



CP Range

Users, Installation & Servicing Instructions Gas & Oil Fired Heaters

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

WARNING: THIS APPLIANCE MUST BE EARTHED



powrmatic



Certificate of Guarantee

Dear Customer

This is to certify that this appliance is guaranteed for two years parts, one year labour from the date of original commissioning. The appliance 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 appliance must have been installed by a competent recognised installer, and in accordance with the manufacturers instructions, building regulations and local regulations.
2. The appliance has been professionally commissioned.
3. The appliance has been maintained on a yearly basis by a competent servicing company.
4. The appliance 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 appliance, 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**

Users Instructions

1. Checks before lighting the Air Heater

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

- Ensure the electrical supply to the heater is switched OFF.
- Check that all warm air delivery outlets are open.
- Check that the thermostat is set at MAX.
- Check that the clock control is set to an ON period.
- Check that any other controls are calling for heat.
- Ensure the Summer/Winter switch (fitted on the Powtrol) is in the Winter position.
- Check that the overheat reset button has not operated.

2. Lighting the Air Heater

2.1 Gas-fired Heaters

1. Switch on the electrical supply at the isolator and the burner start-up sequence will commence. The burner air fan will run and after a pre purge period of approximately 30 seconds the ignition spark will be generated.

CP 100 - 300

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

CP 400 - 2000

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.

1. Switch on the electrical supply at the isolator and the burner start-up sequence will commence. 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 start.

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.

3. To Shut Down the Air Heater

- For Short Periods:
Turn the room thermostat to the OFF or lowest setting.
- For Long Periods:
Turn the room thermostat to the OFF or lowest setting. Wait approximately 4-5 minutes for the main air fan of the heater to stop running and the 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 external controls and not by use of the main switch in the electrical supply to the heater.

The burner start up sequence will commence when the controls e.g. Timeclock, room thermostat etc. call for heat. The burner air fan will run and after a pre purge period the burner will light. Approximately 2/3 minutes after the burner lights the heater fan

will automatically start. When the external controls are satisfied the burner will be turned off and approximately 4/5 minutes later the heater fan will automatically stop.

4.1 Summer / Winter Modes

Certain types of external controls will provide for two modes of operation i.e.

Summer: The heater fan alone will run at the dictate of the external controls 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 air heater upper front panel.

5.1 CP 100 - 1000

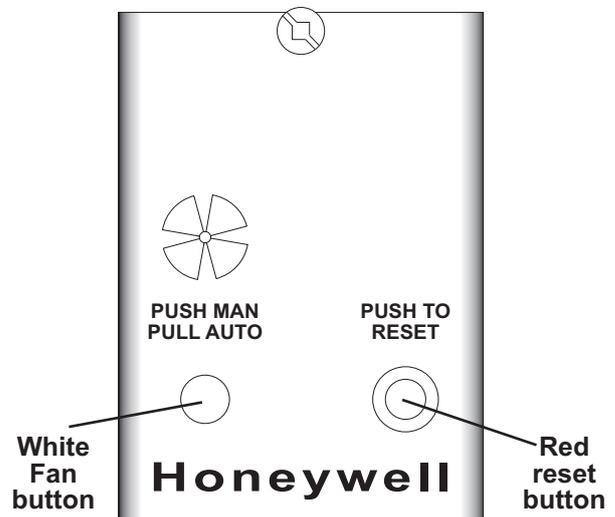
i) Main Air Fan MAN / Auto

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

ii) Limit Thermostat Reset

In the event of a fault that causes the temperature of the air leaving the air heater to rise significantly e.g. Blocked air inlets, the limit thermostat will operate to shut down the burner. Remove the cause of the fault, wait 10 minutes and then reset the thermostat by pushing the red reset button (Refer to Figure below). If the limit thermostat continues to operate turn off the air heater and call a service engineer.

Fig 1. Limit Thermostat CP 100 - 1000



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 Powmatic heaters use gas 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:

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 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.

Installation & Servicing Instructions

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Installation & Servicing Instructions

1. INTRODUCTION

The Powmatic CP range of closed flue, fanned circulation air heaters cover a heat output range of 29.3 kW to 586.1 kW and are intended primarily for heating commercial or industrial premises. They are fitted with either a gas fired forced draught burner or a pressure jet oil fired burner. 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. CP heaters have a centrifugal fan assembly fitted upstream of the combustion chamber / heat exchanger assembly to circulate the air being heated.

CP heaters are available in three styles:

Standard Style

Suitable for internal applications only and available in /UF, /UD, /HD, /HF, /CF and /CD variants (*see below*). /UF and /UD models are floor standing, /HD, /HF, are horizontally mounted on purpose design supports. /CD models can be plinth mounted at floor level. /CF and /CD models can be mounted at high level on purpose design supports.

CP/NCA Style

Suitable for internal applications only and having an extended casing that encloses the burner. Available in /UF and /UD variants only(*see below*).

CP/EA Style

Casing is extended to enclose the burner. The heater is fully weatherproof and designed for external applications only. Available in /TD, /HD, /RT and /SD variants (*see below*).

Variant types are:-

/UF - Upright heater with free blowing rotatable heads.

/UD - Upright heater with outlet duct spigot (*inlet duct spigot optional*).

/HF - Horizontal heater with free blowing rotatable heads.

/HD - Horizontal heater with outlet duct spigot (*inlet duct spigot optional*).

/CF - Counterflow heater with free blowing rotatable heads.

/CD - Counterflow heater with outlet duct spigot (*inlet duct spigot optional*).

/TD - Rooftop heater with top outlet duct spigot (*inlet duct spigot optional*).

/RT - Rooftop heater with outlet duct spigot on the underside (*inlet duct spigot optional*).

/SD - Upright heater with side outlet duct spigot (*inlet duct spigot optional*).

Other options include High/Low or modulating burners, uprated main fan motors, flue support bracket, deep V filters, flat panel filters, proportional air dampers, combustion air inlet adaptors and inlet and outlet duct spigots.

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

For gas fired heaters

Gas Safety (Installation & Use) Regulations

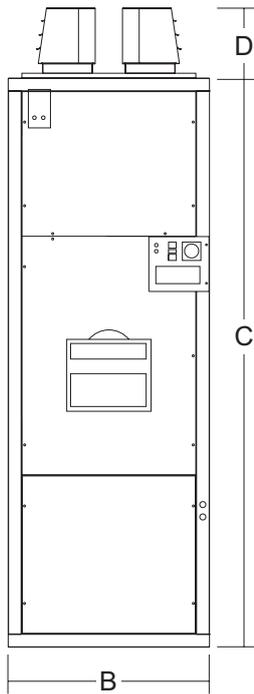
It is law that all gas appliances are installed, adjusted and, if necessary, converted by qualified persons* in accordance with the above regulations. Failure to install appliances correctly can lead to prosecution. It is in your own interests and that of safety to ensure that the law is complied with.

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

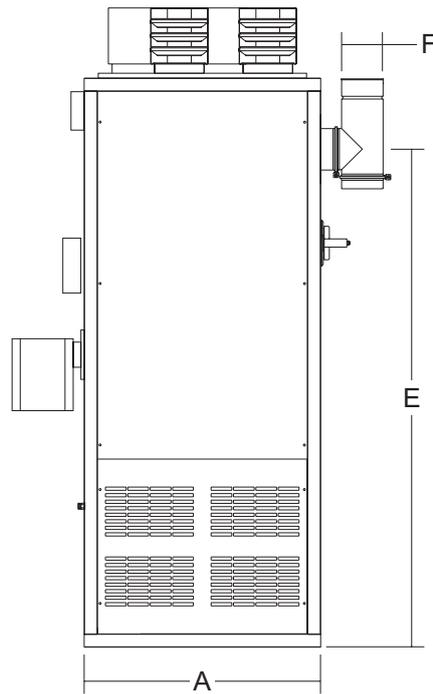
2. TECHNICAL DATA

CP 100 - 1250

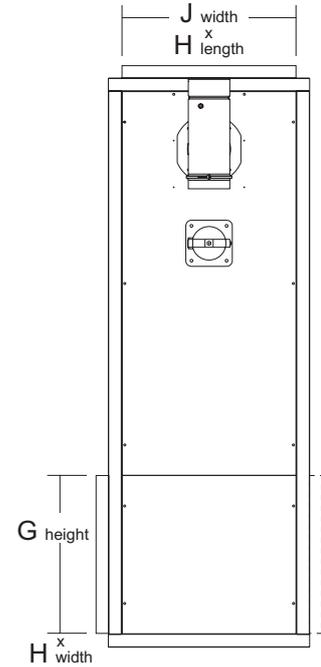
Standard Style (CP300 Shown)



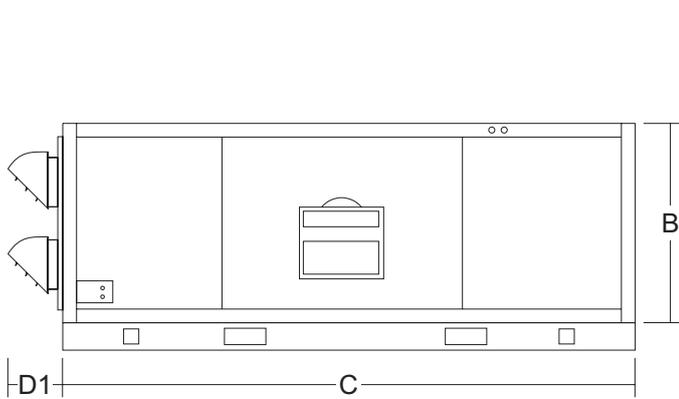
Front View
as /UF



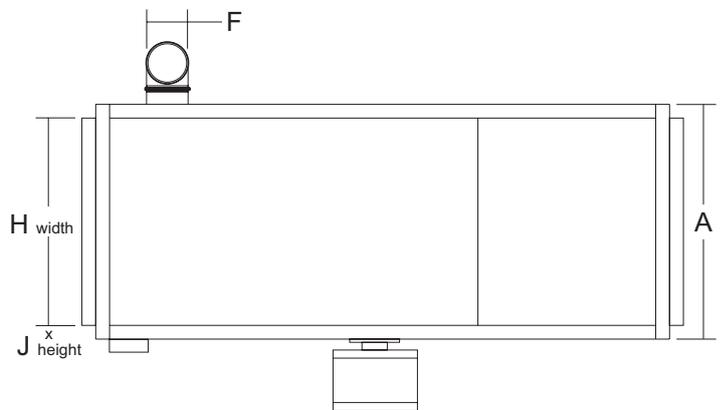
Side View
as /UF



Rear View
as /UD (with optional inlet duct spigot)

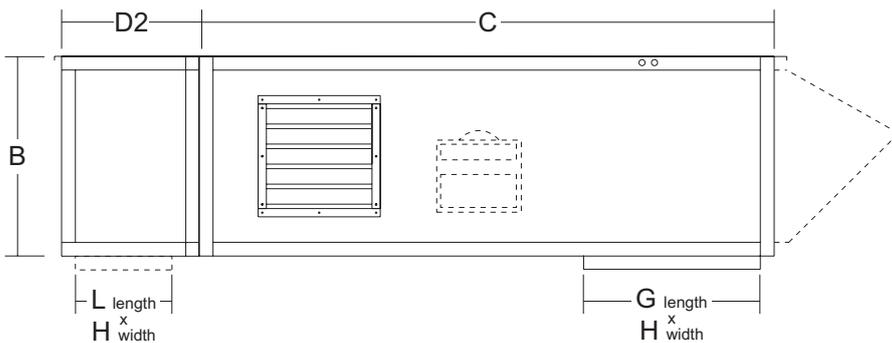


Front View
as /HF



Plan View
as /HD (with optional inlet duct spigot)

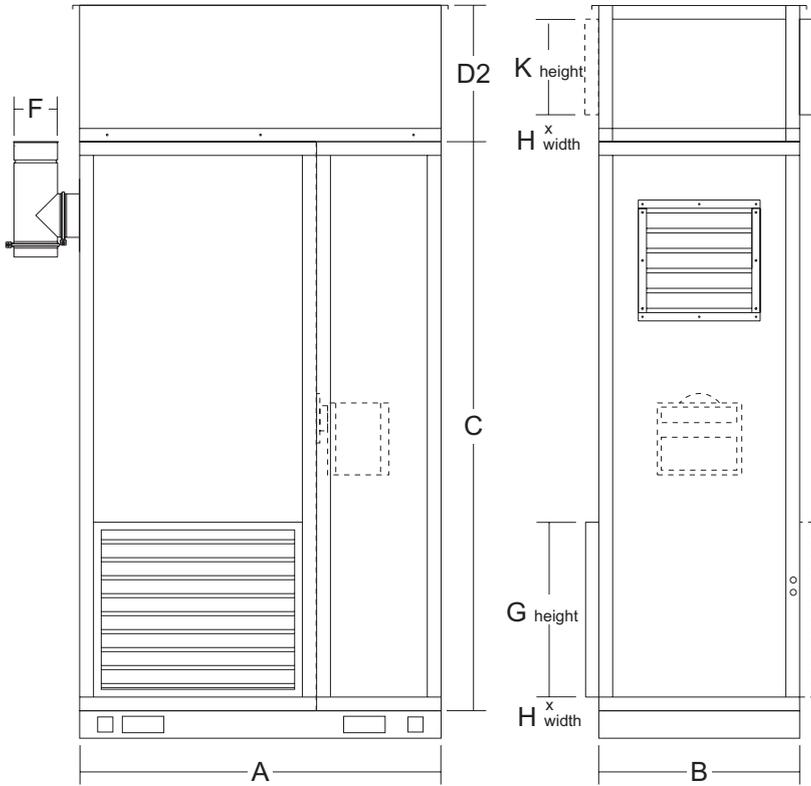
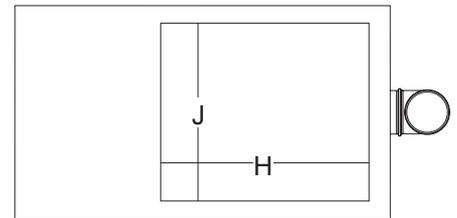
/EA Style (CP300/EA Shown)



Front View
as /RT (with optional weathered inlet hood)

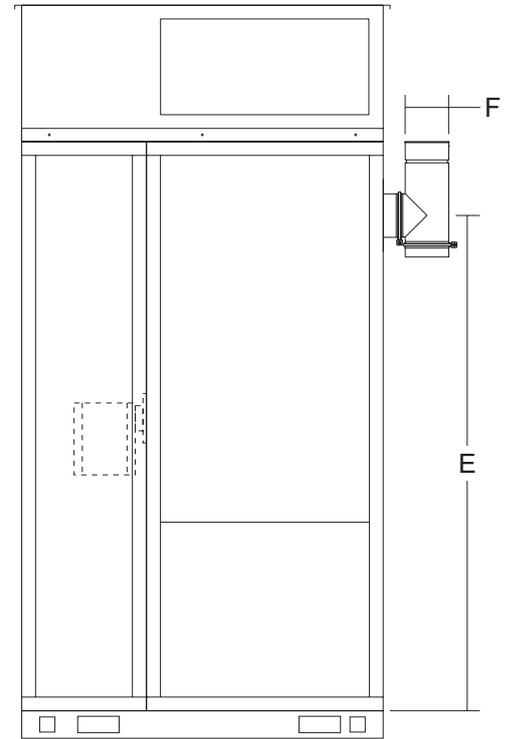
/EA Style continued (CP300/EA Shown)

Top View
as /UD



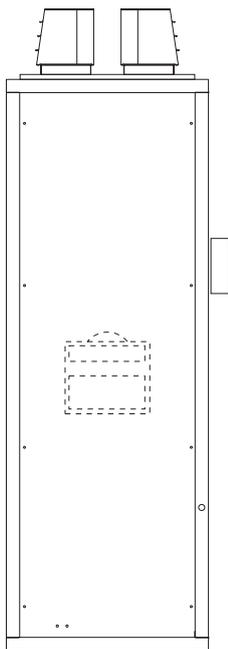
LH Side View
as /SD (with fresh air inlet louvre)

Front View
as /SD

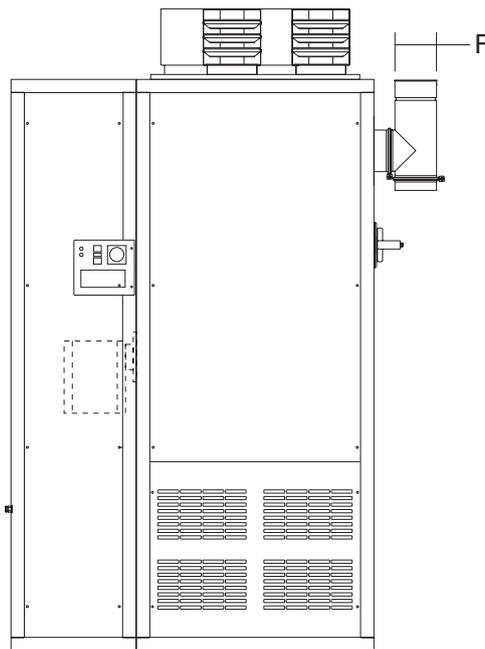


RH Side View
as /SD (with return air inlet duct spigot)

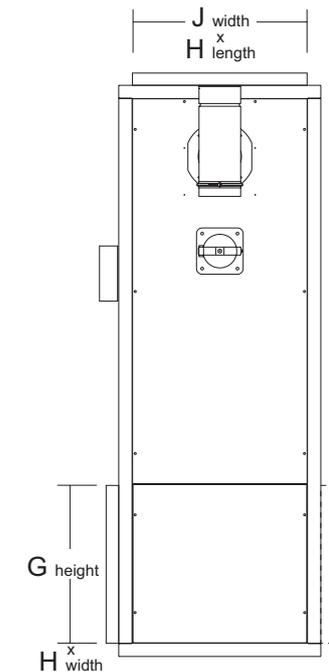
/NCA Style (CP300/NCA Shown)



Front View
as /UF



Side View
as /UF



Rear View
as /UD (with optional inlet duct spigot)

Note: CP 1500 and CP 2000 heaters have front flue outlets

Table 1. Dimensions

Model	A	A NCA & EA	B	C	D	D1	D2	E	F	G	H	J	K	Gas Connection Size	Oil Connection Size		
CP100	728	1130	600	1644	304	246	448	1386	125	482	628	500	300	0.5"	3/8"		
CP150	For CPO150 see CP100 above, for CPG150 see CP200 below (For /E variant CPG150 see CPG100)																
CP200	804	1255	626	1822	255	206	498	1553	125	581	703	524	350	0.75"		3/8"	
CP300	855	1307	728	2074				1907				150					637
CP400	1058	1550	904	2451	340	280	643	2151	175	738	958		803	400			
CP500												1362					1854
CP600	2043	1667	2348	443	350	728	2037	200	1567	1058	580						
CP700												2043	1667	2348			443
CP800	2043	1667	2348	443	350	728	2037	200	1567	1058	580						
CP1000												2043	1667	2348			443
CP1250	2043	1667	2348	443	350	728	2037	200	1567	1058	580						
CP1500												2043	1667	2348	443		350
CP2000	2043	1667	2348	443	350	728	2037	200	1567	1058	580						
CP2000												2737	3537	1695	3016	T.B.A.	2420
CP2000	2737	3537	1695	3016	T.B.A.	2616	300	655	2635	1593	700	1.5"					

Table 2. Specifications

Model	Input (Nett)	Output	Air Volume	Maximum duct resistant		Fan motor		Fuel Connection Size		Weight		
				Standard Motor	Uprated Motor	Standard Motor	Uprated Motor	Gas	Oil	CP	CP/NCA	CP/EA
	Kw		m³/s	pa		Kw				Kg		
CP100	32.1	29.3	0.5192	150	N/A	0.335	N/A	Rc½	¼" BSP	126	149	152
CP150	48.4	44.0	0.7788	290	N/A	0.550	N/A	CPO150 see CP100, CPG150 see CP200				
CP200	67.0	58.6	1.0383	200	N/A	0.560	N/A	Rc¾	¼" BSP	163	210	215
CP300	103.0	88.0	1.5575	250	N/A	1.5	N/A	Rc¾	¼" BSP	204	304	304
CP400	133.7	117.2	2.0766	150	N/A	2.2	N/A	Rc¾	¼" BSP	330	448	458
CP500	168.9	146.5	2.9736	210	240	2.2	3.3	Rc¾	¼" BSP	355	535	546
CP600	202.3	175.8	3.4000	190	250	3.3	5.5	Rc¾	¼" BSP	435	548	560
CP700	237.8	205.1	3.9647	100	200	4.0	5.5	Rc1½	¼" BSP	530	561	573
CP800	266.5	234.5	4.5075	N/A	150	3.3	5.5	Rc1½	⅜" BSP	550	615	628
CP1000	333.1	293.1	5.1919	50	100	5.5	7.5	Rc1½	⅜" BSP	556	828	845
CP1250	413.8	366.4	6.4866	300	N/A	11.0	N/A	Rc1½	⅜" BSP	670	985	1005
CP1500	511.0	439.6	7.7880	200	250	2 x 4.0	2 x 7.5	Rc1½	⅜" BSP	1397	1471	1502
CP2000	678.7	586.2	10.3840	155	250	2 x 7.5	2 x 11.0	Rc2	⅜" BSP	1930	3235	3302

Table 3. Electrical Loadings

Model	ph	Nominal Motor R.P.M.	Standard Motor			Uprated Motor			
			Start Amps (A)	Run Amps (A)	Fuse Rating (A)	Nominal Motor R.P.M.	Start Amps (A)	Run Amps (A)	Fuse Rating (A)
CP100	1	1000	5.0	4.0	5	N/A			
CP150			8.5	5.9	7				
CP200			10.0	5.5	7				
CP300			12.0	7.7	10				
CP400	3	1500	14.0	6.0	10	1500	25.0	5.75	10
CP500			24.0	5.4	10		35.0	11.0	15
CP600			30.0	6.5	10		35.0	8.83	15
CP700			35.0	7.6	10		35.0	11.65	15
CP800			25.0	6.1	10		32.0	14.4	15
CP1000			35.0	11.3	15		N/A		
CP1250			33.0	19.0	20		2 x 48.0	2 x 15.5	35
CP1500			2 x 33.0	2 x 8.0	20		2 x 70.0	2 x 22.0	50
CP2000			2 x 46.0	2 x 16.0	35				

Table 4.1 Burner Pressures - Natural Gas - Group H - G20 - Net CV (H_i) = 34.02MJ/m³

Model	Riello Burners			
	Type	Start Gas Pressure mbar	Main Burner Pressure mbar	Gas Rate m ³ /h
CP-G 100	GS 5	N/A	4.3	3.40
CP-G 150	GS 10	N/A	4.2	5.12
CP-G 200	GS 10	N/A	3.7	7.08
CP-G 300	GS 10	N/A	5.2	10.89
CP-G 400	GS 20	2.4	5.0	14.14
CP-G 500	GS 20	3.4	6.3	17.86
CP-G 600	GS 20	2.4	5.3	21.39
CP-G 700	GAS 3	2.5	6.7	25.15
CP-G 800	GAS 3	1.1	7.8	28.20
CP-G 1000	GAS 3	3.3	9.4	35.25
CP-G 1250	GAS 5	0.75	8.2	43.78
CP-G 1500	RS 50	0.75	5.6	54.00
CP-G 2000	GAS 5	Refer to Powrmatic		71.82

Table 4.2 Burner Pressures - Propane Gas - G31 - Net CV (H_i) = 88.0MJ/m³

Model	Riello Burners			
	Type	Start Gas Pressure mbar	Main Burner Pressure mbar	Gas Rate m ³ /h
CP-G 100	GS 5	N/A	3.1	1.31
CP-G 150	GS 10	N/A	6.4	1.98
CP-G 200	GS 10	N/A	4.1	2.74
CP-G 300	GS 10	N/A	8.3	4.21
CP-G 400	GS 20	2.5	5.9	5.47
CP-G 500	GS 20	3.7	8.5	6.90
CP-G 600	GS 20	3.1	8.9	8.27
CP-G 700	GAS 3	2.9	12.9	9.72
CP-G 800	GAS 3	3.0	18.2	10.90
CP-G 1000	GAS 3	2.5	17.5	13.62
CP-G 1250	GAS 5	2.8	18.0	16.92
CP-G 1500	GAS 5	2.8	18.0	20.43
CP-G 2000	GAS 5	Refer to Powrmatic		27.24

Table 5 Pump Pressures - 35sec Oil - Net CV (H_i) = 42.69MJ/kg

Model	Riello Burners					
	Type	Nozzle Make	Size	Angle °	Type	Pump Pressure bar
CP-O 100	G5	Danfoss	0.60	80	S	14.3
CP-O 150	G10	Danfoss	1.0	60	S	12.2
CP-O 200	G10	Danfoss	1.25	60	S	12.9
CP-O 300	G10	Danfoss	2.0	60	S	13.6
CP-O 400	G20S	Danfoss	2.5	60	S	13.6
CP-O 500	G20S	Danfoss	3.0	80	H	14.3
CP-O 600	G20S	Danfoss	3.75	60	B	14.3
CP-O 700	G20S	Danfoss	4.5	60	B	13.6
CP-O 800	Press GBV	Danfoss	5.0	45	B	14.3
CP-O 1000	Press GBV	Danfoss	6.0	45	B	15.0
CP-O 1250	RL38	Danfoss	4.5	60	B	14.3
CP-O 1500	Refer to Powrmatic					
CP-O 2000	Refer to Powrmatic					

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 Code of Practice

BS 5588 Fire precautions in the design and construction of buildings.

Part 2 : 1985 Code of Practice for Shops

Part 3 : 1983 Code of Practice for Office Buildings

BS 6230: 1991 Installation of Gas Fired Forced Convection Air Heaters for Commercial and Industrial Space Heating.

Those appliances having a gross input rating not exceeding 60kW viz. CPG100 - 150 inclusive and installed so as to take their combustion air from within the building must be installed in accordance with the relevant recommendations of the following document.

BS 5440 Flues and Air Supply for gas appliances of rated input not exceeding 60kW (1st and 2nd family gases), Part 2 - Air Supply

Reference should also be made to

BS 5864. Code of Practice for installation of gas-fired ducted-air heaters of rated input not exceeding 60kW.

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 IGE/UP/2. 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.

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 Three: Installation requirements for oil fired equipment.

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

4. Installation of Air Heater(s)

4.1 General

Before installation, check that the local distribution conditions, fuel specification, and adjustment of the appliance (*see data plate*) are compatible.

Important:

Copper Sulphide / 'Black Dust'

In some areas of the UK, particularly Northern Ireland, problems have been experienced with copper sulphide (more commonly referred to as 'Black Dust') forming on the inner surfaces of copper gas supply pipework. This dust can enter the gas stream and may lead to blockages of valves, filters and injectors. If this heater is being installed in an area where 'Black Dust' is known to be a problem, and copper gas supply pipework is used, it is recommended that a filter having a stainless steel 50 micron mesh and suitable for Natural Gas is fitted at the inlet to the appliance immediately downstream of the main appliance isolation valve. The end user should be advised that the filter will require periodic cleaning or replacement at least once per year, during the annual service, or more often if the problem is severe.

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 CP/EA style is specified. CP/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.

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

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.

IMPORTANT:

Heaters shall not be installed in:-

- a) Those parts of spaces within buildings that have been classified as hazardous areas as defined in BS 5345 : Part 2.
- b) Where there is a foreseeable risk of flammable particles or gases 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 is ducted to the heater from an uncontaminated source, preferably from outside the building. The option of taking combustion air from the space is not permitted. In certain situations where only airborne particles are present it may suffice to fit filters on the main air inlet duct of the heater. Advice in these instances may be obtained from Powrmatic Ltd.
- c) In areas subjected to significant negative pressures due to extract systems.

4.3 Installing the Air Heater

If necessary consideration should be given to mounting the heater on resilient pads, or equivalent, to minimise transfer of noise and vibration to the structure of the building. Floor mounted heaters must be installed on a level

noncombustible surface.

Heaters mounted at high level must be supported on a purpose designed platform or framework that is suspended from vertical drop rods, chains or straps or mounted on specifically designed cantilever brackets from a non-combustible wall. The method of installation support must be capable of adequately supporting the weight of the unit (*See Table 2, Page ?*) and any ancillary equipment. Before installing the heater the existing structure must be inspected to ensure it is suitable. All supports should be protected against the effects of rust or corrosion. Whichever method of mounting the air heater is used the following minimum clearances for installation and servicing must be observed.

To the front	The depth of the heater
To the rear	1.0m
To at least one side	1.0m
On the opposite side	0.5m
Above the heater	1.0m

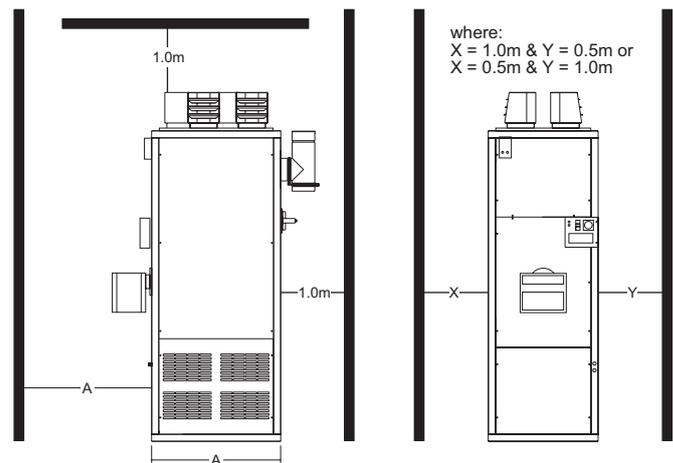


Fig 1 Minimum clearance distances

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.

If the method of mounting allows for any movement of the heater it is essential that all gas, duct, and electrical connections to the heater are made with flexible connections to maintain continuity of connection.

4.4 Combustion Air Supply

In buildings having a design air change rate of less than 0.5/h, and where heaters are to be installed in heated spaces having a volume less than 4.7 m³/kW of total rated heat input grilles shall be provided at low level as follows:-

- (1) for heaters of heat input less than 60 kW, the total minimum free area shall not be less than 4.5 cm² per kilowatt of rated heat input.
- (2) for heaters of heat input 60 kW or more, the total minimum free area shall not be less than 270cm² plus 2.25 cm² per kilowatt in excess of 60 kW rated heat input.

Where the air heater(s) are to be installed in a plant room the plant room must have permanent air vents communicating directly with the outside air, at high level and at low level. Where only high level air vents are available, ducting down to floor level for the lower vents should be used.

All 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 louvres should be so designed that high velocity air streams do not occur within the plant room.

The basic minimum effective area requirements of the air vents are as follows:

- (a) Low Level (inlet)
 - (1) for heaters of total rated heat input less than 60kW: 9cm² per kilowatt of rated heat input.
 - (2) for heaters of total rated heat input 60kW or more:

540 cm² plus 4.5 cm² per kilowatt in excess of 60 kW total rated input.

- (b) High Level (outlet)
- (1) for heaters of total rated heat input less than 60kW: 4.5cm² per kilowatt of rated heat input.
 - (2) for heaters of total rated heat input 60kW or more: 270 cm² plus 2.25 cm² per kilowatt excess of 60kW total rated input.

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 are not permitted. If necessary a single offset using two 45° bends can be included to avoid obstructions. The maximum equivalent resistance of the flue system must not exceed 20 pa. 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. Where condensation in the chimney is unavoidable provision should be made for condensation to flow freely to a point at which it can be released, preferably into a gully. The condensation pipe from the chimney 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. It is recommended that consideration be given to the fitting of a terminal at the chimney flue outlet, however, where the heater flue is less than 200mm (8") in diameter an approved terminal must be fitted.

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 must be supported independently of the air heater. A chimney support bracket that fits directly to the rear of the heater is available as an optional extra. The chimney terminal must not be installed so as to be 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 union must be fitted at the gas inlet to the heater to facilitate servicing. The gas supply to the air heater must be completed in solid pipe work and be adequately supported. Heaters suspended by drop rods, straps or chains must have a flexible connection as the final link between the gas supply pipe work and the heater. Sufficient slack must be left in the connection to take account of normal movement of the heater.

Warning:

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

4.6.2 Oil Connection (if applicable)

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

4.7 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 accompanying wiring diagram for the heater electrical connections.

All units are fully prewired and only require final connections for the incoming mains supply. Heaters not supplied with inbuilt time and temperature controls will also require completion of the external control circuit (230V) via a room thermostat, time clock etc. and, if applicable, the remote low level lockout reset. All heaters must be earthed.

Reference must be made to Table 3 (*Page 7*) to ascertain the electrical loading of the unit(s) being installed so that cables of adequate cross-sectional area 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.

Heaters supplied less main fan must be electrically interlocked to the air movement system so that this is started in the same manner as the air heater fan would be viz. A connection from the appropriate heater terminal (*see wiring diagram with the heater*) must be made to one side of the fan motor contactor coil, the other side of the coil being connected to Neutral. Under no circumstances must the fan motor electrical supply be taken direct from the internal wiring of the heater.

4.8 Air Distribution System

For free-blowing units used in buildings having a low heat loss i.e. where single units are required to cover a large floor area, and in buildings with high roof or ceiling heights Calecon thermal economiser units should be fitted to ensure even heat distribution and minimise stratification.

Care should be taken to avoid impeding the heater air throw with racking, partitions, plant or machinery etc. Various outlet configurations are available as optional extras to modify the air throw pattern to suit particular site conditions.

CP-G *D models are designed for use with duct work to more precisely define the point of air delivery, and /or provide ducted return air or ducted fresh air inlet. All ducting must be independently supported of the air heater.

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.

Where inter-joint spaces are used as duct routes they should be suitably lined with a fire-resisting material.

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

If the air heater(s) is installed in a plant room the return air intake(s) and the warm air outlet(s) from the heater(s) must be fully ducted, into and out of the plant room to avoid interference with the operation of the heater from other equipment.

The openings in the structure of the plant room through which the ducting passes must be fire stopped.

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

If necessary suitable barrier rails should be provided to prevent any combustible material being placed within 900mm of the outlets.

Joints and seams of supply ducts and fittings must be securely fastened and made airtight.

It is recommended that ducting should be connected to the heater spigots via an airtight flexible coupling of noncombustible material. Before fitting coupling it must be ensured that a maximum clearance of 13mm will be maintained between the ends of the ducting and the heater spigots.

If required sound attenuators may be fitted in inlet and outlet ducts to reduce airborne fan noise. Materials used in outlet sound attenuators must be capable of withstanding 100 °C air temperature without any deterioration.

4.9 Room Thermostat Siting

If a remote room thermostat is used it should be fitted at a point which will be generally representative of the heated area as far as temperature is concerned. Draughty areas, areas subjected to direct heat e.g. from the sun, and areas where the air movement is relatively stagnant e.g. in recesses, are all positions to be avoided for siting the thermostat.

The thermostat should be mounted about 1.5m (5ft) from floor level.

Any room thermostat, frost thermostat, time clock etc. must be suitable for switching 230V, 5A and must be of the 'snap action' type to minimise contact bounce.

For electrical connections of external controls see the accompanying wiring diagram.

5. Commissioning & Testing

5.1 Electrical Installation

Checks to ensure electrical safety must be completed by a competent person.

5.2 Gas Installation (if applicable)

The whole of the gas installation, including the meter, should be inspected and tested for soundness and purged in accordance with the recommendations of IGE/UP/1 or IGE/UP1A or IGE/UP/1B as appropriate.

5.2 Oil Installation (if applicable)

The whole of the oil installation, including the tank, should be inspected and tested in accordance with the recommendations of OFTEC.

5.3 Air Distribution System

The system should be checked to ensure that the installation work has been carried out in accordance with the design requirements.

Particular attention should be given to the correct arrangement of delivery ducts and registers, return air ducts and grills and general adequacy of return air paths.

For CP/*D heaters ensure that the total duct system resistance does not exceed the available air pressure of the equipment supplied refer to Table 2 (Page 7). If the duct system resistance is less than the available air pressure of the equipment supplied additional resistance must be introduced e.g. by adjustment of duct outlet nozzles and balancing of the duct system. Conversely if the duct system resistance is greater than the available air pressure of the heater supplied the system resistance must be reduced.

5.4 Lighting the Air Heater

5.4.1 Gas Fired Heaters

Note: Refer also to the burner instruction booklet supplied with the heater. This provides information on adjusting the burner, setting up the air pressure switches, system checks and fault finding detail.

5.4.1.1 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:-
 - 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.

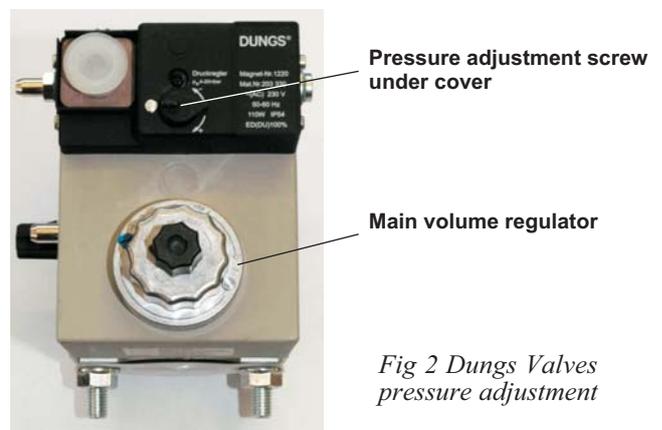
5.4.1.2 Sequence Check

1. Ensure that the gas service valve is closed and that the main electrical supply to the heater is switched off.
2. Start the burner by setting the time clock and thermostat to call for heat or complete the external control circuit.
3. Turn ON the main electrical supply and check that the following sequence of events occurs.
 - i) Burner fan runs
 - ii) Ignition spark is heard
 - iii) Start gas valves open (Main gas valves on CP-G100 - 300.
 - iv) Burner goes to lockout as there is no gas supply.
4. Switch OFF main electricity supply.

5.4.1.3 Final Adjustment

5.4.1.3.1 CP-G 100 - 300

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 CO₂ measuring instrument.
2. 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) Main gas valves open and main gas flame is established.
3. Check that the main burner gas pressure agrees with that stated on the heater data plate. If necessary adjust the main burner gas pressure (Fig 2) by rotating the adjustment screw under the cover flap. If the range of adjustment does not allow for setting of the correct burner pressure the main volume regulator may also be used. It is recommended that the main governor adjustment is within 50% to 75% of its range.
4. Measure the CO₂ content of the flue gases. If necessary adjust the combustion air damper of the burner (Refer to the Burner Instructions) to obtain a reading of 9.0 - 9.5%
5. Turn OFF the burner, remove pressure gauge and refit sealing screw in pressure test point and flue sample point cover plug.



5.4.1.3.2 CP-G 400 - 2000

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 CO₂ measuring instrument.
2. 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 stated on the heater data plate. If necessary adjust the main burner gas pressure (Fig 2) by rotating the adjustment screw under the cover flap. If the range of adjustment does not allow for setting of the correct burner pressure the main volume regulator may also be used. It is recommended that the main governor adjustment is within 50% to 75% of its range.
3. Measure the CO₂ content of the flue gases. If necessary adjust the combustion air damper of the burner (Refer to the Burner Supplement) to obtain a reading of 9.0 - 9.5%.
4. Turn OFF the burner. Remove pressure gauge, refit sealing screw in pressure test point and flue sample point cover plug.

5.4.1.4 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.

5.4.1.5 Flame Safeguard

1. Whilst the burner is in operation close the gas service valve. The burner should go to lockout within 1 second.

5.4.1.6 Gas Burner Max. Air Pressure Switch (P2)

Note: Refer to the burner instruction booklet but follow the steps below.

1. The max. air pressure switch must be set after all other adjustments have been made.
2. Begin with the switch at its highest setting and the burner working at the correct input for high fire.
3. Slowly adjust the pressure switch dial anti-clockwise, to decrease the set point, until the burner locks out. Immediately stop adjustment.
4. Now increase the set point by 0.1mb and restart the burner.
5. If the burner fails to start, or shuts down due to the pressure surge on ignition, increase the pressure switch setting by a further 0.1mb and restart the burner.
6. Continue until the burner reliably starts.

5.4.2 Oil Fired Heaters

5.4.2.1 Initial burner startup

1. Check that fuel is present in the tank and at the oil filter fitted on the front of the heater.
2. Check that fitted fire valves are open.
3. Refer to the burner instruction book and fit a pressure gauge (and vent valve if the burner is on a single pipe oil feed) to the oil pump.
4. Set the time clock and thermostat to call for heat or complete the external control circuit.
5. Turn ON the main electrical supply and check that the burner fan starts.
6. **Note:** This step is only for when a vent valve is being used. Open the vent valve. When air free oil issues from the vent valve close the valve and the burner will fire when the ignition spark is present. (Note: This procedure may need to be repeated several times if the oil line cannot be purged of air within one ignition cycle. At the end of the unsuccessful ignition cycle the burner will go to lockout. Wait 2/3 minutes and then depress the red reset button on the burner control box to restart the ignition cycle.)
7. After completion of the pre-purge period the ignition spark will be energised and the burner oil solenoid valve will open and the burner will light.

Warning: If burner ignition cannot be achieved after 2-3 attempts do not continue to recycle through the ignition sequence but ascertain the cause and rectify.

WARNING:

If continued unsuccessful ignition attempts are made it is possible to accumulate a significant quantity of oil and oil mist in the combustion chamber which, if the burner then fires, can result in a dangerous situation. Any such accumulation of oil must be removed by safe means before any further attempt to light the burner.

5.4.2.2 Final Adjustment

1. Remove the sample point cover plug from the outlet flue length and insert a CO₂ measuring instrument.
2. Relight the burner. Check that the pump pressure is as specified on heater data plate. If adjustment of the pump pressure is necessary refer to the burner instructions and complete.
3. Measure the CO₂ content of the flue gases. If necessary adjust the combustion air damper of the burner (*Refer to the Burner Instructions*) to obtain a reading of 11.5 - 13.0%.
8. Turn OFF the burner. Remove pressure gauge and refit sealing plug, refit flue sample point cover plug.

5.4.2.3 Final Checks

1. After making final adjustments check that there are no leaks on the oil pipework.

5.5 Handing over the Air Heater

Hand these instructions to the user or purchaser for retention and instruct the User in the efficient and safe operation of the air heater.

In the event that the premises are not yet occupied turn off the gas and electricity supplies and leave instructional literature with the heater.

6. Servicing

WARNING: Always switch off and disconnect electricity supply, close the gas service valve or turn off the oil supply before carrying out any servicing work or replacement of failed components.

6.1 General

Full maintenance should be undertaken not less than once per year. After any servicing work has been complete or any component replaced the air heater(s) must be fully commissioned and tested for fuel tightness as described in Section 5.

6.2 Burner Servicing/Maintenance

1. Refer to the burner instructions supplied with the heater and complete the servicing/maintenance instructions therein.

Note: In the case of gas burners ignore any references in the burner supplement to the gas controls assembly.

6.3 Heat Exchanger Cleaning

1. Remove the fan/limit thermostat(s) as described in 6.6.4 and then remove the upper front panel of the heater to expose the heat exchanger clean out panel. Remove the bolts securing the panel, pull the panel forwards at the bottom and then lift up to disengage from the heat exchanger and remove.

2. Withdraw the heat exchanger baffles.

3. Brush through heat exchanger tubes and remove loose material using a vacuum cleaner.

4. If it is necessary to also gain access to the combustion chamber disconnect the fuel and electrical connections from the burner. Remove the nuts securing the burner to the heater and withdraw the burner from the burner tube.

5. Reassemble all components in reverse order. Note: The ceramic fibre gasket around the inside of the heat exchanger clean out panel must be renewed. If the burner has been removed the burner gasket should be replaced if necessary.

6.4 Fan Assembly

1. Remove the lower panels of the heater to gain access to the fan section.

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.

3. Replace panels accordingly.

6.5 Oil Filter (if applicable)

1. Release the securing bolt, or unscrew the filter bowl, to access the filter.

2. Clean the filter or replace as deemed necessary.

3. Refit bowl ensuring that seals are correctly in place.

6.6 Replacement of Faulty Components

6.6.1 Burner Components

1. Refer to the burner instructions supplied with the heater for information regarding replacement of components within the burner.

6.6.2 Gas Controls Assembly (if applicable)

1. Remove the electrical connections from the gas control block.
2. Release the nuts securing the inlet and outlet flanges to the gas control block and lift out the gas control block. Fit the replacement assembly in reverse order ensuring the valve is correctly orientated for the direction of gas flow.

6.6.3 Main Air Fan and Motor

Important: On 3ph heaters fitted with 3ph main fan motors

ensure that the fan direction of rotation corresponds with the direction of rotation arrow on the fan guard or case. If necessary reverse the direction of rotation by interchanging any two of the motor live leads at the terminal strip in the electrical panel. Should it be necessary to remove one or more of the fans for cleaning proceed as follows.

6.6.3.1. CP 100 - CP 400

Note: These heaters are fitted with direct drive fan units.

1. Disconnect the fan motor electrical leads from the terminal strip (Refer to wiring diagram supplied with the heater)

2. Remove the two screws, one on each side of the fan mounting flange, that secure the fan to the fan shroud.

3. Remove the screws securing the heat exchanger mounting frame to the fan shroud on the side that the fan is going to be withdrawn.

4. Withdraw the fan from the slide rails.

5. Reassemble in reverse order.

6.6.3.2. CP 500 - CP 2000

Note: These units are fitted with belt driven main air fans.

1. Remove the lower side panels.

2. Release the motor mounting plate securing screws and then remove the belt tension by turning the tension adjustment screw anticlockwise. Remove the fan belts.

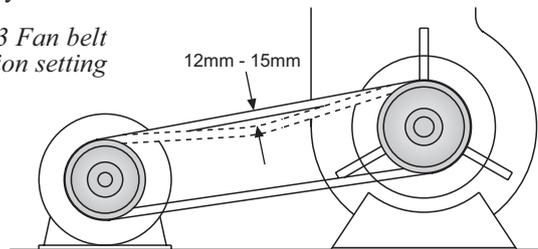
3. Remove the screws securing the fan mounting feet to the heater framework and remove the fan. It may be necessary to re-orientate the fan within the fan compartment and also to release the fan shroud fixings in order to pass the fan through the heater frame. On units with twin or triple fan sets on a common fan shaft it will be necessary to first remove the fan shaft.

4. Inspect the fan belts and if necessary replace with new.

5. Replace components in reverse order.

6. Do not over tension the fan belts. There should be approximately 15mm of deflection when downward pressure is applied to the belt(s) halfway between the motor and fan pulleys.

Fig 3 Fan belt tension setting



6.6.4 Fan and Limit Thermostats

6.6.4.1 CP 100 - CP 1000 - Fan / Limit Thermostat - Honeywell L4064N

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

2. Release wiring from clamp terminals by pushing a small screwdriver into the clamp release holes adjacent to the clamps.

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

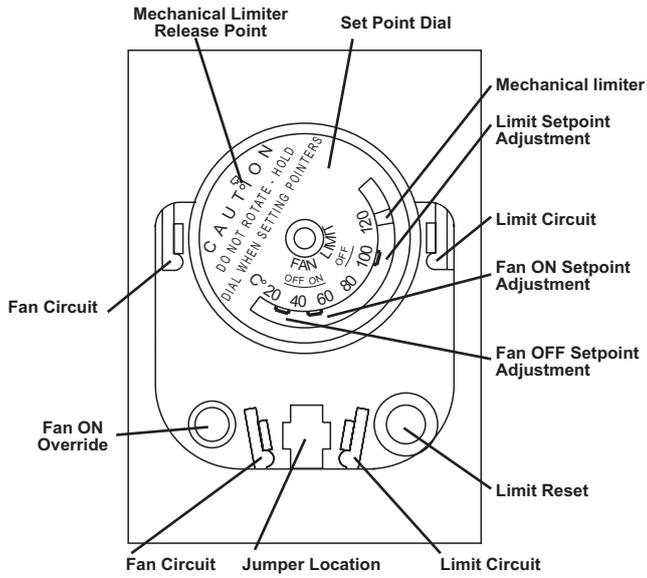
4. Reassemble new unit in reverse order referring to the heater wiring diagram to ensure correct wiring location.

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	- 50°C,	Fan OFF	- 30°C
Limit	CP 100 - 150		90°C
	CP 200 - 800, 1000		110°C
	CP 300 - 700		100°C

Fig 4 Thermostat Fan / Limit - Honeywell L4064N



Note: The new L4064N 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.

7. Fault Finding

Refer also to the burner supplement supplied with the heater

Fault	Cause	Action
Main burner will not light	Electrical	1. Check electrical supply is ON. 2. Check controls are ON or calling for heat. 3. Faulty burner control unit. 4. Limit thermostat open circuit/faulty
	Gas/Oil	1. Check fuel supply is present.
Main burner lights, but goes out before main fan comes on or whilst controls still calling for heat.	Electrical	1. Unit goes out on high limit - a. Check fan thermostat setting - <i>See Section 6.6.4</i> b. Faulty fan thermostat - change c. Check limit thermostat setting - <i>See Section 6.6.4</i> d. Faulty limit thermostat - change. e. Faulty fan assembly - change. f. Fan motor out on thermal overload. - Check running amps. <i>See Table 3.</i> - check duct resistance <i>See Table 2.</i> g. Check that airflow through the heater is not restricted.
	Gas/Oil	1. Check continuity of fuel supply.
Main fan runs continuously	Electrical	1. Summer/Winter switch set to Summer. 2. Fan thermostat set too low - check setting <i>See Section 6.6.4</i> 3. Faulty fan thermostat - change
Main fan fails to run	Electrical	1. Fan motor or capacitor failed - replace. 2. Fan thermostat faulty - replace. 3. Fan contactor failed - replace (3ph units)

8. Short List of Parts

Refer also to the burner supplement supplied with the heater

Dungs MB-DLE 403 B01 0.5"	100 & 150	141378701
Dungs MB-DLE 405 B01 0.75"	200 & 300	141378702
Dungs MB-DLE 405 B07 0.75"	400	141378703
Dungs MB-DLE 407 B07 0.75"	500	141378704
Dungs MB-DLE 410 B07 1.25"	600 & 700	141378705
Dungs MB-DLE 412 B07 1.5"	800 - 1250	141378706
Thermostat - Fan / Limit - Honeywell L4064N	100 - 700	143000303
Contactors - Danfoss CI 9	All	143000608
Overload - Danfoss TI 16 (0.6 - 0.92A)	100(3ph)	143056103
Overload - Danfoss TI 16 (1.2 - 1.9A)	150(3ph), 200(3ph)	143000861
Overload - Danfoss TI 16 (2.7 - 4.2A)	300 (3ph), 400	143000706
Overload - Danfoss TI 16 (4.0 - 6.0A)	500 - 800	143000707
Overload - Danfoss TI 16 (8.0 - 12.0A)	1000	143000770
Overload - Danfoss TI 16 (11.0 - 16.0A)	1250	143000850
Danfoss MCI 15 soft start	1000LHP, 1250, 1500 (x2), 1500LHP (x2)	143000620
Danfoss MCI 25 soft start	CP2000 (x2), CP2000LHP (x2)	143000621
Heat Exchanger Cleanout Door Gasket.	All	170246006
Burner Gasket - Riello GS5.	100	141937080
Burner Gasket - Riello GS10.	150 - 300	141930806
Burner Gasket - Riello GS20.	400 - 600	142931252
Burner Gasket - Riello Gas 3	700 - 1000	142931240

Appendix A

Calculation Of Flue System Equivalent Resistance

The pressure resistance of the flue system (P_r) can be calculated from

$$P_r = 1.5 * [(PFF * H/D + SRF) Q_m / W_m^2]$$

Where P_r = Pressure resistance of the flue system in pa
 PFF = Pipe Friction Factor
 H = Effective flue height in m
 D = Internal Diameter of flue in m
 SRF = Sum of individual resistance factors
 Q_m = Mean Density of the column of exhaust gas in kg/m³
 W_m = Mean exhaust gas velocity in m/s

PRF

Can be calculated from
 $PRF = 0.118 * (0.21147 / D^{0.4})$

Where D = Internal Diameter of flue in m

SRF

Typical resistance factors for individual components are as follows

Segmented 90° bend	0.5
45° Elbow	0.4
Cowl	1.0

Qm

$$Q_m = 97000 / (300 * T_m)$$

Where the mean temperature of the column of exhaust gas (T_m) can be calculated from

$$T_m = 288 + ((T_e - T_L) / 0.2) * (0.18)$$

Where T_e is the exhaust gas temperature in °C
 T_L is the external air temperature in °C

Wm

$$W_m = M / (A * Q_m)$$

Where A is the cross sectional area of the flue in m²
 M is the exhaust gas mass flow in kg/s which is as follows for the various units

CP 100	0.018	CP 500	0.125	CP 1500	0.3
CP 150	0.027	CP 600	0.14	CP 2000	0.4
CP 200	0.035	CP 700	0.145		
CP 300	0.050	CP 800	0.16		
CP 400	0.080	CP 1000	0.2		