

Floor Standing Gas Fired Heaters VCHE - HCHE

Mk 2



approved

Installation, servicing
&
Operating Instructions

Please read this document carefully before commencing installation commissioning and/or servicing.

Leave it with the user or attached to the appliance or gas service meter after installation.

WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. All work must be carried out by appropriately qualified persons.

Subject to modifications

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1.0 Introduction

1.1 General

- 1.1.1 Before installation check that the appliance as described on the packaging label is in accordance with the correct type and model specified on the data plate and complies with your customer order.
- 1.1.2 The heater is delivered wrapped in heavy duty polythene and should be checked to ensure that it has been delivered undamaged.
- 1.1.3 Please read this document before commencing installation. The onus rests with the installer to ensure that all relevant manuals are read and understood, especially with regard to any safety instructions stipulated by the manufacturer.
- 1.1.4 These instructions are only valid for the country of use indicated on the appliance, i.e. GB - IE. If these symbols are not shown it is necessary to obtain appropriate technical instructions which will provide information concerning the necessary modification of the appliance for use in the country concerned. Such instructions may be obtained from your supplier upon request.
- 1.1.5 Check that the local distribution conditions of electricity supply, type of gas and pressure and adjustment of the appliance are compatible.
- 1.1.6 When installed in Great Britain the total installation must comply with the requirements and recommendations of British Standard BS 6230 "Installation of Gas Fired Forced Convection Air Heaters for Commercial and Industrial Space Heating". The installation must also be in accordance with the relevant requirements of "The Gas Safety (Installation and Use Regulations) and (Amendment Regulations) and The "Building" and "Electrical Regulations" (in GB the IEE Regulations). Installation, commissioning and servicing must be carried out by competent CORGI registered gas installers.
- 1.1.7 **Warning!**
Unauthorised modification of this appliance or departure from use in the manner for which it was intended by the manufacturer, or installation in a manner contrary to these instructions may constitute a hazard and jeopardise all warranties.
Deviations should only be carried out after formal consent has been obtained from the manufacturer.

- 1.1.8 **Caution!** Ensure that the environment in which the air heater is to be installed will not create a hazard, i.e. where excessive (volatile) dust, flammable or corrosive substances and/or vapours and combustible materials may be present. Suitable protection should be given to prevent damage to the appliance, for example from fork lift trucks.
- 1.1.9 These appliances have been tested and set according to the data plate before leaving the factory.

1.2 Quality Products

- 1.2.1 The Ambi-Rad range of gas fired cabinet heaters is manufactured in the EC and supplied in accordance with BS EN 9002: Quality Assurance System.
- 1.2.2 Certificates of conformity are available from the Quality Control department at Ambi-Rad Limited.

1.3 CE-Approval-European Directives

- 1.3.1 Ambi-Rad cabinet heaters have been fully assessed and tested and meet the following EC Directives:
- Gas Appliance Directive (90/396/EEG)
- Machinery Directive (89/392/EEC)
- Low Voltage Directive (73/23/EEC & 93/68/EEC)
- Electromagnetic Compatibility Directive (89/336/EEC & 91/36 EEC)
- Product Liability Directive (65/379/EEC)
- 1.3.2 In addition Ambi-Rad gas fired cabinet heaters conform to the following harmonised standards:

BS EN 676 :
Automatic forced draught burners for gaseous fuels.

EN 1020 :
Requirements for non domestic gas fired forced convection air heaters for space heating incorporating a fan to assist transportation of combustion air and/or combustion products.

BS EN 292 - Part 1 :
Safety of Machinery - Basic Concepts, General Principles for terminology, methodology

BS EN 292 - Part 2:
Safety of Machinery - Basic Concepts,
General Principles for Design Technical
Principles and Specifications.

BS EN 60204 - Part 1:
Safety of Machinery - Electrical Equipment
for Machine Specification for General
Requirements.

BS EN 60335 - Part 1:
Safety of Household and Similar Electrical
Appliances General Requirements.

BS EN 55014
Limits and methods of measurement of radio
disturbance characteristics of electrical
motor-operated and thermal appliances for
household and similar purposes, electric
tools and similar electric apparatus.

prEN 50165
Electrical equipment of non-electric heating
appliances for household and similar
purposes, safety requirements.

1.4.2 All cabinet heaters are fitted with a pre-tested and set forced draught burner. A sequential control box is fitted to each burner to provide safety. Note: No asbestos or soldered joints are present in the construction of the heater.

1.4.3 All the materials selected can withstand the range of chemical, mechanical and thermal demands expected during the foreseen and normal use of the product, as stipulated by manufacturers' instructions and recommendations.

1.4.4 Before final location of the product the following criteria should always be considered in placing the heater:-

- Flue outlet access
- Placing for efficient distribution of warm air
- Gas supply
- Electrical services
- Fresh air supply (when applicable)
- Service access and maintenance requirements

1.4. Product Information

- 1.4.1 Ambi-Rad cabinet heaters are available with burner outputs from 30kW to 270kW and can be floor mounted (VCHE units) or suspended (HCHE units). Cabinet heaters can be used in free blowing or ducted applications. Each heater must have its own individual open flue.

1.5 Warning

Heaters should not be installed in a corrosive or solvent atmosphere (i.e. near plating or degreasing plants), in areas where there is a fire risk, or any other environment which is detrimental to the heater or its operation. Consult BS 6230 for further information on hazardous areas.

2.0 Technical Specifications

2.1 Natural Gas – Single Stage (table 1a)

VCHE/HCHE Model		30	40	50	60	75	90	120	140	150	180	215	250
FRAME size		I		II			III		IV			V	
Heat input (gross)	kW	36,6	49,1	62,2	76,6	91,1	108,6	145,3	169,7	185,3	215,4	262,0	298,8
	Btu/h	124883,9	167685,3	212234,4	261369	310844,9	370557,1	495782,2	579038,2	632267,4	734972,4	893977,6	1019544
Heat output	kW	30,4	40,2	51,5	63,3	75,0	89,3	119,2	140,0	153,0	178,0	216,7	248,2
	Btu/h	103728,7	137290,2	175724,6	215987,7	255909,6	304703,1	406725,7	477698	522055,6	607358,8	739408,2	846890,2
Burner type	Riello	40	40	40	40	40	40	40	40	40	40	RS28.1	RS28.1
		GS5	GS5	GS5*	GS10	GS10	GS10*	GS20	GS20*	GS20*	GS20*		
Gas consumption (1)	m ³ /hr	3,49	4,68	5,94	7,30	8,69	10,36	13,86	16,19	17,66	20,55	25,00	28,51
Minimum gas inlet pressure	mbar	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20	17.5/20
	ins WG	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
Burner head pressure	mbar	2,1	2,9	4,7	4,5	4,1	5,2	3,4	4,0	5,1	6,0	5,6	8,0
	ins WG	0,84	1,16	1,89	1,81	1,65	2,09	1,36	1,61	2,05	2,41	2,25	3,21
Head setting (at 0 flue resistance)	Number	1,5	3,5	4,5	1,4	2,0	3,8	2,0	3,0	3,5	4,0	6,0	3,0
Air shutter setting (at 0 flue resistance)	Number	2,75	3,5	5,0	2,8	3,5	3,7	2,9	3,7	5,7	5,9	2,0	4,0
Flow pressure switch setting	mbar	3,35	4,7	3,3	4,1	5,1	5,7	6,7	4,4	5,1	6,0	5,1	8,0
CO2 (3)	%	9,7	10,0	9,3	9,9	9,6	9,5	9,7	9,3	9,9	9,0	9,2	9,3
Gross flue temperature (20°C ambient)	°C	190	218	217	229	246	232	227	198	192	190	210	185

(1) : G20 : 10.48 kWh/m³– 1013 mbar – 15°C – G.C.V.

(2) : CO2 figure measured by reference condition with reference gas (this figure can be subject to fluctuations in different installations on site (see § 6.2.1 /g)

(*) : extended head

2.1 Natural Gas – Single Stage (table 1b)

VCHE/HCHE Model		30	40	50	60	75	90	120	140	150	180	215	250
FRAME size		I		II			III		IV			V	
Nominal air flow	m³/hr	2500	2500	5180	5180	5180	7140	8750	10500	11500	12800	14100	17330
	ft³/min	1488	1488	3083	3083	3083	4250	5208	6250	6845	7619	8393	10315
Available outlet pressure (ducted outlet)	Pa	95	95	130	130	130	125	150	200	215	250	160	250
Air throw (approx.) (1)	m	18	18	21	21	21	20	25	25	27	30	25	30
	ft	59	59	69	69	69	66	82	82	88	98	82	98
Temperature rise through heater (nominal)	°K	36	50	29	36	42	37	40	39	39	41	45	42
	°F	65	90	52	65	76	67	72	70	70	74	81	76
Sound level (2) (for guidance only)	dB(A)	52	52	53	53	53	59	61	61	62	65	63	67
Flue spigot outside diameter	mm	125	125	150	178	178	178	178	178	223	223	223	223
Main fan motor size	kW	0,55	0,55	0,74	0,74	0,74	1,5	2,2	3,0	4,0	4,0	4,0	5,5
Total absorbed electrical power	kW	0,9	0,9	1,6	1,6	1,6	2,4	2,8	4,6	5,1	5,8	5,5	8,4
Electrical supply		230/240V - 1N ~ 50 Hz					400/415V - 3N ~ 50 Hz						
Inlet gas connection	ins BSP	1/2	1/2	3/4	3/4	3/4	3/4	3/4	3/4	1 1/4	1 1/4	1 1/4	1 1/4
Weight	kg	190	190	225	225	225	280	292	300	320	320	360	380

(1) : unobstructed in still air with a terminal velocity of 0.25m/s

(2) : Condition r=5m; Q=2; A=160; louvres in neutral position

2.2 Dimensions

Vertical heater range

Figure 1a : unit with discharge nozzle

Front view

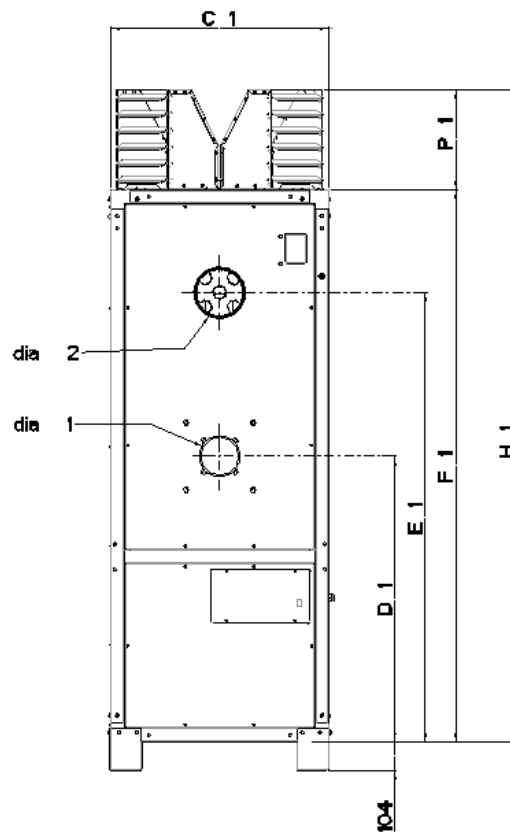


Figure 1b : unit with discharge plenum

Front view

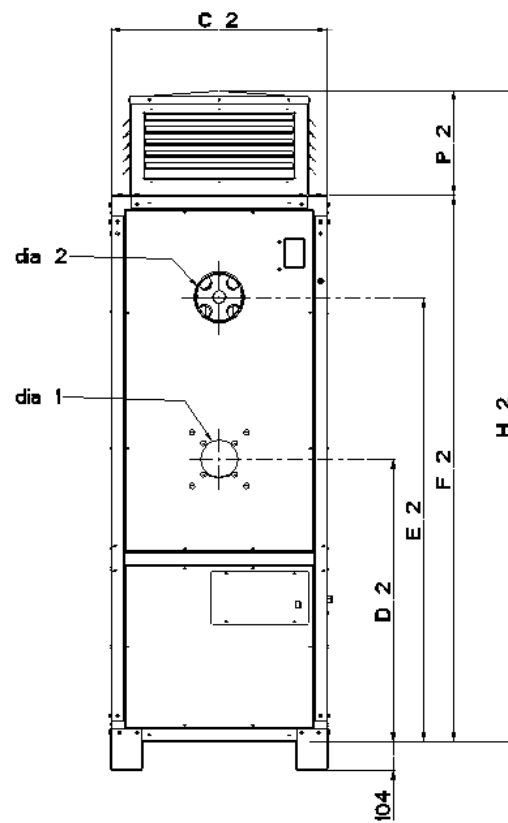


Figure 1c – Side view

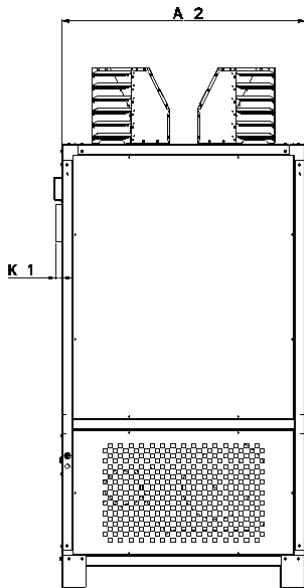


Figure 1d

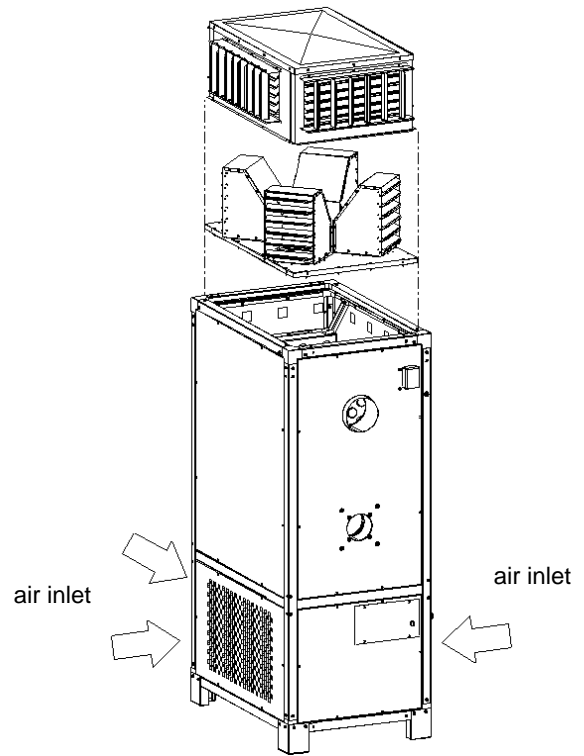


Figure 1e

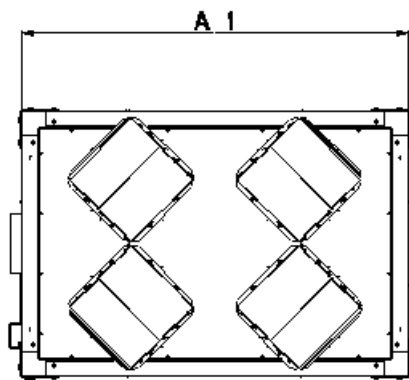
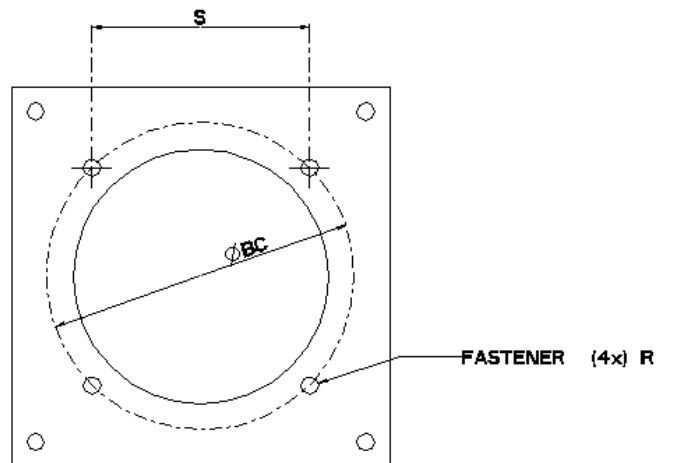


Figure 1f : burner mounting flange



Horizontal heater range

Figure 2a – Side view

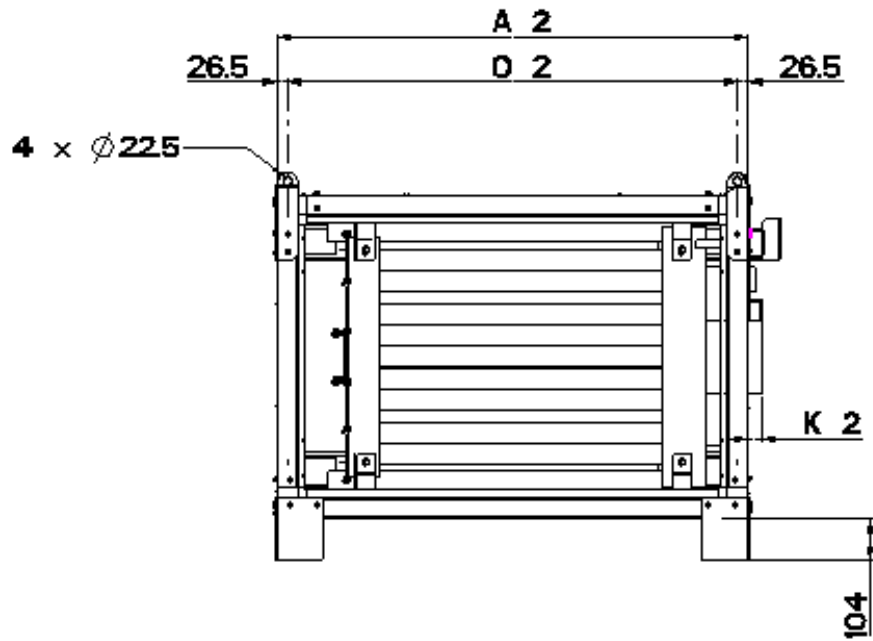
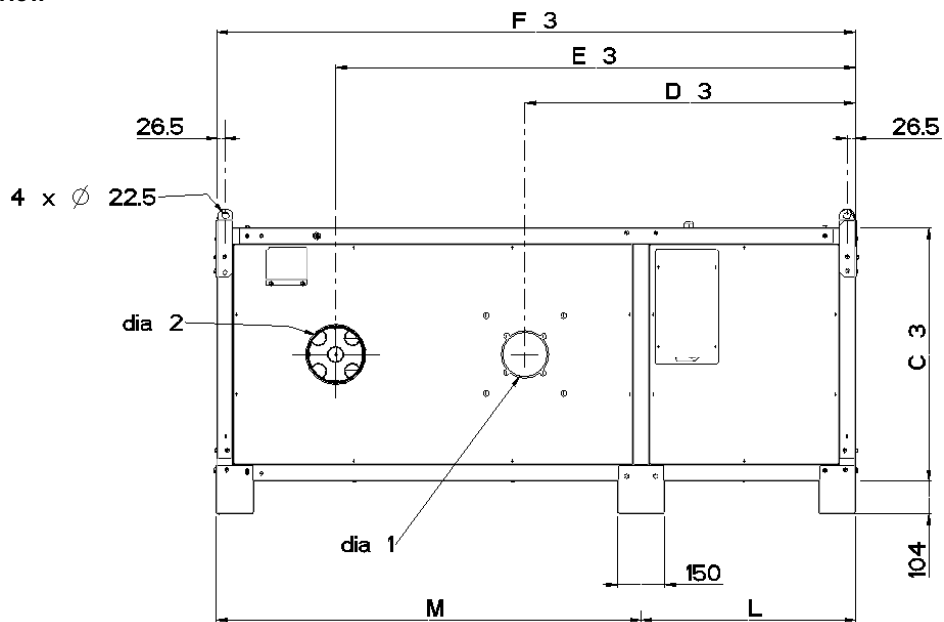


Figure 2b – Front view



Remark :

The fixation eyes (4x dia 22.5) may only be used to put the unit into horizontal position after delivery. It is strictly forbidden to use the fixation eyes for suspending the unit.

3.0 Mechanical/Electrical Services

3.1 Gas connection

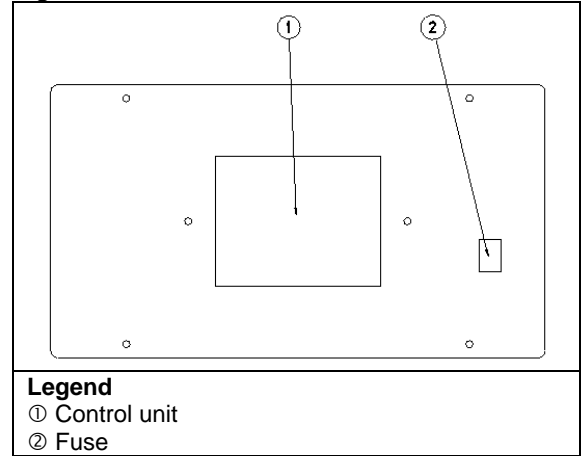
- 3.1.1 Connection to a gas service may only be carried by suitably qualified persons. The gas installation must comply with the rules in force using materials appropriate for gas service installations.
- 3.1.2 Check that the gas category is in accordance with the data described on the air heater.
- 3.1.3 An adequate gas supply sized to provide the dynamic pressure for the volume required by the air heater(s) is essential to maintain the nominal heat input.
- 3.1.4 A 90° action gas service tap and, to facilitate servicing, a disconnect union fitting must be provided adjacent to the appliance.
- 3.1.5 Ensure that a gas service includes a filter and has been tested and purged in accordance with prescribed practice prior to commissioning and taking the air heater into service.

Warning: Never use a flame to test for gas soundness.

3.2 Electrical connection

- 3.2.1 The electrical installation may only be carried out by suitably qualified persons observing the rules in force.
- 3.2.2 Check that the electrical specification is in accordance with the specified data on the air heater. A unique appliance wiring diagram is supplied as a separate document attached to this one, plus an additional copy attached to the air heater.
- 3.2.3 These appliances must be earthed.
- 3.2.4 A lockable main switch must be installed adjacent to each appliance and in view when facing the service compartment. The isolator must have a contact separation of at least 3.0mm on all poles.
- 3.2.5 The cabinet heaters are foreseen with a control unit supplied by Ambi-Rad.
- 3.2.6 Ensure when planning the external appliance control circuitry that power will be supplied at all times to the air heater, even when it is control switched in the 'heat-off' mode. This is necessary to ensure that the fan can operate independently of the heating control. Therefore never incorporate automatic controls that electrically isolate the appliance.

Figure 4 :



3.3 Ventilation requirements

- 3.3.1 It is essential that sufficient fresh air is provided for combustion and room ventilation.

Most traditional building constructions have a natural air change rate of at least 0.5/h.

Where it is known that the air change rate is at least 0.5/h and the volume of the heated space is greater than 4.7m³ per kW of total rated heat input, additional ventilation is not required.

- 3.3.2 **Building volume limits for Ambi-Rad cabinet heaters based upon 4.7m³ per kW of rated heat input for one air heater only (table 3)**

Frame	Model	Heat Input kW	Room Volume m ³
I	30	36.6	175
	40	52.2	245
II	50	62.2	295
	60	76.6	360
	75	91.1	430
III	90	108.6	510
	120	145.3	685
IV	140	169.7	800
	150	185.3	870
	180	215.4	1015
V	215	262.0	1230
	250	298.8	1405

If the minimum volumes stated above exist together with appropriate similar allowances for other combustion plant that may be installed in the same space or zone, then additional ventilation is not required.

3.3.3 Where it is known that the air change rate is less than 0.5/h or where the building volume is less than 4.7m³ per kW of heat input ventilation grilles must be provided at low level, i.e. below the level of the appliance flue connection. In cases where doubt exists over the air change rate ventilation should be provided.

For air heaters of heat input less than 60kW the total minimum free area shall not be less than 4.5 cm² per kW of total rated heat input for low level inlet and 2.25cm² for high level inlet.

For our heaters of heat input 60kW or more the total minimum free area shall not be less than 540cm² plus 4.5cm² per kW in excess of the 60kW rated heat input for low level grilles and 270cm² plus 2.25cm² per kW in excess of the 60kW rated heat input for high level outlet grilles.

3.3.4 **Air Supply Requirement for Combustion and Ventilation (table 4).**

Frame	VCHE Model	Heat Input kW	Low Level Grill cm ²	High Level Grill cm ²
I	30	36.6	165	82
	40	52.2	235	117
II	50	62.2	820	410
	60	76.6	885	442
	75	91.1	950	472
III	90	108.6	1030	515
	120	145.3	1195	597
IV	140	169.7	1305	652
	150	185.3	1375	687
	180	215.4	1510	755
V	215	262.0	1720	860
	250	298.8	1885	942

Note: Ventilation grilles must be installed so that air is drawn directly from outdoors. In the event that communication from the space where the heater is installed to outdoors is via another room then the route to outdoors must be ducted through the communicating area.

The grille velocity for all air supply must not exceed 2.0 m/s. Grilles should be sited where they cannot easily be blocked or flooded. Notices should be provided advising about the need to keep air supply grilles unobstructed.

3.3.5 Where mechanical ventilation is used it shall be by mechanical inlet with either mechanical or natural extraction. Automatic means of control such as interlocks must be provided. The function of other ventilation plant in the zone must be taken into account.

At no time should it be possible to create a negative pressure in the zone as this will lead to a hazardous situation whereby the air heater flue will act as a pressure relief.

3.3.6 Normally cabinet air heaters, which are used in the free, blowing mode, i.e. without discharge air ducting, are installed within the room to be heated. If it is necessary to install the air heater in a separate room and blow the air into an adjoining room then a short duct may be used to connect the appliance to the air discharge louvre.

A return air grille must be provided to ensure that an unobstructed path for recirculation air back to the air heater is maintained. This is to ensure that a negative pressure cannot develop within the space where the air heater is installed.

Grilles sized in accordance with table below must be installed at low level. Sizes stated must be regarded as the minimum free area size to be fitted. Such grilles should be situated as low as possible in the dividing wall and in a location where they are unlikely to become obstructed. It is recommended that a guard be fitted to prevent obstruction, i.e. stored materials. Permanent notices should be fitted in a prominent location on either side of the grille worded "This grille must be kept clean and unobstructed at all times".

Return air grille sizes based upon the appliance operated at standard airflow. (table 5)

Frame	VCHE HCHE	Air Volume m ³ /h	Grille Size cm ²
I	30	2500	3480
	40	2500	3480
II	50	5180	7200
	60	5180	7200
	75	5180	7200
III	90	7140	9900
	120	8750	12160
IV	140	10500	14600
	150	11500	16000
	180	12800	17800
V	215	14100	19500
	250	17330	24000

For spigot connection sizes to heater see fig. 10 & table 10 in section 5. For appliances operating at higher air volumes the size should be calculated to ensure that the grille velocity does not exceed 2.0 metres per second.

3.3.7 Where ducted cabinet heaters are installed within a separate room from the space being heated and the appliance does not have a direct supply connection to the outside, a return air grille must be provided to ensure that an unobstructed path for recirculation of air back to the heater is maintained. This is to ensure that a negative pressure cannot develop within the space where the air heater is installed.

4.0 Installation

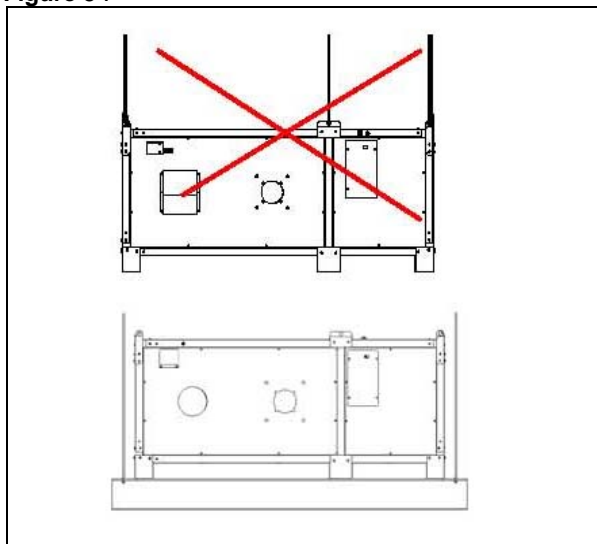
4.1 Location

- 4.1.1 Ensure the structural elements of the building are adequate to carry the weight of the appliance and its ancillary components, i.e. the flue system, and that the surface on which the heater is located is level in all plains and non-combustible.
- 4.1.2 Sufficient space must be maintained around the heater for servicing and the appliance should not be sited where it may suffer damage, e.g. forklift trucks or traffic.
- 4.1.3 The location must also allow for fitting an effective flue system and for adequate clearance for the air supply, return air, circulation, gas and electrical supplies whilst providing good and safe working access.
- 4.1.4 When moving the heater it is strongly advised that the lifting eyes are used. Adequate clearance from combustible materials must be maintained between the appliance and its flue system.
- 4.1.5 The horizontal cabinet heater (HCHE) must be suspended as illustrated in figure 5. When suspending the horizontal units, ensure the structural elements of the building are adequate to carry the weight of the appliance and its ancillary components (e.g. : flue system, duct system, ...). Unit may only be suspended by means of a frame on which the unit must be installed. It is strictly forbidden to make use of the fixation eyes to suspend the unit!

When unit is installed as a ducted heater, the duct connections must be installed as described in § 4.5.3. Ensure the dimensions of inlet & outlet duct are the same.

When the air intake is installed without a grille at the backside of the unit, ensure that a protection grille IP20 is installed to avoid the penetration of objects into the blower compartment.

Figure 5 :



4.2 Heater clearances

- 4.2.1 The following minimum clearances must be observed when installing the heater to enable easy access to the heater:

Minimum clearance around a vertical heater (table 6)

VCHE	Frame	Front *	LHS	RHS	Rear	Top**
30	I	800	500	500	500	1200
40		800	500	500	500	1200
50	II	800	500	500	500	1500
60		800	500	500	500	1500
75		800	500	500	500	1500
90	III	900	600	600	600	1500
120		900	600	600	600	1500
140	IV	1000	800	800	600	1750
150		1000	800	800	600	1750
180		1000	800	800	600	1750
215	V	1000	1000	1000	2000	2000
250		1000	1000	1000	2000	2000

* Measured from front panel.

** Measured from top of outlet nozzle

All dimensions in mm. Front is when looking at the burner.

Minimum clearance around a horizontal heater (table 7)

HCHE	Frame	front*	Rear side	Bottom	Top
30	I	800	500	500	500
40		800	500	500	500
50	II	800	500	500	500
60		800	500	500	500
75		800	500	500	500
90	III	900	600	600	600
120		900	600	600	600
140	IV	1000	600	800	800
150		1000	600	800	800
180		1000	600	800	800
215	V	1000	2000	1000	1000
250		1000	2000	1000	1000

* Measured from front panel

4.3 Flue

4.3.1 Ambi-Rad cabinet heaters must be connected to a flue system venting the products of combustion directly to outdoors.

Flue systems must be installed in accordance with the rules in force taking into account the location of flue termination relative to the construction elements of the building, i.e. windows, roof levels, etc., and in accordance with statutory requirements.

4.3.2 Ambi-Rad recommends that appliances are connected to individual flues sized in accordance with the diameter appropriate to the appliance flue connection socket. Flues must be terminated with an approved terminal fitting.

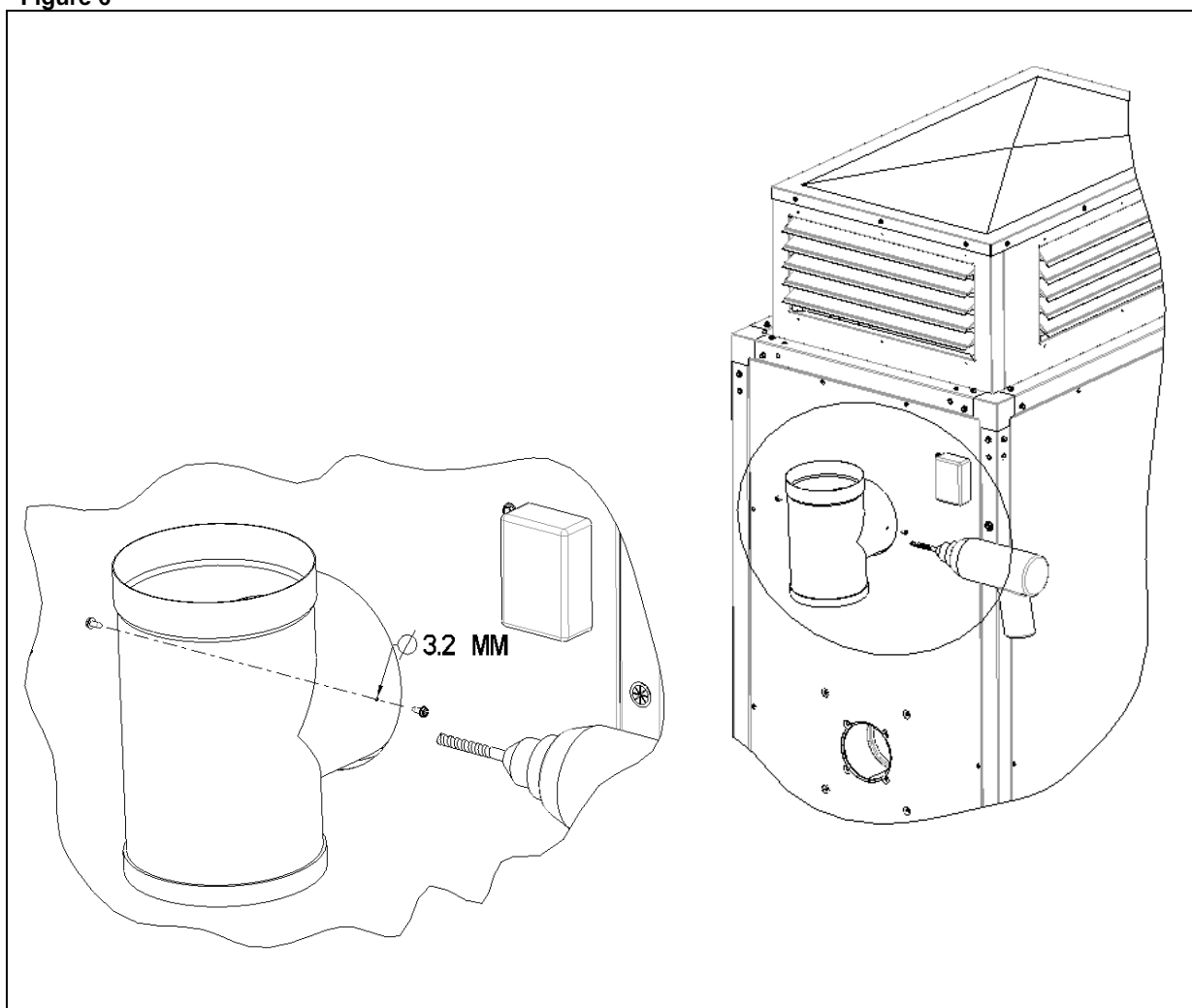
Attention : ensure that the connection of the flue to the cabinet heater is completely air tight or sealed.

4.3.3 A minimum length of 2.0m is required to ensure a good flue draught condition.

4.3.4 Install the flue elbow or T-with drip pan directly into the appliance flue socket and secure firmly using self-tapping screws. Seal the joint with high temperature sealant or fibreglass rope and fire clay.

4.3.5 The use of twin wall flue should be considered if condensation in the flue system is a possibility.

Figure 6



4.4 Free blowing nozzled Heaters

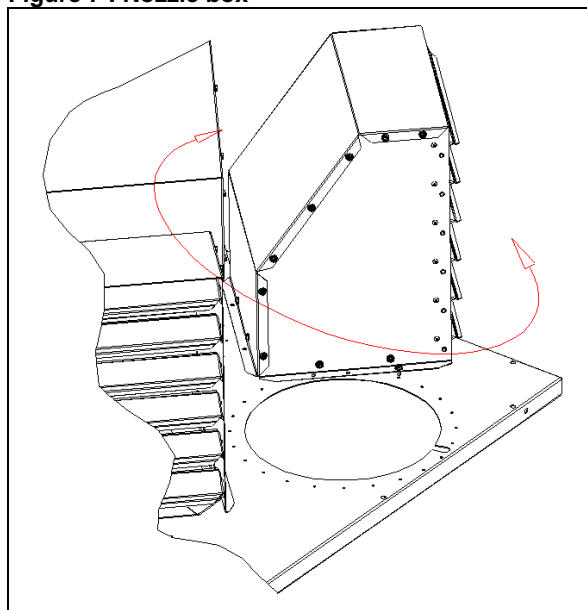
4.4.1 **Nozzle boxes** (options 203 / 203.2)
 When the unit is ordered with option 203 or option 203.2 (nozzle boxes), the nozzle top plate is installed on the unit. The nozzle boxes are supplied loose and must be installed on the top plate of the heater, as shown in figure 7

Each nozzle box must be correctly positioned in order to obtain the desired air distribution. The louvers can be adjusted. It is forbidden to close all louvers at a time as overheating could occur. For safety reasons it is recommended to wear gloves & glasses when adjusting the louvers.

(*) :Quantity of nozzle boxes & fixing screws
 2 for types 30 & 40 + 4 fixing screws
 3 for types 50/60/75 + 6 fixing screws
 4 for types 90→250 + 8 fixing screws

It is recommended to fix the nozzle boxes to the top panel using 2 fixing screws. This will secure the nozzle boxes particularly when applied on horizontal units

Figure 7 : Nozzle box



4.4.2 **Discharge plenum** (option 203.3) (figure 8)
 The discharge plenum is designed to be installed on top of the VCHE series. When ordered with this option, the unit is delivered without top plate so that the discharge plenum can easily be pushed in the top outlet of the unit.
 A plastic bag contains the needed fixing screws (qty 12 for the sizes 30 & 40 / qty 14 for the sizes 50, 60 & 75 / qty 16 for the sizes 90 & 120 / qty 16 for the sizes 140, 150 & 180 and qty 18 for the sizes 215 & 250) (see fig. 8).

The horizontal louvers may be adjusted to obtain proper deflection and air pattern. For safety reasons, it is recommended to wear gloves and glasses when adjusting the louvers.

Table 8a: Number of horizontal louvers per side :

VCHE	N° of sides	Hor. louvers
30/40	4	4
50/60/75	4	3
90/120	4	5
140/150/180	4	3
215/250	2	3
	2	2x3

The different "Open/Closed" combinations of the louvers :

- during heating all louvers may be fully opened
- 1 fully open & 3 fully closed louvers (all directions)
- 2 fully open & 2 fully closed louvers (all directions)
- for protection of fan motor and proper heater operation do not close all louvers at a time
- a minimum of 2 open louvers per direction must always be respected

4.4.3 **Vertical louvers** (option 207.1) (fig. 9)

The discharge plenum (option 203.3) can be equipped with vertical louvers thus enabling a horizontal deflection of the air (max. ! 150°). The vertical louver frame must be securely screwed in the openings (outlets) foreseen in the bottom and upper side of the plenum. When adjusting the vertical louvers wear gloves and glasses. Closing all the vertical louvers at a time is forbidden as this could result into an air obstruction influencing the LC3 (maximum temperature thermostat).

The number of vertical louver assemblies, the vertical louvers and the fixing screws vary per model. See table 8b below.

VCHE	Vertical louvers assy	Vertical louvers	Fixing screws
30/40	4	6	24
50/60/75	4	8	24
90/120	2	10	24
	2	8	
140/150/180	4	8	14
215/250	4	8	36
	2	10	

Figure 8 : Nozzle plenum

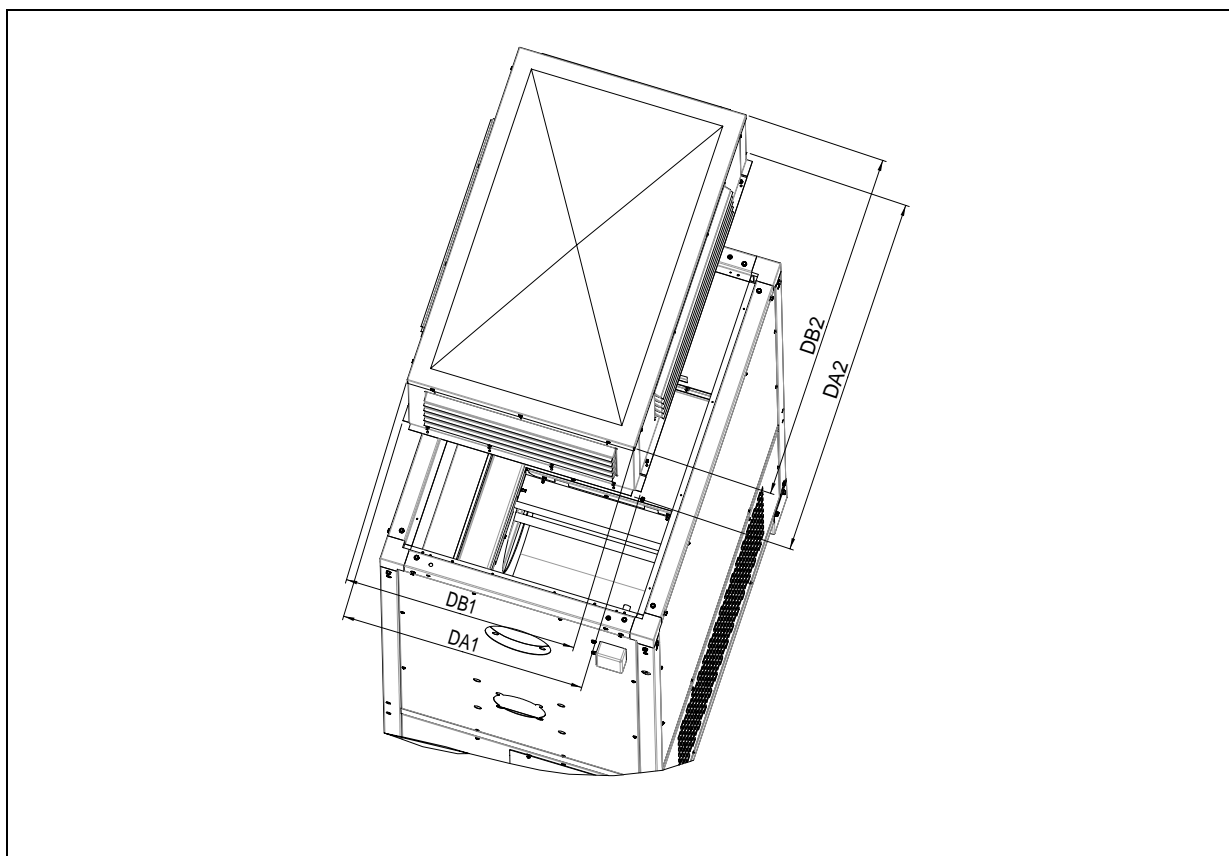
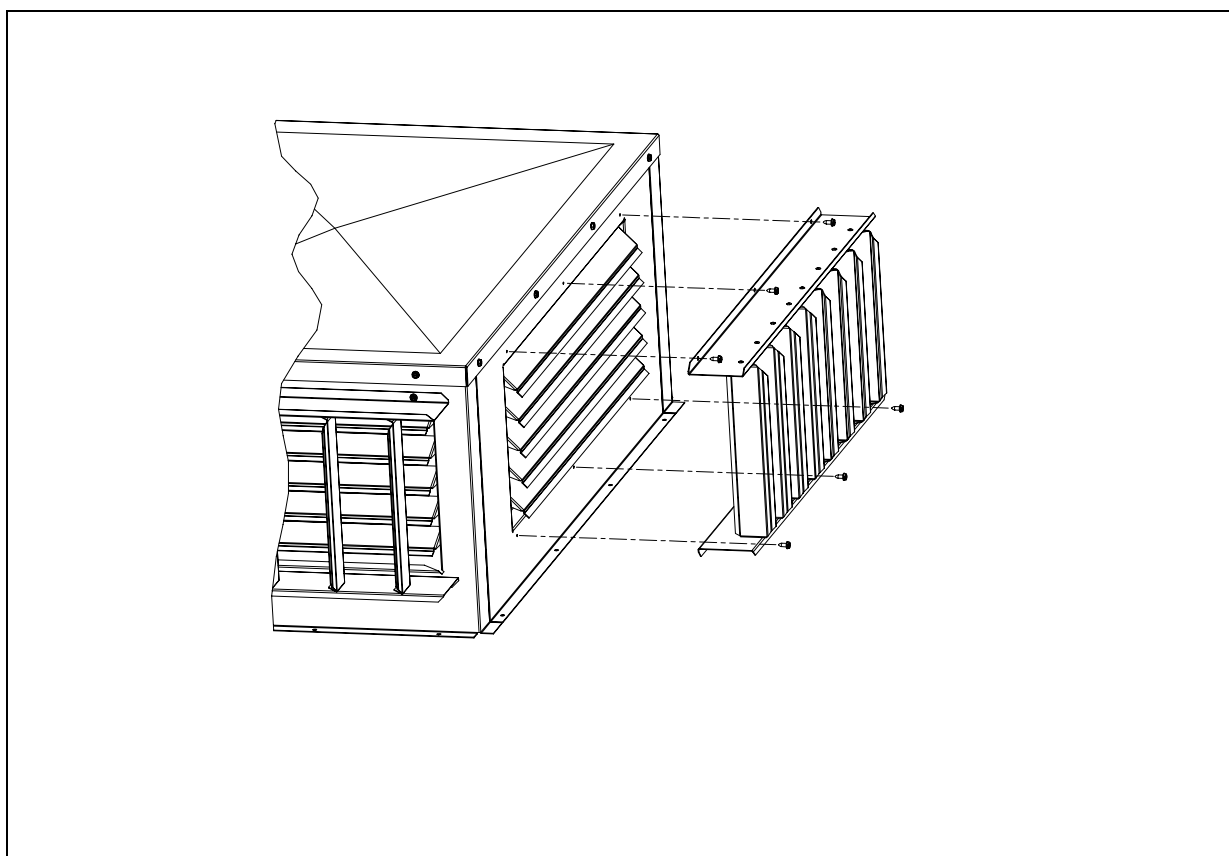


Figure 9 : Vertical louvres

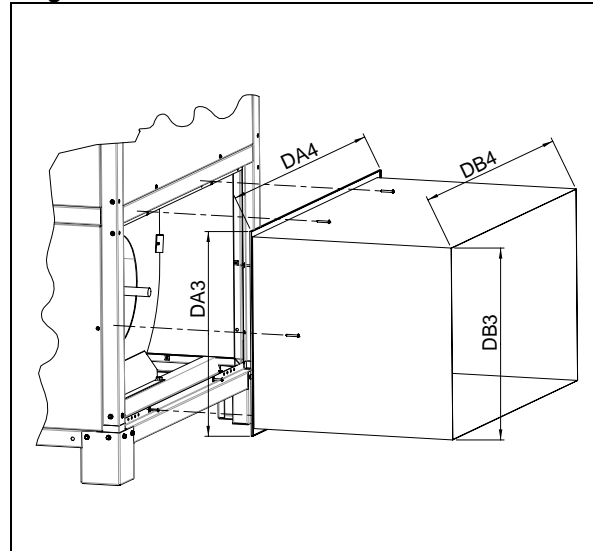


4.5 Ducted Heaters

- 4.5.1 The Ambi-Rad ducted cabinet heater is designed to be used with discharge ducting. A positive seal should be made between any ducting and the air heater. A flexible connection is desirable to eliminate transmission of noise and to take account of thermal expansion.
- 4.5.2 Consideration should be given to the application of duct fittings directly connected to the appliance. Air outlet elbows, transitions etc. should be designed to ensure an unrestricted and turbulent free air flow. This requirement is to ensure that an even air temperature is maintained when leaving the appliance thus eliminating heat exchanger "hot-spots" and nuisance shut-down of the burner due to over heating.
- 4.5.3 Figures 8 and. 10 illustrate the principle and the method of fixing duct channels to the heater
- ducts must have adequate duct flanges to fit into the frame structure of the heater
 - the dimensions DA1/DA2/DA3/DA4 refer to the duct flange; the dimensions DB1/DB2/DB3/DB4 refer to the duct.
 - duct flanges must be screwed to the frame structure; holes are provided in the frame

Remark : fig. 10 shows ducted air inlet fixation – same fixation method applies for ducted air outlet

Figure 10



Attention must be given to the motor load when applying discharge ducting. Duct outlets must be adjusted when necessary to meet the values mentioned in table 9.

Table 9

Frame	Model	Nominal airflow m ³ /h	Available outlet static pressure Pa	Motor load (maximum) (A)	Motor current normal use (*) (A)	Voltage (V)
Standard airflow conditions						
I	30/40	2500	95	4.00	3.4	230V – 1N
II	50/60/75	5180	130	9.00	7.8	230V – 1N
III	90	7140	125	3.20	2.3	400V – 3N
	120	8750	150	5.08	3.7	400V – 3N
IV	140	10500	200	6.60	5.4	400V – 3N
	150	11500	215	8.00	7.8	400V – 3N
	180	12800	250	8.50	8.4	400V – 3N
V	215	14100	160	9.00	7.0	400V – 3N
	250	17330	250	11.50	11.0	400V – 3N
High airflow conditions (when option 403 is applied)						
Frame III	90	8750	150	5.08	3.7	400V – 3N
Frame IV	140/150	12800	250	8.50	8.4	400V – 3N
Frame V	215	17330	230	11.50	11.0	400V – 3N
High outlet static pressure conditions (when option 404 is applied)						
Frame III	90	7140	205	5.08	3.7	400V – 3N
Frame IV	140	10500	350	8.50	8.4	400V – 3N
	150	11500	310	8.50	8.4	400V – 3N
Frame V	215	14100	330	11.50	11.0	400V – 3N

(*) Current is measured in cold air conditions (heating off) while unit is working at standard air flow. However, measuring motor current of 10% lower than the figures mentioned in table 9, means that the air flow will be lower and the ΔT higher. In this case overheating can occur. To avoid this problem, larger outlets must be provided. In case motor current is greater than the maximum motor load (mentioned in table 9) duct outlet openings must be decreased so that motor load becomes lower. We strongly recommend respecting the figures given in table 9.

4.5.4 Ducted air **outlet** on VCHE/HCHE units (std. option 206.1)
 In this situation, the unit is delivered without nozzle boxes (option 203) or outlet discharge plenum (option 203.3). The ducts must be connected to the air outlet

(on top of the heater for vertical model or at the left side of the heater for horizontal models). Respect the dimensions for the duct air outlet and for the flange as indicated in table 10a & 10b.

Table 10a (refer to fig. 8) : duct dimensions required for ducted outlet on VERTICAL model (VCHE)

VERTICAL MODEL VCHE					
Frame	Model	Duct flange dimensions (mm)		Duct channel dimensions (mm)	
		Width DA1	Depth DA2	Width DB1	Depth DB2
I	30/40	761	509	721	469
II	50/60/75	761	755	721	715
III	90/120	691	1054	651	1014
IV	140/150/180	1082	1201	1042	1161
V	215/250	1082	1400	1042	1360

Table 10b (refer to fig. 8) : duct dimensions required for ducted outlet on HORIZONTAL model (HCHE)

HORIZONTAL MODEL HCHE					
Frame	Model	Duct flange dimensions (mm)		Duct channel dimensions (mm)	
		Height DA1	Depth DA2	Height DB1	Depth DB2
I	30/40	761	509	721	469
II	50/60/75	761	755	721	715
III	90/120	691	1054	651	1014
IV	140/150/180	1082	1201	1042	1161
V	215/250	1082	1400	1042	1360

Attention must be given to the motor load when applying discharge ducting. Duct outlets must be adjusted when necessary to meet the values mentioned in table 9.

4.5.5 **Ducted air inlet on VCHE/HCHE units**
 The unit is designed so that it can be installed with inlet air ducts.

Vertical units :

- Option 541.1 = left
- Option 541.2 = right
- Option 541.3 = rear

Horizontal units :

- Option 541.4 = end
- Option 541.5 = top
- Option 541.6 = rear
- Option 541.7 = bottom

To enable free blowing of the air into the blower system, **it is forbidden to install air baffles or elbows in the last part (!0.75m) of the duct connected to the heater.**

Respect the normal motor current as shown in table 9 as a normal motor current guarantees a normal airflow and a normal ΔT . Respect dimensions for duct air inlet and for the flange as indicated in table 11a & 11b

Attention : Never install the inlet air ducts in combination with the standard protection air inlet grille. This situation may constitute a hazard & jeopardise all warranties.

Table 11a (refer to fig. 10)

VERTICAL MODELS VCHE						
Frame	Model	Option	Duct flange dimensions (mm)		Duct channel dimensions (mm)	
			Height DA3	Width DA4	Height DB3	Width DB4
I	30/40	541.1 (left)	441	509	401	469
		541.2 (right)				
		541.3 (rear)				
II	50/60/75	541.1 (left)	512	755	472	715
		541.2 (right)				
		541.3 (rear)				
III	90/120	541.1 (left)	596	1054	556	1014
		541.2 (right)				
		541.3 (rear)				
IV	140/150/180	541.1 (left)	707	1201	667	1161
		541.2 (right)				
		541.3 (rear)				
V	215/250	541.1 (left)	596	1400	556	1360
		541.2 (right)				
		541.3 (rear)				

Table 11b (refer to fig. 10)

HORIZONTAL MODELS HCHE						
Frame	Model	Option	Duct flange dimensions (mm)		Duct channel dimensions (mm)	
			Height (1) Depth (2) DA3	Width DA4	Height (1) Depth (2) DB3	Width DB4
I	30/40	541.5 (top)	509	441	469	401
		541.7 (bottom)				
		541.6 (rear)	761	441	721	401
		541.4 (end)				
II	50/60/75	541.5 (top)	755	512	715	472
		541.7 (bottom)				
		541.6 (rear)	761	712	721	672
		541.4 (end)				
III	90/120	541.5 (top)	1054	596	1014	556
		541.7 (bottom)				
		541.6 (rear)	1054	596	1014	556
		541.4 (end)				
IV	140/150/180	541.5 (top)	1201	707	1161	667
		541.7 (bottom)				
		541.6 (rear)	1082	707	1042	667
		541.4 (end)				
V	215/250	541.5 (top)	1400	596	1360	556
		541.7 (bottom)				
		541.6 (rear)	1082	596	1042	556
		541.4 (end)				

(1) : Depth : top/bottom
 (2) : Height: end/rear

4.5.6 Air inlet via an air inlet duct with extra filter cabinet (option 501.x) (fig. 11).

The cabinet is equipped with sliding rails for installing the flat filter elements. EU4 panel filters (1") can be used.

The filter elements can be replaced without removing the duct.

The tables 12a & 12b on next page show the different possibilities and option numbers.

Figure 11

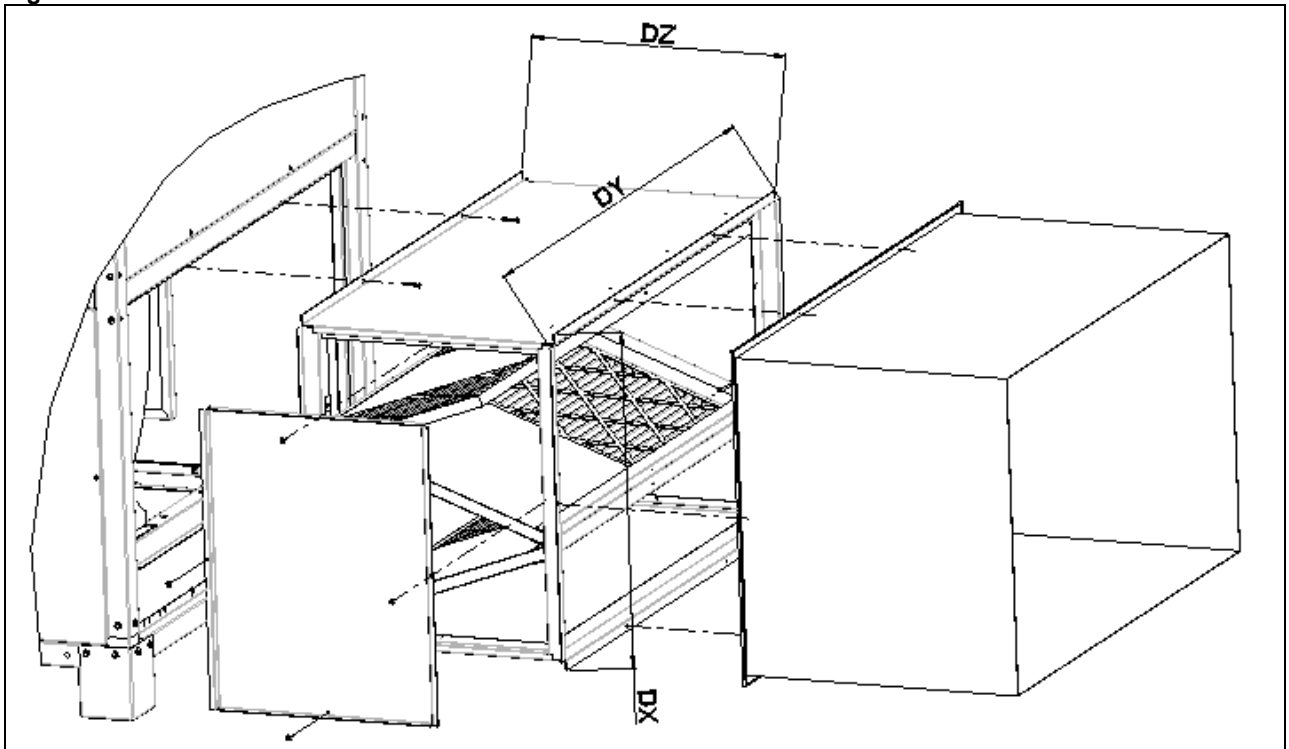


Table 12a

VERTICAL MODEL								
Frame	Model	Option	Location	Dimensions (mm)	Qty	DX (mm)	DY (mm)	DZ (mm)
I	30/40	501.7	Rear	622x394	2	443	763	466
I	50/60/75	501.7	Rear	622x394	3	514	763	471
III	90/120	501.7	Left	495x495	6	598	1056	465
IV	140/150/180	501.7	Left	495x495	6	709	1203	560
V	215/250	501.7	left	622x495	6	598	1402	567

Table 12b

HORIZONTAL MODEL								
Frame	Model	Option	Location	Dimensions (mm)	Qty	DX (mm)	DY (mm)	DZ (mm)
I	30/40	501.8	End	622x394	1	763	511	176
I	50/60/75	501.8	End	622x394	3	763	757	446
III	90/120	501.8	End	495x495	6	693	1056	454
IV	140/150/180	501.8	End	495x495	6	1084	1203	502
V	215/250	501.8	End	622x495	6	1084	1402	502

4.6 Filters (options 501.1 / 502.1) (fig. 12)
(only for vertical heater model VCHE)
 The cabinet heaters can be equipped with panels with sliding rails for filter elements (option 501.1)
 EU4 panel filter (1") can be fitted to this heater (option 502.1). Refer to table 13a/13b for more details.
 Filters must be inspected on a regular basis as dirty filters can affect the safe working of the unit.

For safety reasons it is recommended to wear gloves & glasses when inspecting the filters. Dirty filters should be carefully handled and must be packed in plastic bags – never throw them in the usual dustbin.

Attention :
It is forbidden to use filters with standard air intake panels. The pressure drop would become too high resulting into overheating of the heater.

Table 13a : Panel filters for vertical units

Frame	Mod	Location	Qty	Dim (mm)
I	30 40	side	0	no filters
		rear	1	394x622
II	50 60 75	side	2	394x622
		rear	1	394x622
III	90 120	side	2x2	495x394
		rear	1	495x622
IV	140 150 180	side	2x2	495x495
		rear	1 1	495x495 495x394
V	215 250	side	2x2	495x622
		rear	2	495x394
		front	1	495x622

Table 13b : Panel filters for horizontal units

Frame	Mod	Location	Qty	Dim (mm)
I	30 40	right (end)	1	394x622
		top	0	no filters
II	50 60 75	right	2	394x622
		top	1	394x622
III	90 120	right	1	394x495
			1	622x495
		top	2	394x495
IV	140 150 180	top	2	495x495
		right (end)	4	495x495
V	215 250	top	2	495x622
		front	1	495x622
		right (end)	4	495x622

Figure 12 : Filters

Legend

- 1. standard
- 2. duct left
- 3. duct right
- 4. duct rear

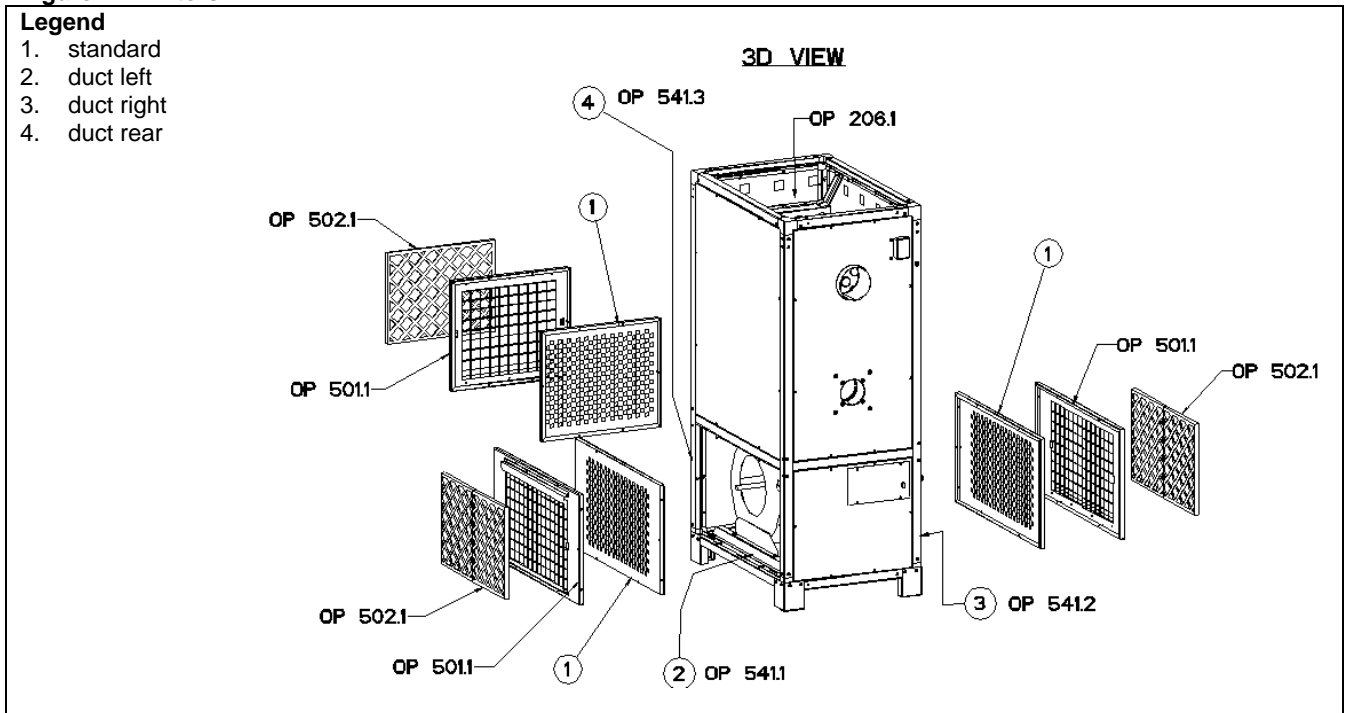
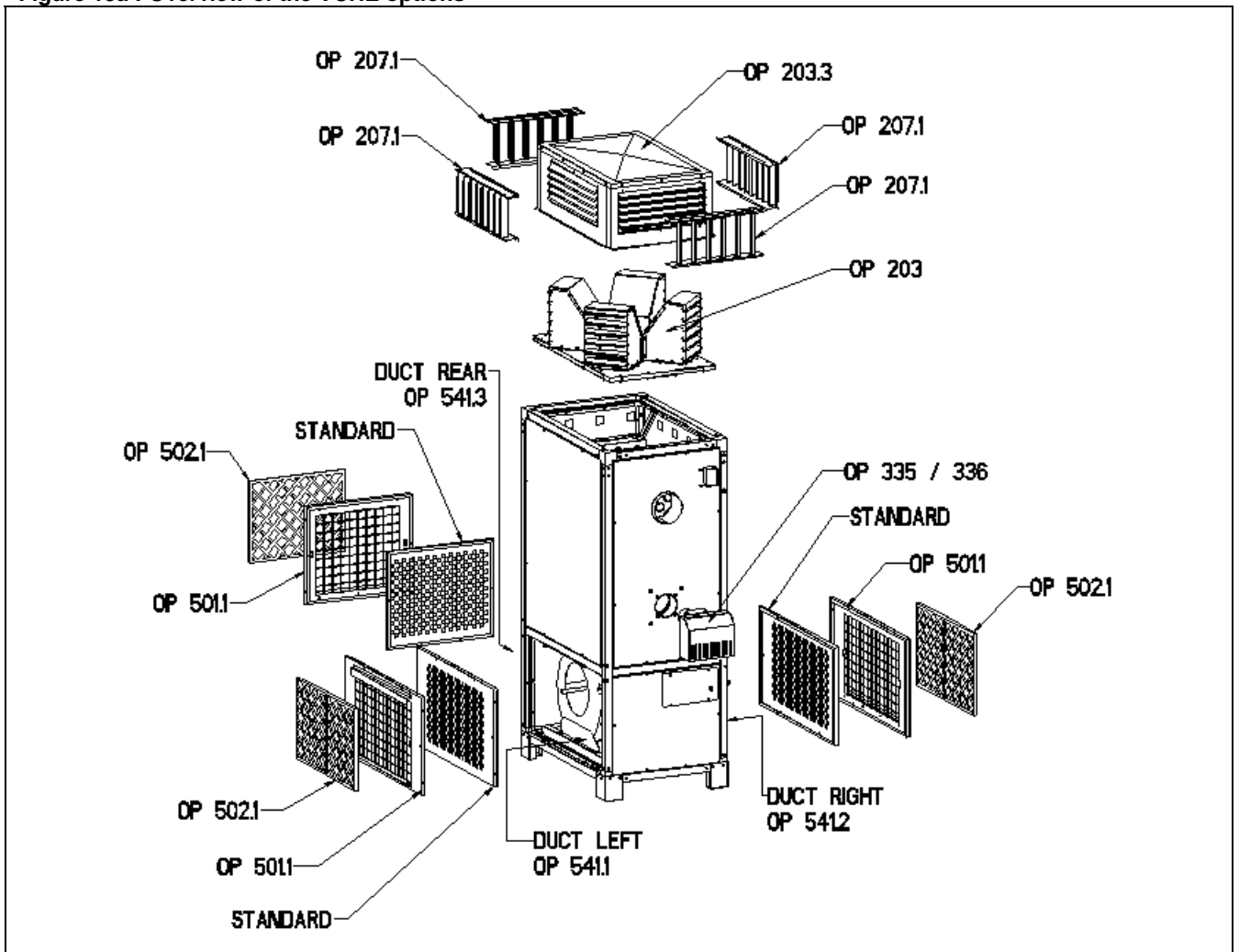
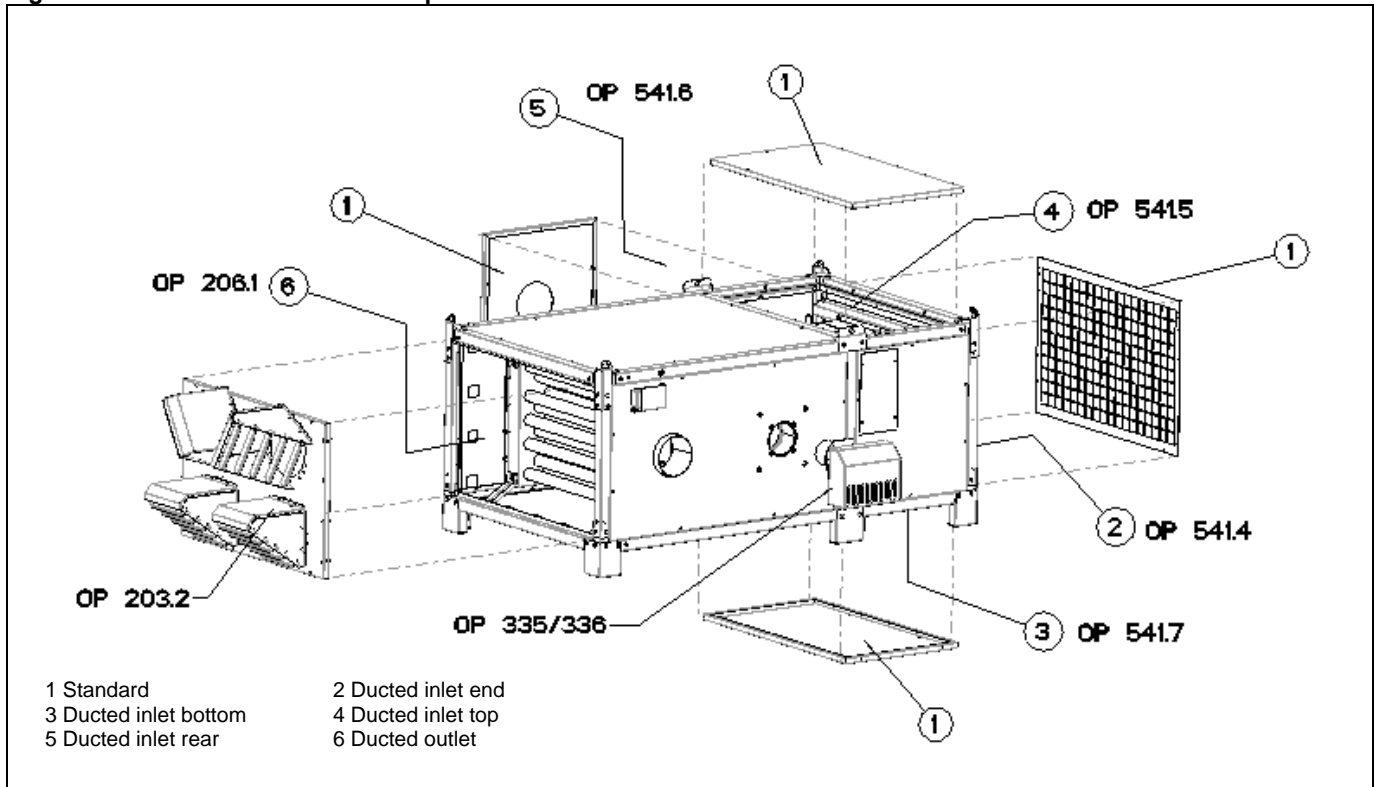


Figure 13a : Overview of the VCHE options



Note : When filters (option 502.1) are required, then the standard air intake panels must be replaced by the panels included in option 501.1

Figure 13b : Overview of the HCHE options



Note : When the option 541.4 (ducted inlet end) is required, the standard perforated end panel is not required

4.7 Controls

- 4.7.1 Vertical heaters are supplied with a pre-wired control unit, comprising :
1. time control
 2. day/night temperature control
 3. heat-vent facility
- Horizontal heaters are supplied with a remote panel.
 Refer also to § 3.2 'Electrical connections'.

5.0 Commissioning

- 5.1 Only suitably trained personnel or specialist commissioning engineers should be used to carry out the commissioning of the installed equipment. Ensure that all relevant manuals and user instructions are available before the commissioning engineer proceeds.
Although the heater is test fired at the factory, each installation has a different set of site conditions. Therefore commissioning is very important.
Note: The heater should not just be switched on and left to function.
 The correct type of combustion analysis equipment, correctly calibrated, should be used at all times.

Pre-Commissioning Checks

Always ensure electrical safety and soundness of the gas installation before commencing, then proceed with the following checks:-

- (a) Ensure electrical supply has been switched off.
- (b) Ensure the gas supply is switched off.
- (c) Check that the heater has been installed on a suitable level base and is supported correctly with adequate clearance around the inlet grilles.
- (d) Fully open louvres on nozzle outlets or ductwork grilles.
- (e) Ensure the flue system is adequately supported with correct termination and sealing of the joints.
- (f) Check that all heater panels are securely fastened and correctly fitted.
- (g) Locate gas sampling point and ensure this can be resealed on completion of commissioning.
- (h) Check fan and limit stat
 Fan off 30°C
 Fan on 60°C
 Overheat Limit see table 14
 Ensure white button is pulled out and red button has been reset.
- (i) Where applicable check pulley alignment and belt tension.
- (j) Test for earth continuity between the heater, control panels, burner and gas pipe work.
- (k) Turn on the electrical supply and ventilation manual switch. The fan will start enabling the direction of the fan impeller to be verified.
- (l) Switch off electrical supply.
- (m) At the heater control panel or remote panel set the required positions of the thermostats and time clock.

Table 14

VCHE HCHE	Working point Rt 25°C	Switching point
30	!52°C	100°C
40	!55°C	100°C
50	!40°C	90°C
60/75	!51°C	90°C
90	!77°C	100°C
120	!84°C	100°C
140	!50°C	90°C
150/180	!53°C	90°C
215	!52°C	90°C
250	!60°C	90°C

5.2 Commissioning Procedure

5.2.1 Do not proceed with this section unless all parts of section 6.1.2 have been successfully completed. In the event that one part does not comply DO NOT PROCEED. Seek assistance from the supplier. Refer to the burner manual, supplied separately, ensuring all setting data is known before commencing.

- (a) Turn on electrical supply and adjust panel to 'heat' mode.
- (b) Check that burner goes through correct ignition sequence and goes to 'lock-out'.
- (c) Adjust panel to 'off' mode. If the burner does not go to lockout DO NOT PROCEED until the fault has been correctly identified and repaired.
- (d) Switch on the gas supply and connect a suitable manometer to the test point on the burner prior to the combustion head.
- (e) Adjust panel to 'heat' mode and reset the control box from lockout. The burner will start and a head gas pressure will be indicated on the manometer. Check this value is in line with the technical specification in section 2. If not adjust governor on gas valve accordingly. See burner manual accompanying this manual.
- (f) Using approved and calibrated combustion analysis equipment to measure the percentage CO₂. CO, gross flue temperature and ambient temperature.
- (g) If the CO₂ levels do not correspond to the technical specification in section 2 adjust the primary air damper, more open for less CO₂ and more closed for more CO₂, until the correct level has been obtained.
The CO₂ level on the site must be lower than 10% & higher than 8.5%.
- (h) Re-check all readings and enter on the commissioning sheet.
- (i) From readings calculate the net efficiency of the unit. This is not to be less than 84%.
- (j) The operation of the fan/limit stat is checked as follows :
*for types 30-75 (direct driven blowers) : by depressing and holding the main fan starter overload button.
*for types 90-250 (V-belt driven) : by removing the red wire of the fan stat. This will stop the main fan without stopping the burner. After 3 minutes the burner will stop.

- (k) If the burner has not stopped release the button and allow the main fan to cool down the heater. Then check the following:-
 - Fan & limit stat settings are correct.
 - The bi-metal strip has not been damaged.
 - The bi-metal strip casing is not in contact with the heat exchanger body.
- (l) Adjust temperatures and time periods to ensure that the burner operates when required by the controls.
- (m) Adjust panel to 'off' mode'. The burner will stop. Note the time it takes for the fan to stop, approximately two minutes, thus ensuring the fan side of the fan/limit stat is operating correctly.
- (n) Complete the commissioning sheet and return a copy to the Service Department.

In the event of any problems occurring during the commissioning process, which cannot be properly, rectified please consult the Technical Department of Ambi-Rad Limited.

5.3 Commissioning Outlets

For free standing heaters it is essential to ensure that the nozzle outlet louvres (discharge or plenum louvres) have been adjusted to the required angle of discharge and have been rotated to give the optimum distribution of air throughout the premises. Take care to avoid the short cutting of hot air back into the fan system, i.e. when installed close to a wall, as this can lead to a nuisance overheating condition.

Securely fix all nozzle outlets after final adjustments have been made.

Outlets for ducted systems are generally adjusted by the ductwork-commissioning engineer. On completion ensure that the static pressure at the top of the heater does not exceed that as quoted in the technical specification in section 2 of this manual This can be achieved by the use of a manometer taking a pressure reading in the plenum of the ductwork. Also check the running current of the main fan motor.

If the ductwork pressure is correct then the running current will be as quoted on the data plate. If the static pressure is too low this will be verified by a high running current, which could lead to premature failure of the fan motor. Consequently, the ductwork outlet grilles will have to be closed to increase the static pressure. If the static pressure is too high this will be verified by a low running current of the motor, which could lead to overheating of the heater. The limiter will trip out. Consequently the duct grilles will have to be opened.

5.4 User Instructions

- (a) Complete all commissioning data on the commissioning sheet.
- (b) Instruct end user in correct operation and function of heater and ancillary controls. Particular awareness should be made to start up and shut down of the equipment.

- (c) Instruct on the safety features of the heater.
- (d) Hand over to the end user a copy of the 'User Instructions' complete with a copy of the commissioning sheet.
- (e) Advise on the need for regular servicing of the equipment. In particular that the fan belts will require tensioning after the first 100 hours of running.

6.0 Instructions for Servicing

Servicing should be carried out on a regular basis (minimum once a year) by a suitably qualified engineer or fully trained competent personnel. More frequent servicing may be required dependent upon the environmental circumstances where the air heater is installed. Regular inspection is necessary, especially in dirty areas. Failure to undertake this servicing could lead to premature failure of various components and invalidation of the warranty for individual parts or the heater as a whole.

Only approved spares or replacement parts may be used. Failure to comply with requirement could lead to an unsafe condition within the heater and invalidate any warranty claim.

Reference should also be made to the appropriate burner manual accompanying this manual before the commencement of any work.

For safety reasons no service should commence before isolating both the electrical and gas supplies to the heater and the heater has been allowed to cool down until the heat exchanger is completely cold.

6.1 Frequency

In order to maintain a safe, reliable and efficient operation of the heater we recommend that the following planned service maintenance programme is adopted by the end user.

First 100 hours of use:-

Inspect fan belts and retention if required.

After 3 months:-

- (a) Visual inspection of outer panels
- (b) Visual inspection of burner
- (c) Clean and check position of ionisation and ignition probes.
- (d) Check operation of burner lock-out.
- (e) Check operation of safety overheat and device.

After 6 months:

- (a) Same as after 3 months
- (b) Carry out check on all combustion readings.

Annual inspection

- (a) Same as after 6 months
- (b) Heat exchanger inspection and

cleaning.

- (c) Burner maintenance.
- (d) Main fan and motor.
- (e) Pulley and belts.
- (f) Flue. system
- (g) Control panel and electrical connections.
- (h) Gas supply connections.

6.2 Procedures

Heat Exchanger

- a) Access to the heat exchanger is made via the top rear panels, i.e. the panels opposite to the burner. Loosen the 8 hex head screws on the back panel of the heater and remove the panel.. The rear panel and heat shield can now be lifted off The cover plate over the end assembly will now be exposed and can be removed by undoing the brass nuts around the periphery of the cover, thus exposing all the heater exchanger tubes.

Attention :

For safety reasons it is forbidden to remove the explosion relief panel and its 4 bolts and springs.

Inspect for deposits and clean, using a strong flue brush suitable for 51mm diameter tubes. The loose deposits can now be vacuumed up using an industrial vacuum cleaner. During the inspection of these parts the deposit can also be vacuumed out.

- b) Remove the burner to inspect and clean the combustion chamber.

The whole of the heat exchanger and combustion chamber should be given a good inspection ensuring there are no slots, cracks or severe distortion. **If the condition of either the heat exchanger or the combustion chamber gives cause for concern please notify the end user and the Ambi-Rad UK Limited Service Department immediately.**

Replace access cover plate ensuring the new gasket material is used. The outer panels can also be replaced

Retighten the hex screws on the top of the heater.

When removing side panels (qty 2 for models 30→120 & qty 4 for the models 140 →250) be aware that the inner skin plate of the side panels has a 90° air deflector being very important for the good operation (efficiency) of the heater. Be careful not to remove or damaging the air deflector. The location of the fixing holes in the side panels ensures an exact position of the air deflector even after removing the side panels.

Burner Maintenance

Remove the burner from the heater and carry out the following procedures:-

- (a) Clean burner head with a stiff brush, removing any deposits.

- (b) Clean and check positions of ionisation and ignition probes.
- (c) Check airways for any obstructions.
- (d) Check ionisation and ignition probes for wear or burning. Replace if necessary.
- (e) Clean the blades of the burner fan impeller with a stiff brush to remove any dust.
- (f) Check settings of pressure switches.
- (g) Inspect condition of sequence controller and ensure the blade terminals are clean and tight.
- (h) Fit new gasket to burner and replace to combustion chamber.

Refer to burner manual for any other specific instruction.

Main fan and motor

Remove the access panels to the fan section and clean by removing any foreign matter and dust with a vacuum cleaner or compressed air. The blades of the fan impeller should also be cleaned free of dust and dirt by means of a stiff brush and a vacuum cleaner.

The following inspection routine should be carried out:-

- (a) Check the fan bearing resilient mounts for signs of distortion or excessive wear.
Change for new rubber mountings if required.
- (b) Check bearings for any signs of excessive play in the housing.
Replace if required.
- (c) Check the shaft for alignment, straightness and rusting. Realign, replace or oil where necessary.
- (d) Check the bearings locking collars for correct fitting and tightness.
- (e) Check all screws and nuts holding the fan and motor for tightness.
- (f) For indirect drive systems check that the locking nut on the adjustment bolt is securely fastened.

Pulleys and Belts

Using a straight edge check that the fan and motor pulleys are in line and are as close to the bearings as possible. If necessary adjust the position of the pulleys to achieve this.

Check the condition of the belts for splits or fraying; if one belt in any set appears to have worn excessively then change the whole set immediately. **DO NOT MIX BELTS OF DIFFERENT AGES OR BATCHES.** As the belts stretch at a different rate according to the batch curing number and age, premature failure could occur if they are mixed.

Ensure that the belts are correctly tensioned.

This can be confirmed when the mid point of the belt is displaced to a maximum of 6mm when a force of 3kg is applied in a plane perpendicular to the belt.

Check the pulleys for signs of wear in the grooves and replace where required, also ensure the keys.

Flue connection

Remove the flue elbow or T-piece with drip pan. Inspect for signs of wear or leakage. Repair or replace where necessary.

Using a vacuum cleaner clean out any deposits remaining when the heat exchanger tubes were cleaned.

Replace elbow (or T-piece with drip pan) guard & nuts and ensure of the correct installation.

Inspect the flue and terminal for water ingress, if any found reseal where necessary.

Control Panel and Electrical Connections

Check all electrical connections to ensure they are tight and free from corrosion. Any connections that have signs of loose strands that may come into contact with adjacent terminals should be removed and a new connection made.

Check the operation and correct functioning of the control panel. Ensure the settings are in accordance with the end users requirement.

Gas Supply Connections

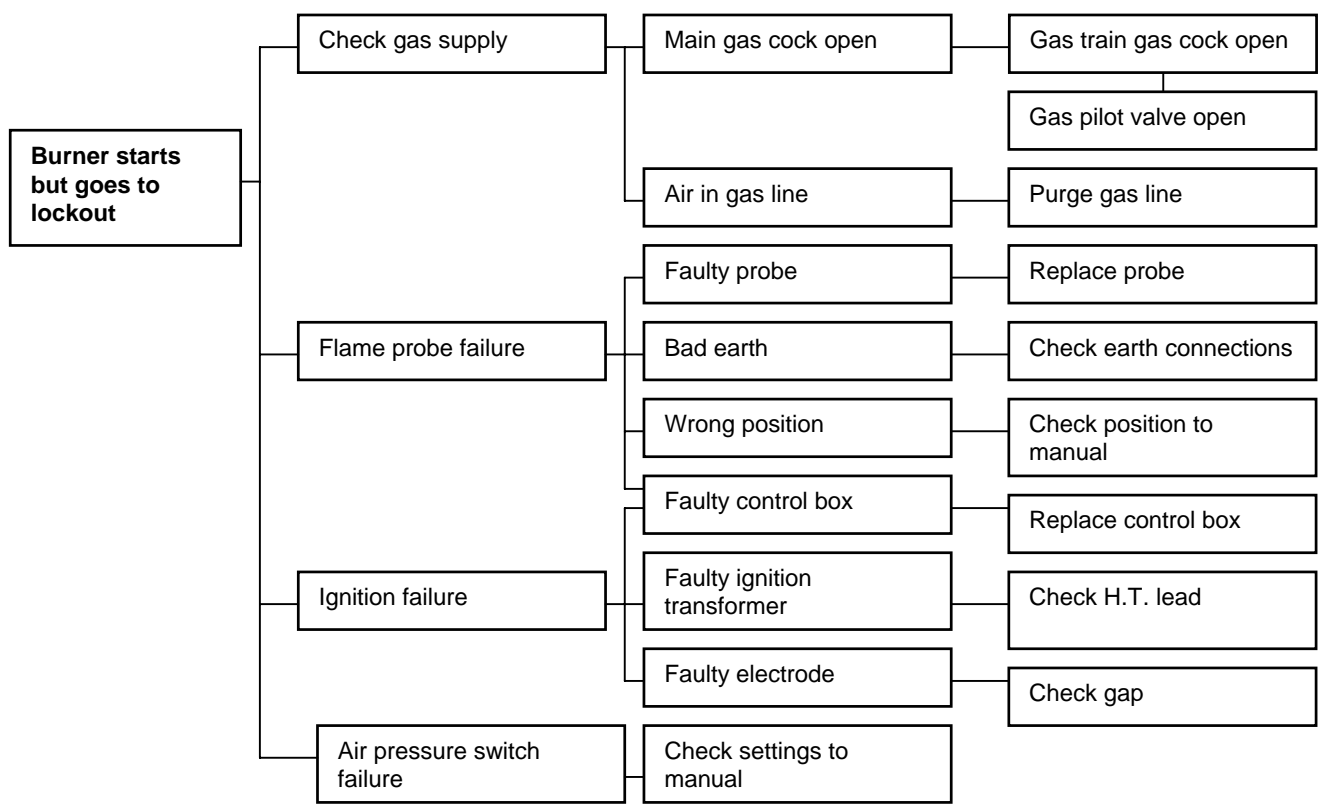
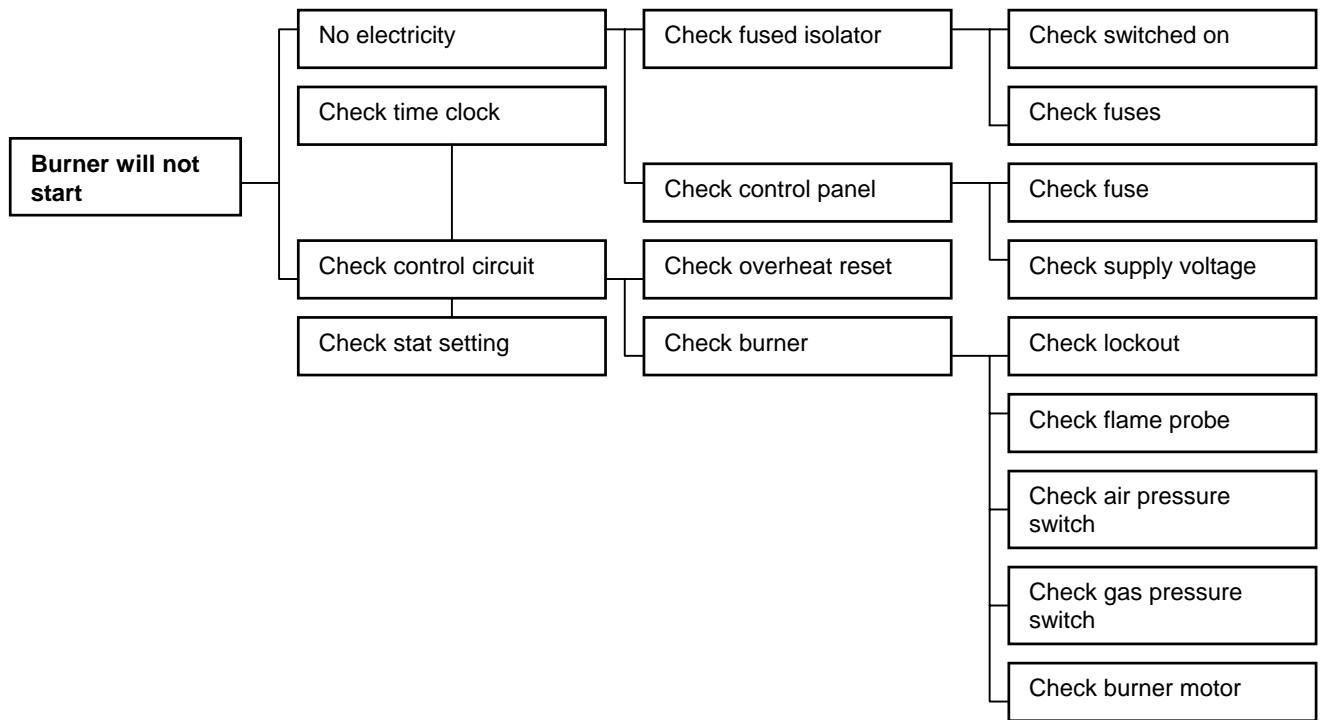
Inspect the supply pipes and joints for any signs of wear and corrosion. Ensure any support brackets are secure and correctly adjusted. Any suspect joints should be checked for soundness in accordance with the appropriate standard.

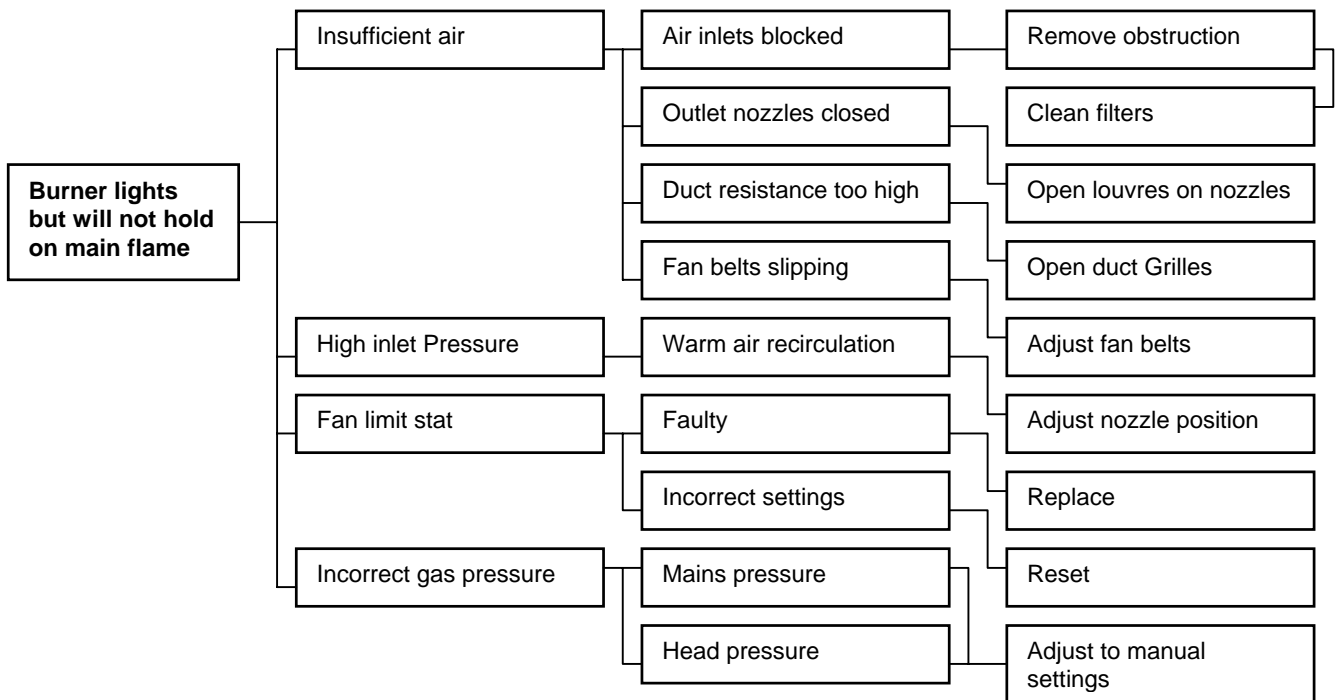
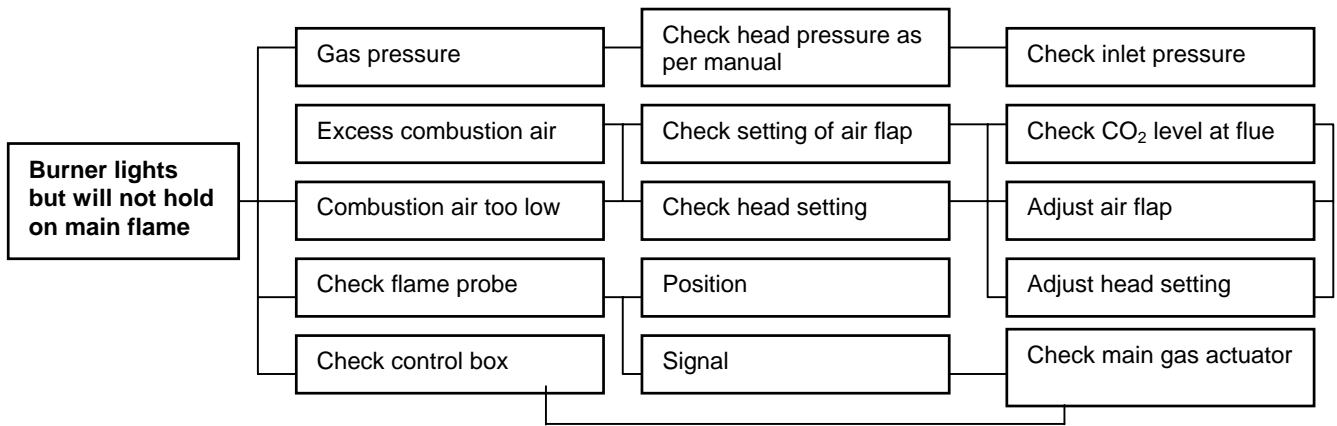
6.3 Re-Commissioning

On completion of the service work the heater and burner are to be re-commissioned in accordance with the manual section 6.2.

A record of the service work carried out, any recommendations and commissioning details are to be completed as a report and issued to the end user.

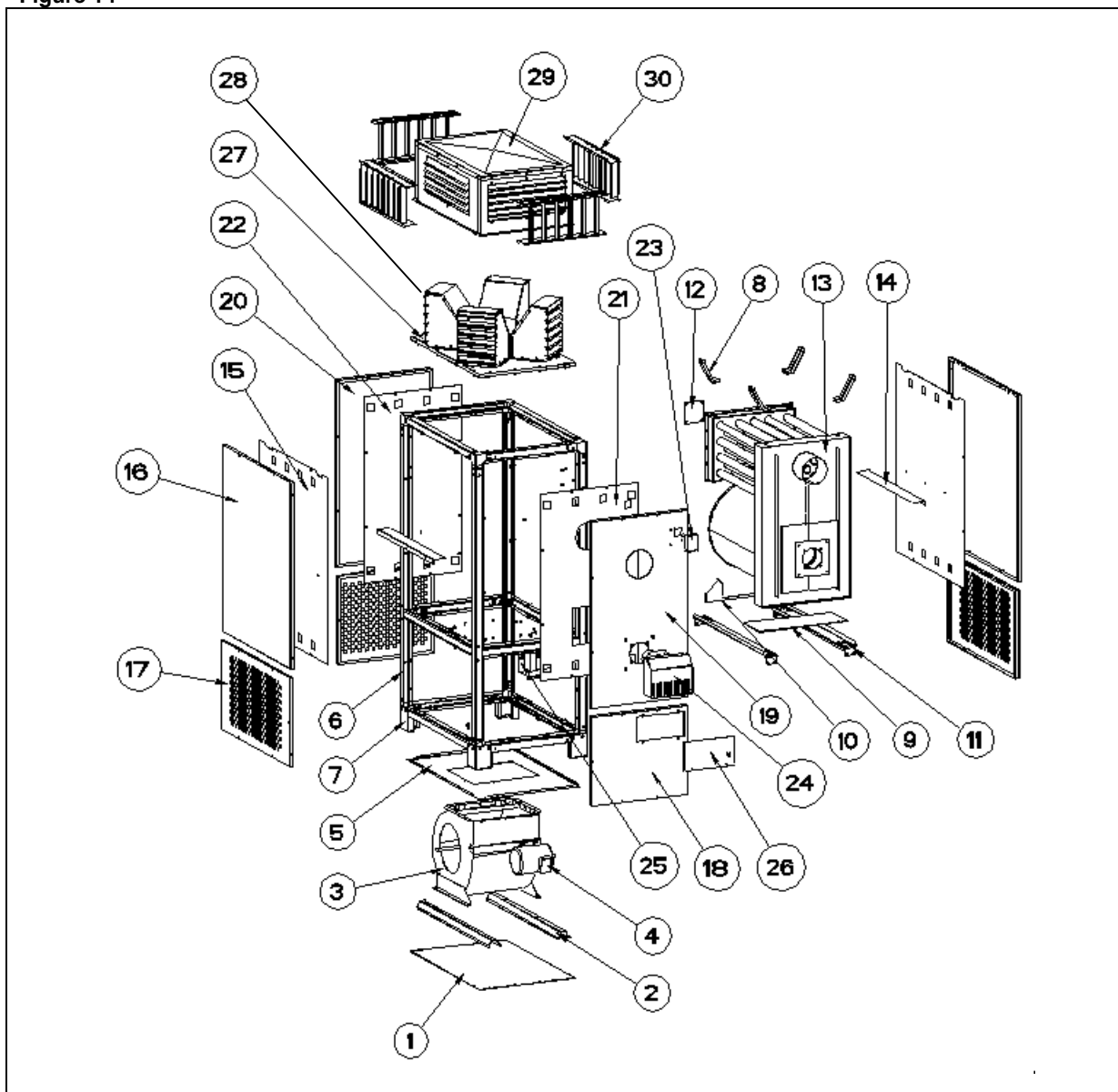
7.0 Fault Finding





8.0 Spare Parts & part numbers

Figure 14



Legend			
1.	bottom plate	15.	side inner skins
2.	bottom brackets	16.	top side panels
3.	direct driven fan unit (frame I & II)	17.	lower side panels
	belt driven fan unit (frame III, IV & V)	18.	lower control panel
4.	electric motor	19.	top front panel
5.	fan baffle plate	20.	top rear panel
6.	basic frame skeleton	21.	front inner skin
7.	lower corner profile	22.	rear inner skin
8.	heat exchanger fixation profiles	23.	Honeywell thermostat
9.	combustion chamber (CC) air deflector	24.	burner unit
10.	fixation plate HE	25.	control unit
11.	sliding bracket HE	26.	control unit cover
12.	over-pressure relief panel	27.	nozzle panel
13.	heat exchanger (combustion chamber)	28.	nozzles
14.	side air deflectors	29.	plenum assy (optional)
		30.	vertical louvers (optional)

Overview of most important part numbers

Description	Mfgs ref.	PN	Application
FC limit stat	Honeywell	03 24963 N1157B	all sizes
Motor & direct driven blower	Nicotra DDC 270-270	02 26012 100150	sizes 30/40
	Nicotra DDC 321-321	02 26012 200300	sizes 50/60/75
Contactora		60 61679 D910M5	sizes 90/120/140/150 180/215
Contactora		60 61679 D1210M	size 250
Overload protection		60 61703 02-04	size 90
		60 61703 04-06	size 120
		60 61703 05-09	size 140
		60 61703 07010	sizes 150/180/215
		60 61703 09-13	size 250

Motortype

Size	Direct Driven Blower		Belt Driven Blower					
	30/40	50/60/75	90	120	140	150/180	215	250
Motor type	0.55 kW 1ph	0.75 kW 1 ph	1.5 kW 3 ph	2.2 kW 3 ph	3.0 kW 3 ph	4.0 kW 3 ph	4.0 kW 3 ph	5.5 kW 3 ph

9.0 Reference Standards

EN1020

Non Domestic Gas Fired Forced Convection Air Heaters for Space Heating.

BSEN292

Parts 1 & 2 :

Safety of Machinery.

BSEN 60335

Part 1:

Safety of Electrical Appliances.

BSEN 60204

Part 1:

Safety of Machinery Electrical.

BSEN 676

Automatic forced draught burners for gaseous fuels

BSEN 55014

Electromagnetic Compatibility

BSEN 50165

Safety of Electrical Equipment

BS 5991

Indirect Gas Fired Heaters less than 2MW.

BS 5440

Part 1:

Specification/Installation of Flues.

Part2:

Ventilation Requirements of Gas Appliances.

BS 6320

Installation of Gas Fired Heaters.

BS 5854

Code of Practice – Flues/Flue Structures.

BS 715

Metal Flue Pipes & Fittings.

UP/1

Installation of Gas Appliances.

UP/2

Installation of Gas Appliances.

BS 6891

Installation of Pipe Work.

ISO 7/1

Specification for Metric Pipe Threads.

ISO 228/1

Pipe Threads Seals and Couplings.

Subject to modifications