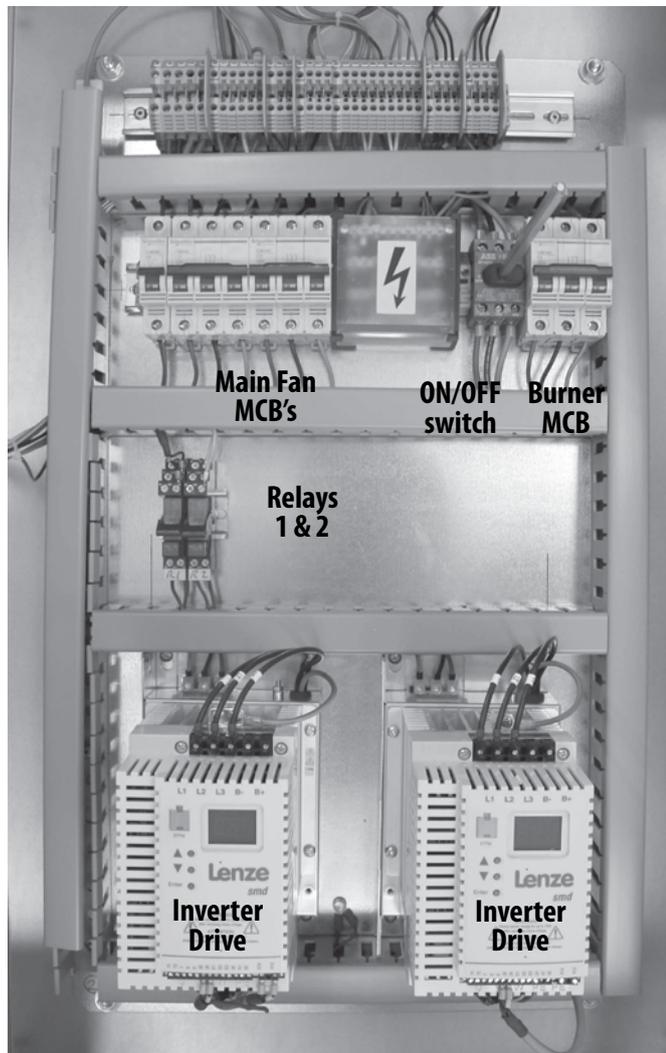
Hand the Users Instructions to the user or purchaser for retention and instruct in the efficient and safe operation of the air heater and associated controls.

Adjust the automatic controls to those values required by the User.

Finally, advise the user or purchaser that, for continued efficient

and safe operation of the air heater, it is important that servicing is carried out annually. In the event that the premises are not yet occupied turn off the gas and electricity supplies and leave instructional literature adjacent to gas meter.

Fig 2 Main Control Panel



## 6. Servicing

**WARNING:** Always switch off and disconnect electricity supply and close the gas service valve before carrying out any servicing work or replacement of failed components. Access doors on TE units are fitted with electrical interlocks however these alone must not be relied upon to prevent equipment operation during maintenance or servicing work.

### 6.1 General

Full maintenance should be undertaken not less than once per year. After any servicing work has been completed or any component replaced the air heater(s) must be fully commissioned and tested for soundness as described in Section 6.

### 6.2 Burner Maintenance

1. Refer to the Burner Instructions supplied with the heater.

### 6.3 Heat Exchanger Cleaning

1. Disconnect the gas supply at the inlet to the gas controls assembly.
2. Unplug the electrical connections from the heater electrical panel to the burner.
3. Remove the nuts securing the burner to the heat exchanger

and remove the burner.

4. (TE 41 & 61 only) Remove the fixings of the second section (from the floor) rear panel and hinge panel down to expose the heat exchanger clean out access plate.
- (TE21 only) Remove heater rear panel.
5. Remove the nuts securing the cleanout plate and remove.
6. Withdraw the heat exchanger baffles, if fitted.
7. Brush through heat exchanger tubes and remove loose material using a vacuum cleaner.
8. Reassemble all components in reverse order. Inspect all gaskets and replace if necessary.

## 6.4 Fan Assembly

**WARNING** Electrical supplies to the heater must be isolated and locked OFF before proceeding.

1. Gain access to the fan section by removing the lower panels.
2. Inspect the fan blades to see that they are not damaged and that there is no excessive build up of deposits that could give rise to an imbalance. If necessary clean the fan blades using a stiff brush and vacuum cleaner.

## 6.5 Replacement of Faulty Components

### 6.5.1. Burner Components

1. Refer to the burner supplement supplied with the heater.

### 6.5.2 Gas Controls Assembly

1. Refer to the burner supplement supplied with the heater.

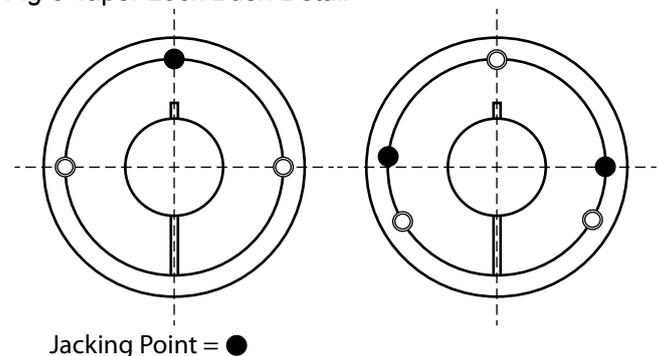
### 6.5.3 Main Fan Motors

**DANGER** Electrical supplies to the heater must be isolated and locked OFF before proceeding.

1. Remove fan assembly from motor shaft. Note: On TE41 and TE61 units the fans are fitted to the motor shafts by taper lock bushes.

To remove a bush slacken all screws in it and remove (one or two screws depending on the size of the bush). After oiling point and thread of grub screws (bush size 1008 to 3030) or under the head and thread of cap screws (bush size 3535 to 5050) insert them into the jacking off hole(s) in the bush. Tighten the screw(s) uniformly and alternatively until the bush is loose in the hub and fan is free on the motor shaft. Remove fan and bush.

Fig 3 Taper Lock Bush Detail



Bush	1008 1108	1310 1315	1210 1215	1610 1615	2012	2517	3020 3030	3535	4040	4545	5050
Torque (Nm)	5.6	20	20	20	31	48	90	112	170	192	271
Screws	2	2	2	2	2	2	2	3	3	3	3
Screw Size (BSW)	1/4"	3/8"	3/8"	3/8"	7/16"	1/2"	5/8"	1/2"	5/8"	3/4"	7/8"

2. Disconnect the electrical connections from the motor and remove the motor. Note: Providing the replacement motor is identical it is recommended that bolts are fitted in the motor mounting plate directly under the existing motor so that mounting position is marked. The bolts will also support the weight of the new motor whilst it is fitted.

3. Fit new motor and reassemble in reverse order. Refit the taper lock bush into the fan and line up the holes (half threaded holes must line up with half straight holes). Lightly oil the grub screw or cap screws and screw in but do not tighten. Fit fan to shaft. Gradually tighten the grub/cap screws in accordance with the torque schedule. Fill all holes with grease to prevent dirt ingress. Recheck torque settings after half an hour running.

### 6.5.4 Main Air Fan(s)

**DANGER** Electrical supplies to the heater must be isolated and locked OFF before proceeding.

Should it be necessary to replace one or both of the fans proceed as follows.

(TE41 & 61)

1. Remove fans as detailed in 6.5.3 above. On units with fans having a high number of blades it may also be necessary to remove one or two heat exchanger module side panels.

(TE21 & 31)

1. Remove one or two side panels to gain access to the top of the fan shaft. Remove set screw securing fan assembly to the motor shaft and remove fan.

2. Fit new fan(s) and reassemble in reverse order. Ensure the loose key that prevents the fan assembly rotating on the fan shaft is refitted.

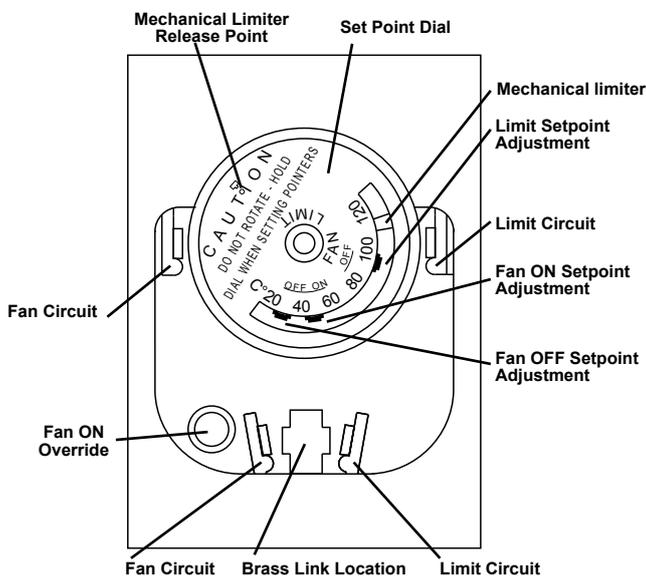
### 6.5.5 Fan and Limit Thermostats

#### 6.5.5.1 Honeywell L4064B

1. Release the single screw securing the fan and limit thermostat cover and remove cover by pulling forward.

2. Release wiring from screw terminals.

Figure 4 Fan/Limit Thermostat



3. Remove the 2 screws securing the thermostat to the heater panel and withdraw thermostat and sensor.

4. Reassemble new unit in reverse order referring to the heater wiring diagram to ensure correct wiring location.

**Important:** A replacement fan/limit thermostat will have a brass link between the bottom fan terminal and the bottom limit terminal (situated in the slot between the two terminals). This **MUST** be removed, by breaking the link off using a pair of thin nose pliers, before the replacement thermostat is installed.

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

Fan ON - 40°C, Fan OFF - 20°C

Limit 60°C

**Note:** The new L4064B may be supplied with the limit temperature mechanically limited to less than the setting required.

To release the mechanical limit push a pointed object into the small hole at the top of the dial. At the same time prevent the dial from rotating and push the limit temperature adjuster around to the required setting.

#### 6.5.5.2 High Limit Thermostat

##### TE41 & 61

1. Release the two screws securing the limit thermostat housing cover and remove cover by pulling forward.

2. Release the thermostat from the front cover, two screws

3. Pull off wiring connectors from under the thermostat.

4. Remove a central side panel from the heater exchanger section to gain access to the heat exchanger and release the thermostat sensing phial from its holder on top of the heat exchanger and withdraw thermostat and phial.

5. Reassemble new unit in reverse order referring to the heater wiring diagram to ensure correct wiring location.

6. Ensure that the setting is as follows:-

Limit 100°C

##### TE21 & 31

1. Release the two screws securing the limit thermostat housing cover and remove cover by pulling forward.

2. Release the thermostat from the front cover, two screws

3. Pull off wiring connectors from under the thermostat.

4. Remove heater side panels and release the thermostat sensing phial from its holder on the fan shroud and withdraw thermostat and phial.

5. Reassemble new unit in reverse order referring to the heater wiring diagram to ensure correct wiring location.

6. Ensure that the setting is as follows:-

Limit 50°C

#### 6.5.5.3 Fan Protection Thermostat

##### TE 21 & TE31

1. To replace the thermocouple remove the side panels on one side of the heater. Release the tip of the thermocouple from its holder and disconnect the other end from the relay base. Renew using a Type K thermocouple only.

## 7. Fault Finding

Refer also to the burner supplement supplied with the heater

<b>Fault</b>	<b>Cause</b>	<b>Action</b>
Main burner will not light	Electrical	1. Check electrical and fuel supplies are ON. 2. Check controls are ON or calling for heat.
Main burner lights, but goes out before main fan comes on.	Electrical	1. Unit goes out on high limit - a. Check limit thermostat setting - See Section 7.5.5. b. Faulty limit thermostat - change. 3. Inverter code 0C6, motor overloaded. - Check running amps. See specification sheet.
Main fan fails to run	Electrical	1. Fan motor (or capacitor - 1ph only) failed - replace. 2. Fan thermostat faulty - replace. 3. Inverter failed - replace

## 8. Short List of Parts

Refer to the burner supplement supplied with the heater.

Refer to Powrmatic Ltd for the details of other parts quoting the serial number of the heater.

## Appendix A

### Calculation Of Flue System Equivalent Resistance

The pressure resistance of the flue system ( $P_r$ ) =  $1.5 * [(PFF * H / D + SRF) Q_m / W_m^2]$  (pa)

Where  $H$  = Effective flue height in m

$D$  = Internal Diameter of flue in m

**PRF** (Pipe Friction Factor) =  $0.118 * (0.21147 / D^{0.4})$

Where  $D$  = Internal Diameter of flue in m

**SRF** (Sum of individual resistance factors)

Typical resistance factors for individual components are as follows

Segmented 90° bend      0.5

45° Elbow                      0.4

Cowl                              1.0

**Q<sub>m</sub>** (Mean Density of the column of exhaust gas in kg/m<sup>3</sup>) =  $97000 / (300 * T_m)$

Where the mean temperature of the column of exhaust gas ( $T_m$ ) =  $288 + ((T_e - T_L) / 0.2) * (0.18)$

Where  $T_e$  is the exhaust gas temperature in °C

$T_L$  is the external air temperature in °C

**W<sub>m</sub>** (Mean exhaust gas velocity in m/s =  $M / (A * Q_m)$ )

Where  $A$  is the cross sectional area of the flue in m<sup>2</sup>

$M$  is the exhaust gas mass flow in kg/s which for this heater is \_\_\_\_\_

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