

Floor Standing Oil Fired Heaters VCHE - HCHE

Mk 2

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 oil 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 the relevant British Standards & local laws. The installation must also be in accordance with the relevant electrical regulations and I.E.E. regulations.
- 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 oil fired cabinet heaters is manufactured in the EC and supplied in accordance with BS EN 9002: 1994 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:
- 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 oil fired cabinet heaters conform to the following harmonised standards:
- 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. Product Information

1.4.1 Ambi-Rad cabinet heaters are available with
burner outputs from 30kW to 293kW 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.

1.4.2 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
- Oil supply
- Electrical services
- Fresh air supply (when applicable)
- Service access and maintenance requirements

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 Class D oil – 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		VI		VII		VIII		IX		X		XI			
Heat input (gross)	KW	36,6	52,2	62,2	76,6	91,1	108,6	145,3	169,7	185,3	215,4	262,0	298,8	Btu/h	124883,9	178113,1	212234,4	261369	310844,9	370557,1	495782,2	579038,2	632267,4	734972,4	893978	1019544
Heat output	KW	30,4	42,6	51,5	63,3	75,0	89,3	119,2	140,0	153,0	178,0	216,7	248,2	Btu/h	103728,7	145356,7	175724,6	215987,7	255909,6	304703,1	406725,7	477698	522055,6	607358,8	739408	846890
Burner type	Riello	G5	G5	G10	G10	G10	G20	G20	G20*	G20*	G20*	RL28.1	RL28.1													
Oil consumption	kg/hr	2,78	3,95	4,71	5,81	6,91	8,23	11,01	12,86	14,03	16,31	19,85	22,63	gal/hr	0,73	1,04	1,24	1,53	1,82	2,17	2,90	3,38	4,29	5,22	5,96	
Pump pressure	bar	11,9	13	12,4	13	13	12,3	11	13,3	12	13	12,9	13,5	psi	173	189	180	189	189	160	174	193	189	187	196	
Smoke n°		0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1													
Nozzle	Size	0,65	0,85	1,10	1,25	1,50	2,00	2,75	3,00	3,50	4,00	2,50	3,00	Angle	60	60	60	60	45	45	60	60	60	60	60	
Air shutter setting (at 0 flue resistance)	Shape	S	S	S	S	S	S	S	S	S	S	S	S	Number	2,1	3,2	2,2	2,0	3,3	4,7	5,6	4,0	2,5	3,0	3,0	
CO2	%	12,0	12,6	12,4	12,9	11,9	12,4	12,2	12,2	12,2	13,0	12,4	11,9													
Gross flue temperature (20°C ambient)	°C	195	203	210	212	222	228	225	213	220	220	188	195													

2.1 Class D oil – Single Stage (table 1b)

VCHÉ/HCHE Model	FRAME size											
	30	40	50	60	75	90	120	140	150	180	215	250
Nominal air flow	2500 1488	2500 1488	5180 3083	5180 3083	5180 3083	7140 4250	8750 5208	10500 6250	11500 6845	12800 7619	14100 8393	17330 10315
Available outlet pressure (ducted outlet)	95	95	130	130	130	125	150	200	215	250	160	250
Air throw (approx.) (1)	18 59	18 59	21 69	21 69	21 69	20 66	25 82	25 82	27 88	30 98	25 82	30 98
Temperature rise through heater (nominal)	36 65	50 90	29 52	36 65	42 76	37 67	40 72	39 70	39 70	41 74	45 81	42 76
Sound level (2) (for guidance only)	52	52	53	53	53	59	61	61	62	65	63	67
Flue spigot outside diameter	125	125	150	178	178	178	178	178	223	223	223	223
Minimum flue height	2	2	2	2	2	2	2	2	2	2	2	2
Main fan motor size	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	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 oil connection	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Weight	190	190	225	225	225	280	292	300	320	320	360	380

(1) : unobstructed in still air with a terminal velocity of 50ft/min.

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

2.2 Dimensions

Vertical heater range

Figure 1a : unit with discharge nozzle

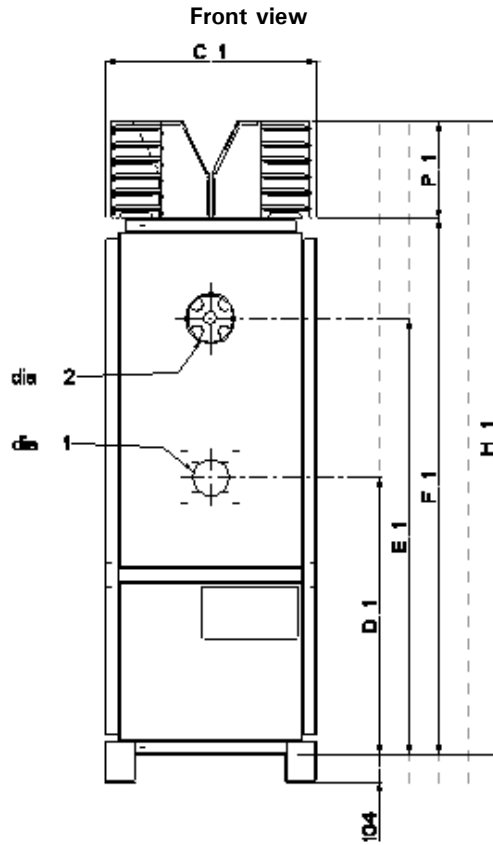


Figure 1b : unit with discharge plenum

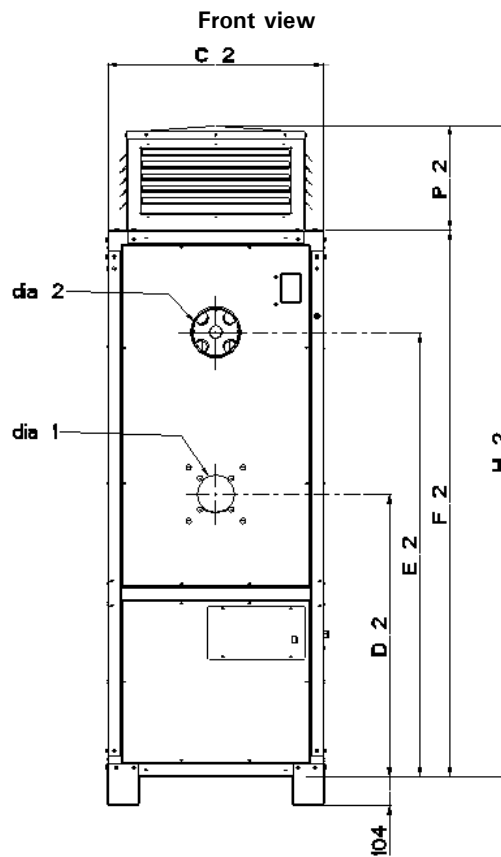


Figure 1c – Side view

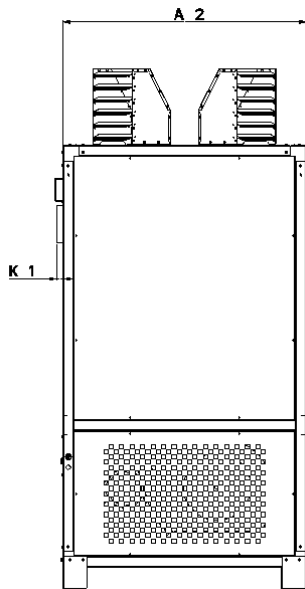


Figure 1d

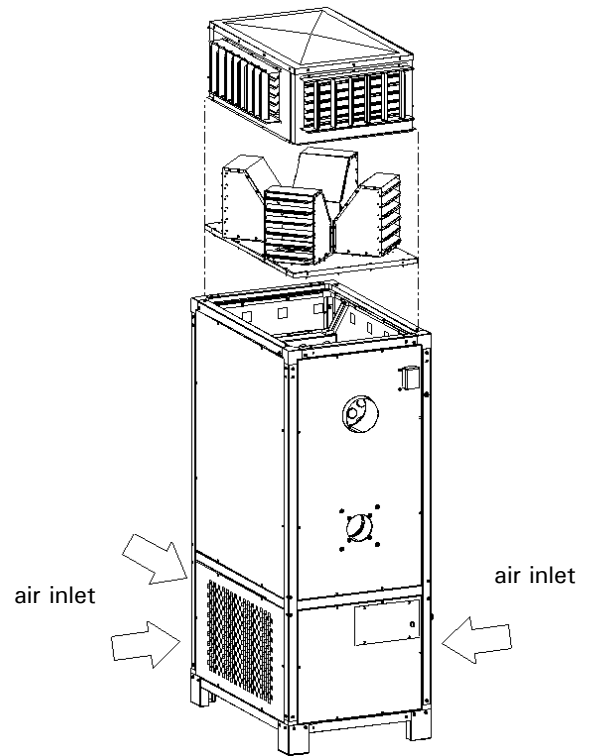


Figure 1e

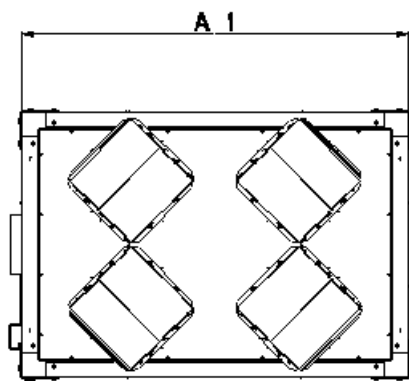
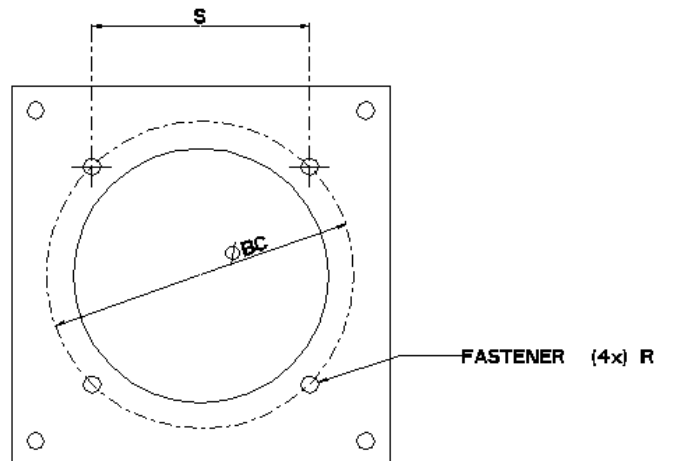


Figure 1f : burner mounting flange



Horizontal heater range

Figure 2a – Side view

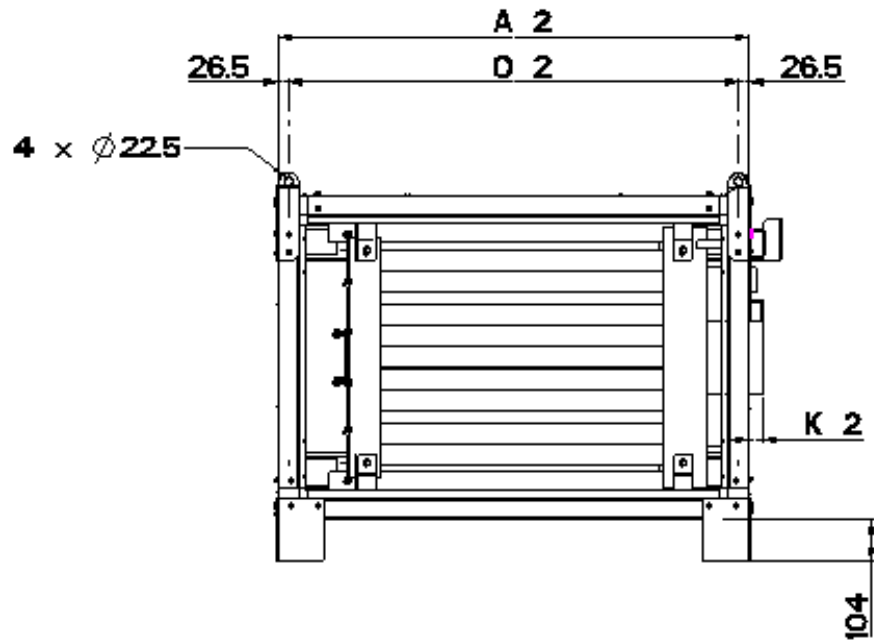
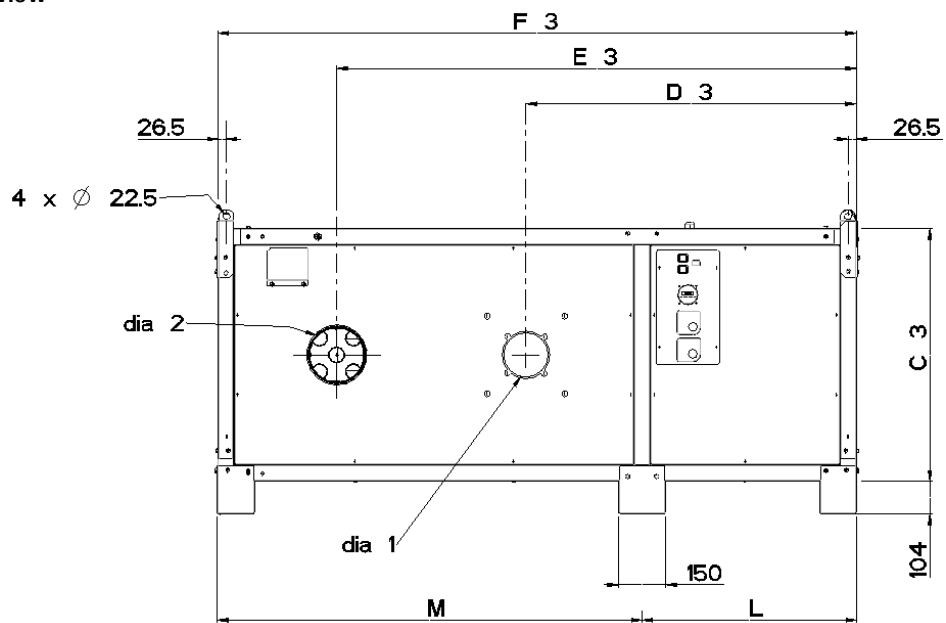


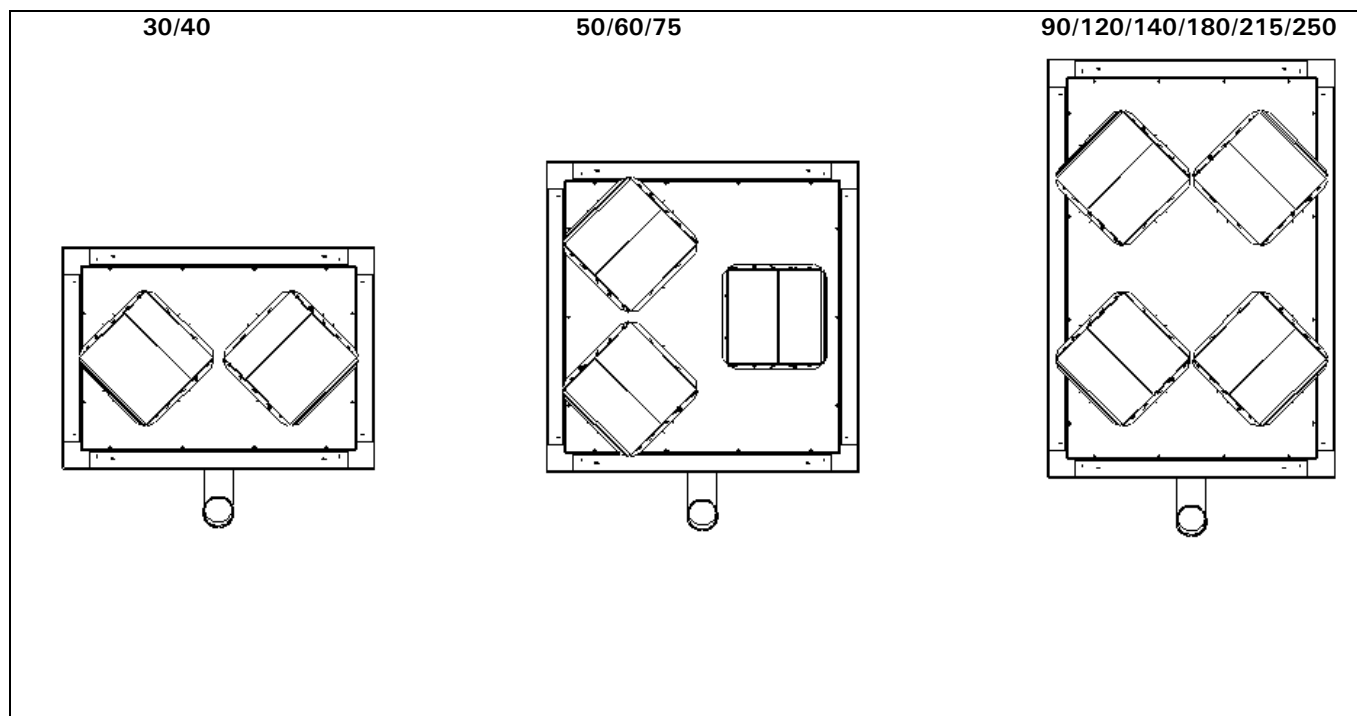
Figure 2b – Front view



Dimensions (mm) (table 2)

VCHE/HCHE	30	40	50	60/75	90	120	140	150/180	215	250
Frame size	I		II		III		IV		V	
A1/A2	613	613	859	859	1158	1158	1305	1305	1504	1504
C1/C2/C3	865	865	865	865	795	795	1186	1186	1186	1186
D1/D2/D3	1007	1007	1019	1019	1041	1041	1184	1184	1111.5	1111.5
E1/E2/E3	1441	1441	1465	1465	1637	1637	1750	1750	1677.5	1677.5
outside dia ² (flue outlet)	125	125	150	150	178	178	178	223	223	223
F1/F2/F3	1804	1804	1804	1804	2012	2012	2073	2073	2012	2012
inside dia ¹ (burner inlet)	110	110	120	120	140	140	155	155	155	155
H1	2088	2088	2168	2168	2376	2378	2477	2477	2466	2466
H2	2164	2164	2114	2114	2400	2400	2395	2395	2334	2334
K1/K2	35.5	35.5	107.5	35.5	32	32	105.5	33.5	32.7	32.7
L	520	520	591	591	675	675	786	786	675	675
M	1284	1284	1213	1213	1337	1337	1287	1287	1337	1337
P1	284	284	364	364	364	366	404	404	454	454
P2	360	360	310	310	388	388	322	322	322	322
dia BC	142	142	145	145	162	162	180	224	180	224
R	M8	M8	M8	M8	M8	M8	M8	M8	M8	M8
S	100.4	100.4	102.5	102.5	114.5	114.5	127.3	158.4	127.3	158.4

2.3 Number of nozzles on heaters (figure 3)



3.0 Mechanical/Electrical Services

3.1 Oil supply

- 3.1.1 Connection to an oil supply may only be carried out by suitably qualified persons. The oil installation must comply with the rules in force using materials appropriate for oil installations.
- 3.1.2 Check that the oil grade is in accordance with the data described on the air heater.
- 3.1.3 An adequate oil line 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 shut off tap and, to facilitate servicing, a disconnect union fitting must be provided adjacent to the appliance.
- 3.1.5 Ensure that the installations a filter and has been tested and purged in accordance with prescribed practice prior to commissioning and taking the air heater into service.

3.2 Oil Pipework

- 3.2.1 The burners fitted to the Ambi-Rad air heaters are suitable for Class D (35 sec) oil via a suitable oil pipeline and filter to a storage tank installed externally to the building.
- 3.2.2 The pipework can be constructed for use on either a single pipe, or two-pipe system. Whether a gravity feed or pumped system is required is determined by the parameters of the installation i.e. number of heaters and length of pipeline.
- 3.2.3 Please refer to the burner manual as to the limitations of the oil line and most suitable pipe diameters after deciding on which pipework system to adopt.
- 3.2.4 The storage tank and heater are to be installed with the appropriate safety/service components as shown by the following figures.
Tank and single pipe system
Pressure ring main.
- 3.2.5 Any external piping from the tank or filter should be adequately lagged to avoid waxing during the winter. Always ensure the correct grade of fuel is used and especially ensure winter grade is used for the winter period, as this will be suitable down to -12°C whereas summer grade will wax and plug the filter at -4°C .
- 3.2.6 When using a pumped ring main ensure that correct pressure regulating valves are used prior to each heater and a ring main pressure below 0.4bar is used to avoid aeration and consequential 'air locks'.

- 3.2.7 All pipework must be adequately sealed using approved sealing compounds suitable for oil.

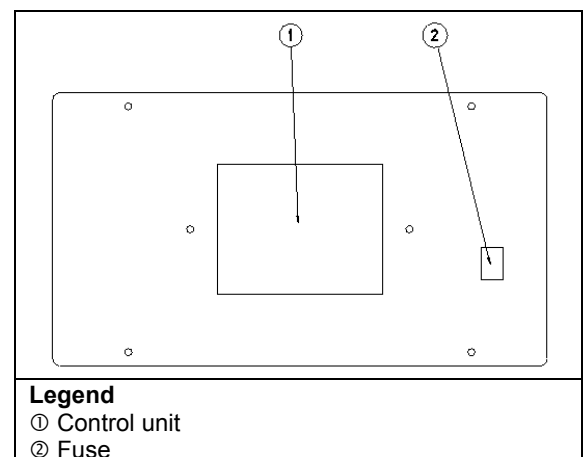
GALVANISED PIPEWORK AND FITTINGS MUST NOT BE USED.

The pipework must be effectively sealed so as to eliminate the ingress of air which will ultimately stop the flow of oil.

3.3 Electrical connection

- 3.3.1 The electrical installation may only be carried out by suitably qualified persons observing the rules in force.
- 3.3.2 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.
- 3.3.3 These appliances must be earthen.
- 3.3.4 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.
- 3.3.5 The cabinet heaters are provided with a control unit by AmbiRad.
- 3.3.6 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 :



3.4 Ventilation requirements

3.4.1 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.

3.4.2 **Building volume limits for AmbiRad 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	1230
	250	298,8	1405

If the minima 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.

3.4.3 Where it is known that the air change rate is less than 0.5/h or where the building column 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 grills.

3.4.4 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	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.

3.4.5 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.

3.4.6 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 air flow. (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.

3.4.7 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. fork lift 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, oil and electrical supplies whilst providing good and safe working access.

4.1.4 When positioning 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.

4.2 Heater clearances

4.2.1 The following minimum clearances must be observed when installing the heater to enable easy maintenance of 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.

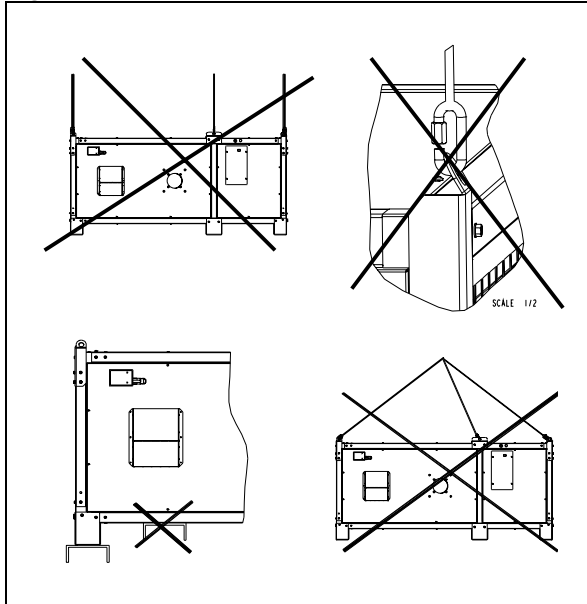
** Measured from top of outlet nozzle.

All dimensions in mm.

Front is when looking at the burner.

4.2.2 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!

Figure 5 :



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	800	800	800
180		1000	600	800	800
215	V	1000	2000	1000	1000
250		1000	2000	1000	1000

* Measured from front panel

When unit is installed as a duct heater, the duct connections must be installed as described in § 5.5.3. 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.

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 be 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.

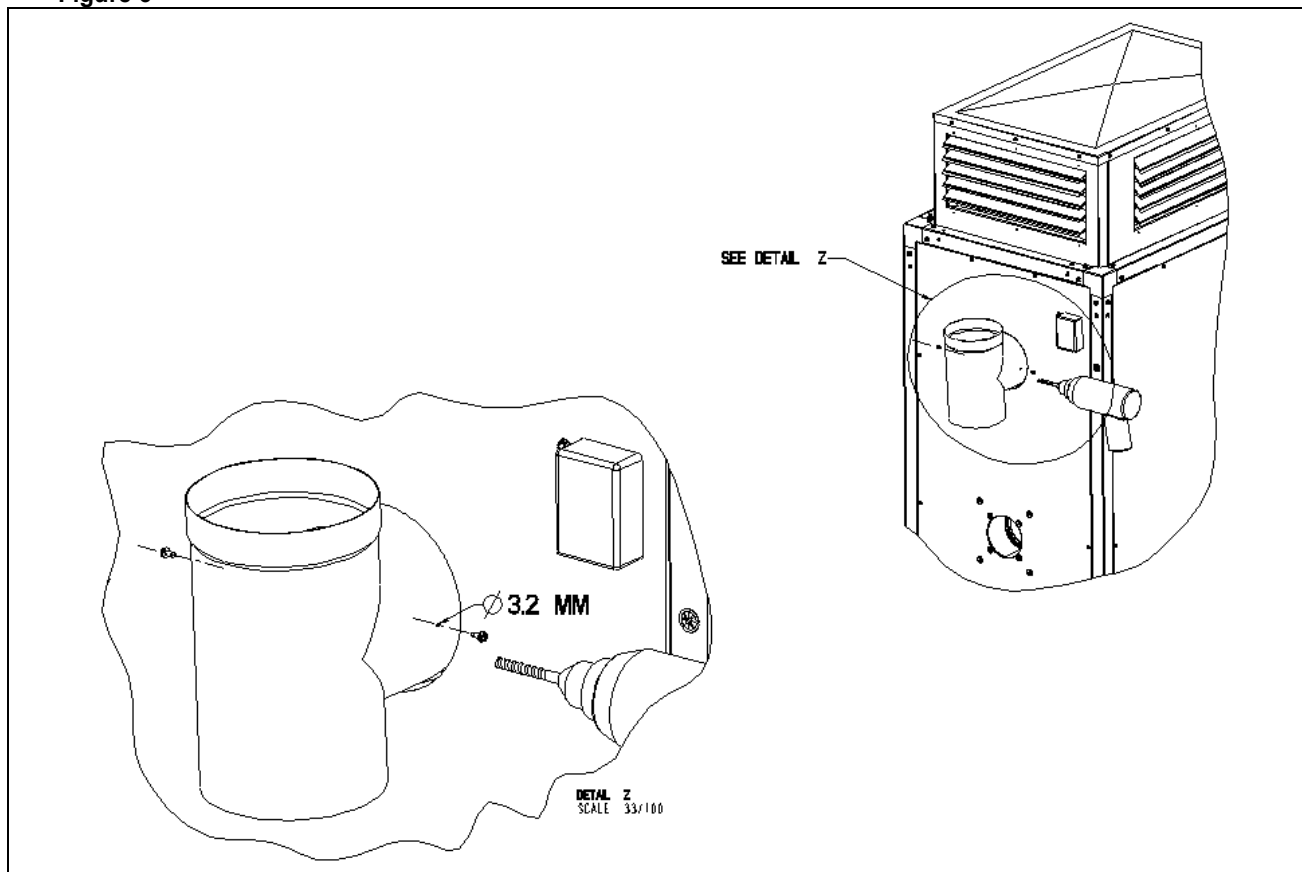
Attention: ensure that the connection of the flue to the cabinet heater is completely air tight or sealed.

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 nozzleed 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

Nozzle boxes:

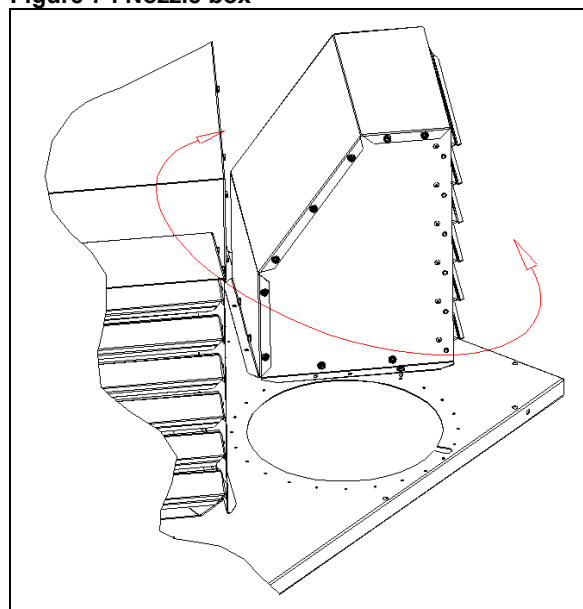
Option 203 for VCHE models or option 203.2 for HCHE models (see also fig. 7).

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 louvres can be adjusted. It is forbidden to close all louvres at a time as overheating could occur. For safety reasons it is recommended to wear gloves & glasses when adjusting the louvres.

(*) :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

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 louvres may be adjusted from horizontal to vertical down blow to obtain proper deflection and air pattern. For safety reasons, it is recommended to wear gloves and glasses when adjusting the louvres.

Number of horizontal louvres per side :

Table 8a

VCHE	N° of sides	Hor. louvres
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 louvres :

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

4.4.3 Vertical louvres (option 207.1) (fig. 9)

The discharge plenum (option 203.3) can be equipped with vertical louvres thus enabling a horizontal deflection of the air (max. $\pm 150^\circ$). The vertical louvre frame must be securely screwed in the openings (outlets) foreseen in the bottom and upper side of the plenum.

When adjusting the vertical louvres wear gloves and glasses.

Closing all the vertical louvres at a time is forbidden as this could result into an air obstruction influencing the LC3 (maximum temperature thermostat).

The number of vertical louvre assemblies, the vertical louvres and the fixing screws vary per model :

Table 8b

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

Figure 8 : Nozzle plenum

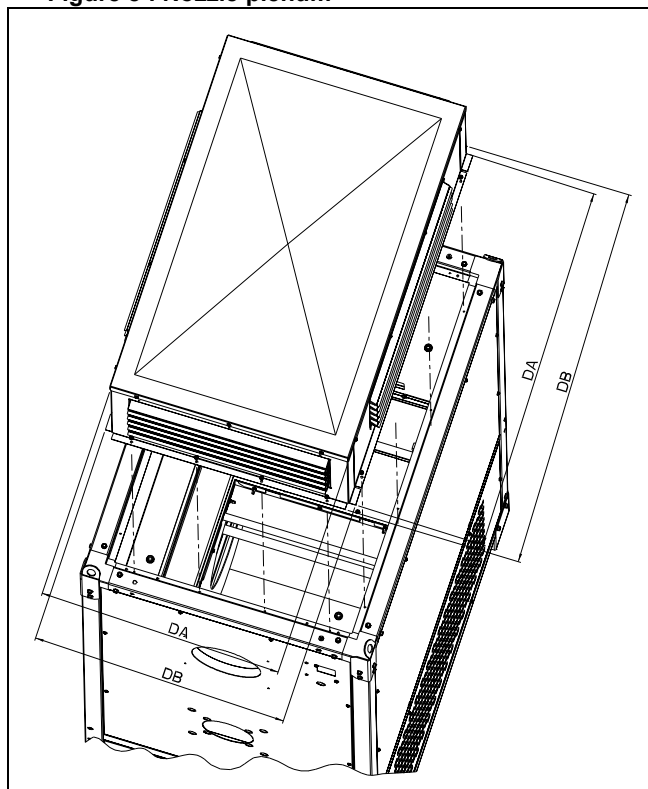
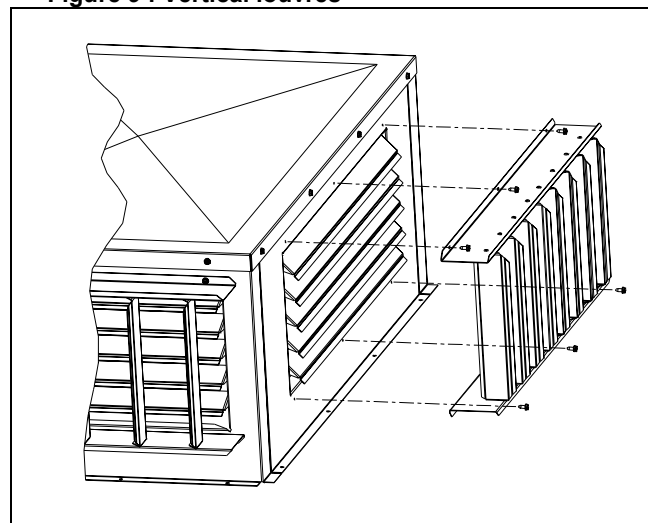


Figure 9 : Vertical louvres



4.5 Ducted Heaters

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.

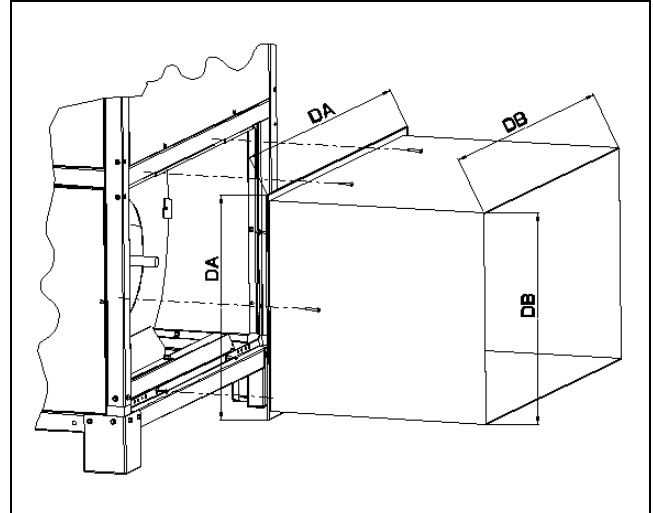
Consideration should be given to the application of duct fittings directly connected to the appliance. Air outlet elbows, transitions etc. should be designed to ensure an unrestricted and turbulent free air flow. This requirement is to ensure that an even air temperature is maintained when leaving the appliance thus eliminating heat exchanger "hot-spots" and nuisance shut-down of the burner due to over heating.

Fig. 10 illustrates the principle and the method of fixing duct channels to the heater

- duct channels must have adequate duct flanges to fit into the frame structure of the heater
- the dimensions DA refer to the duct flange; the dimensions DB refer to the duct channel itself
- 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.

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 duct channels 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 (DA) and for the flange (DB) as
 indicated in table 10a & 10b.

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

VERTICAL MODEL VCHE					
Frame	Model	Duct flange dimensions DA (mm)		Duct channel dimensions DB (mm)	
		Width	Depth	Width	Depth
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. 10) : duct dimensions required for ducted outlet on HORIZONTAL model (HCHE)

HORIZONTAL MODEL HCHE					
Frame	Model	Duct flange dimensions DA (mm)		Duct channel dimensions DB (mm)	
		Height	Depth	Height	Depth
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.

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 ($\pm 0.75m$) 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 air flow and a normal ΔT . Respect dimensions for duct air inlet (DA) and for the flange (DB) 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 VHCE						
Frame	Model	Option	Duct flange dimensions DA (mm)		Duct channel dimensions DB (mm)	
			Height	Width	Height	Width
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 DA (mm)		Duct channel dimensions DB (mm)	
			Height (1) Depth (2)	Width	Height (1) Depth (2)	Width
I	30/40	541.5 (top)	509	441	469	401
		541.7 (bottom)				
		541.6 (rear)	761	441	721	401
		541.4 (end)	761	509	721	469
II	50/60/75	541.5 (top)	755	512	715	472
		541.7 (bottom)				
		541.6 (rear)	761	712	721	672
		541.4 (end)	761	755	721	715
III	90/120	541.5 (top)	1054	596	1014	556
		541.7 (bottom)				
		541.6 (rear)	1054	596	1014	556
		541.4 (end)	691	1054	651	1014
IV	140/150/180	541.5 (top)	1201	707	1161	667
		541.7 (bottom)				
		541.6 (rear)	1082	707	1042	667
		541.4 (end)	1082	1201	1042	1161
V	215/250	541.5 (top)	1400	596	1360	556
		541.7 (bottom)				
		541.6 (rear)	1082	596	1042	556
		541.4 (end)	1082	1400	1042	1360

(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.(1").

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

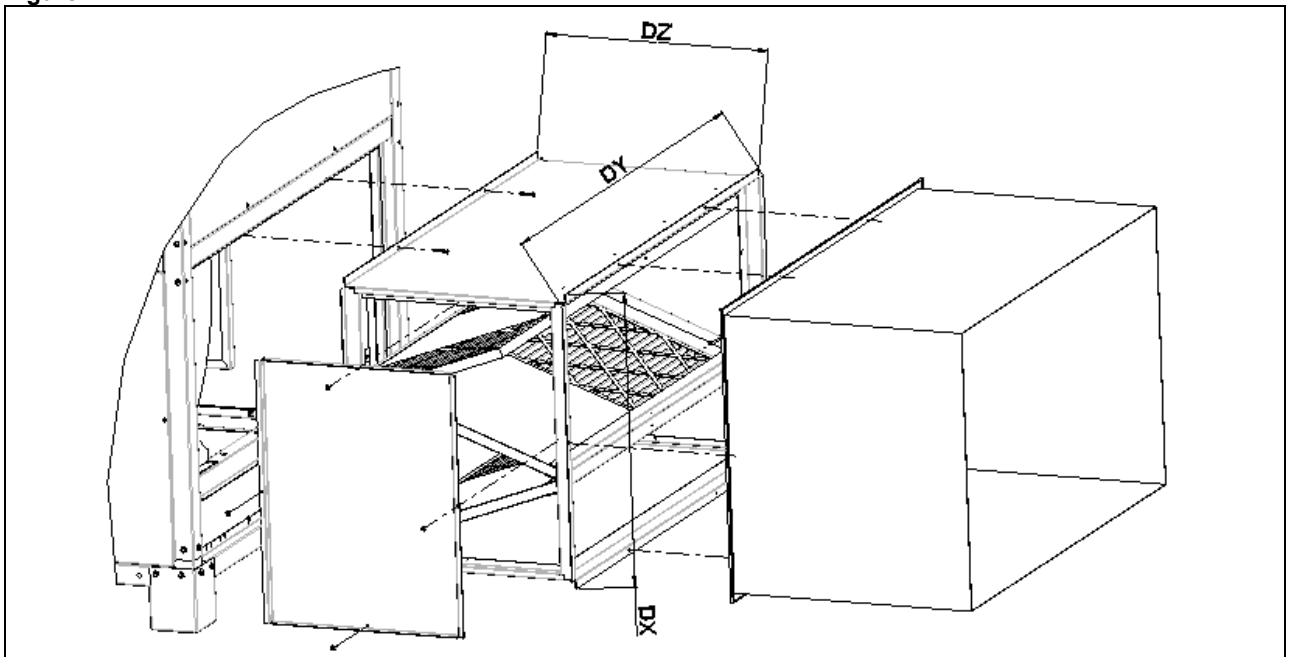


Table 12a

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). We 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.

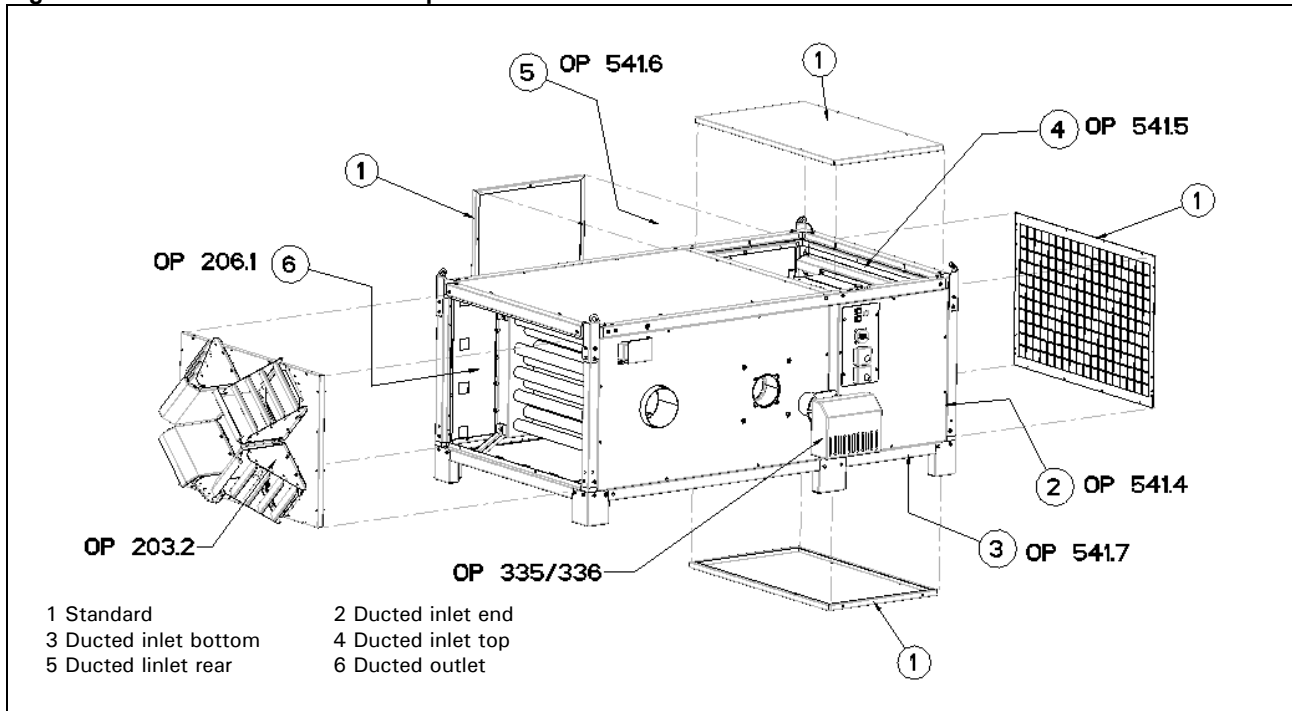
Table 13a : Panel filters for vertical units

Frame	Model	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 1	394x495 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 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

Vertical heaters are supplied with a pre-wired control panel (= option 910.2), comprising :

1. time control
2. day/night temperature control
3. heat-vent facility

Horizontal heaters are supplied with a remote panel.

Refer also to § 4.2 'Electrical connections'.

Oil tanks should be installed externally and be manufactured from steel or moulded medium density polyethylene in accordance with the relevant OFTEC, local and national fire regulations. Steel tanks should be suitably painted. Every tank must be fitted with the following components :

- Fuel level gauge none glass with isolating valve.
- Vent pipe that has a diameter greater than that of the filler pipe and is suitably terminated with a weather proof outlet
- Filler pipe installed at the opposite end to the vent pipe.
- Sludge or drain valve at the lowest point in the tank.
- Outlet valve at the opposite end of the tank to the sludge valve.

The size of the oil tank should take into account the usage requirements of the installation.

The typical arrangement shows the tank installed at an angle to avoid contaminating the oil supply to the heater (fig. 13). This slope should be approximately 6mm for every 300m.

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 oil installation before commencing, then proceed with the following checks:-

- (a) Ensure electrical supply has been switched off.
- (b) Ensure the oil 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 nozzled outlets or duct work 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 oil pipework.
- (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

VHCE 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 move switches at control point, heat/vent to 'heat' and on/off to 'on'.
 - (b) Check that burner goes through correct ignition sequence and goes to 'lock-out'.
 - (c) Switch on/off switch to the 'off' position.
If the burner does not go to lock-out DO NOT PROCEED until the fault has been correctly identified and repaired.
 - (d) Switch on the oil supply and connect a suitable pressure gauge to the pump on the heater.
 - (e) Switch on/off switch to the 'on' position and reset the control box from lock-out. The burner will start and a pressure will be indicated on the oil gauge. N.B. : it may be necessary to purge the oil pump of air before pressure is indicated on the gauge. Check this value is in line with the technical specification in section 2. If not adjust accordingly. See burner manual accompanying this manual.

- (f) Using approved and calibrated combustion analysis equipment 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 site must be in the range of the figures given in table 2.1.
- (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 thermostats and time clocks to ensure that the burner operates when required by the controls.
- (m) Switch on/off switch to 'off'. 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 nozzleed 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 duct work. Also check the running current of the main fan motor.

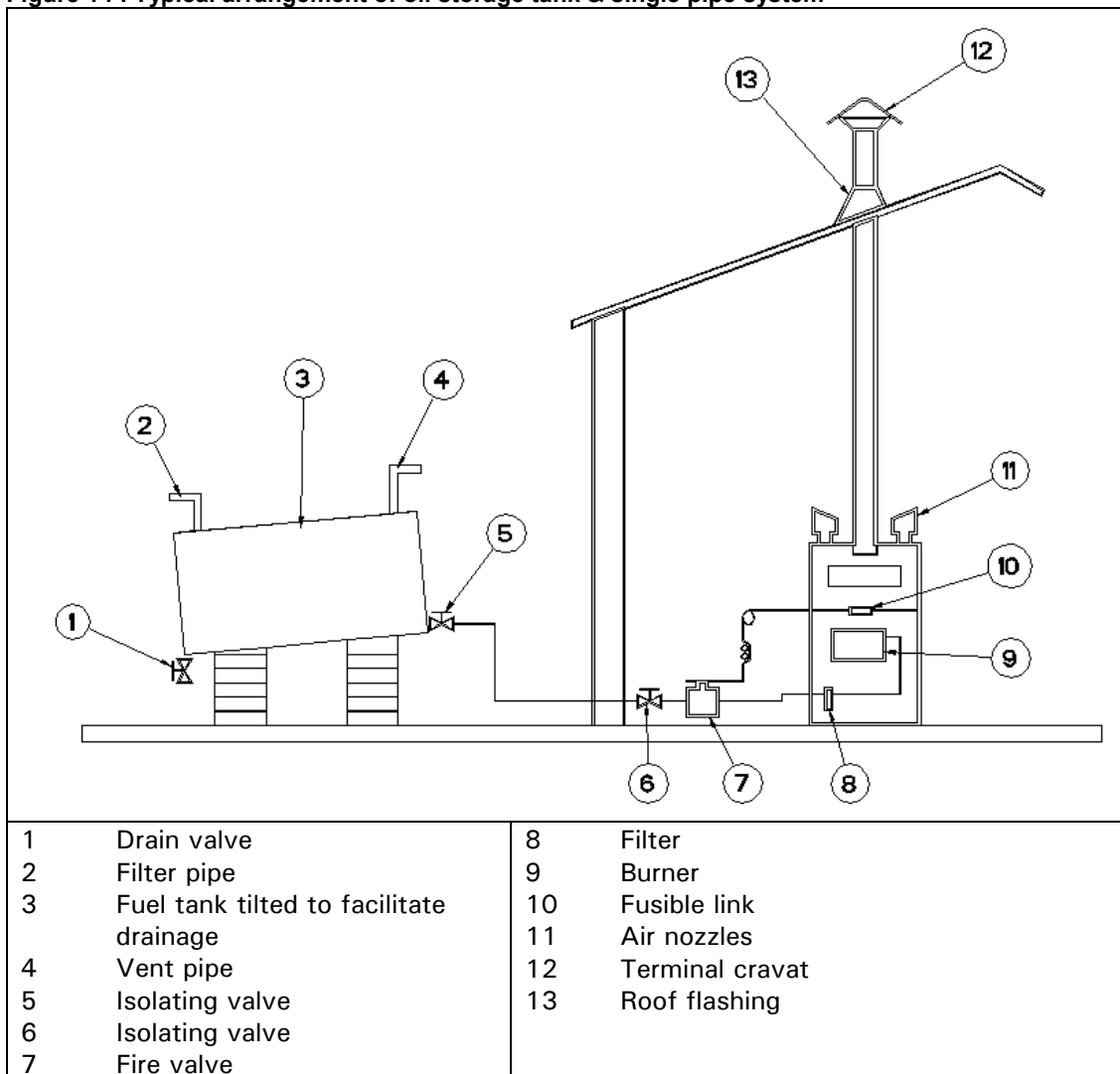
If the duct work pressure is correct then the running current will be as quoted on the data plate. If the static pressure is too low this will be verified by a high running current which could lead to premature failure of the fan motor. Consequently, the duct work outlet grilles will have to be closed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

Typical arrangement of oil storage tank & single pipe system : see figure 14.

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.

Figure 14 : Typical arrangement of oil storage tank & single pipe system



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 oil 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 retension 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.

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 splits, racks 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 oil pressure setting on pump.
- (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 individual thermostats and time clocks. Ensure the settings are in accordance with the end users requirement.

Oil 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.

Oil Supply Connections

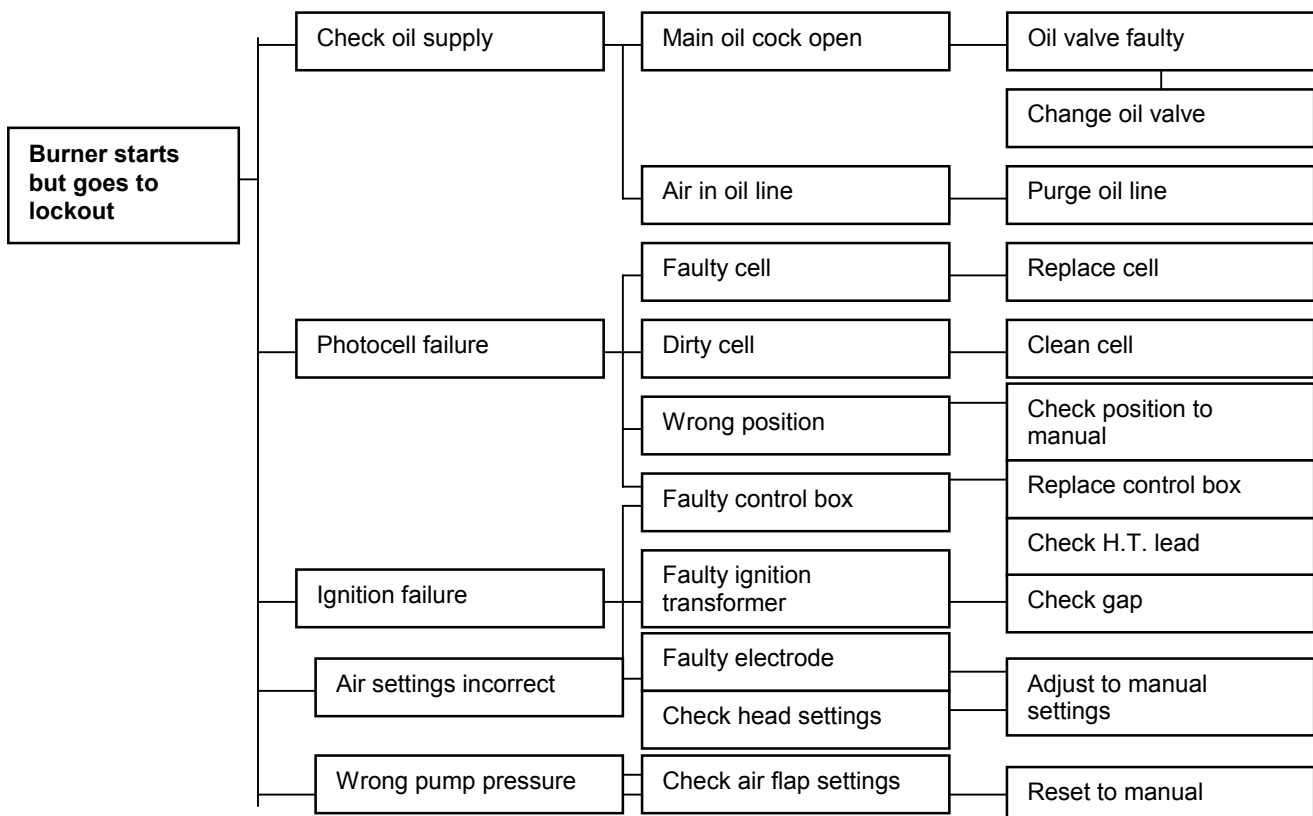
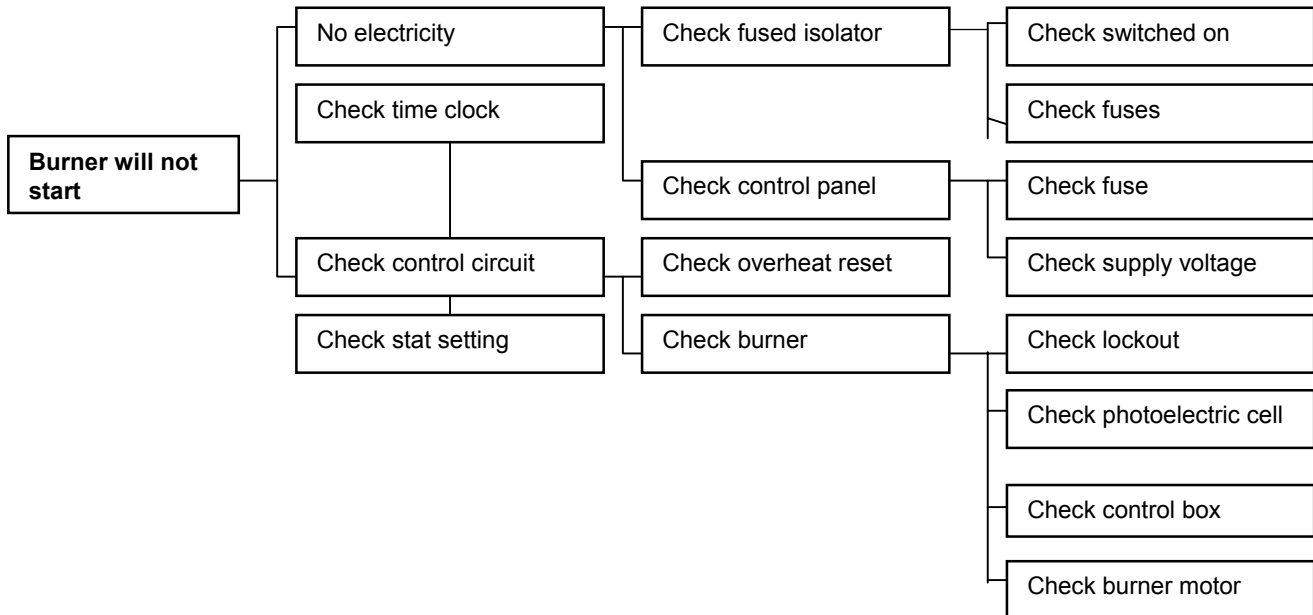
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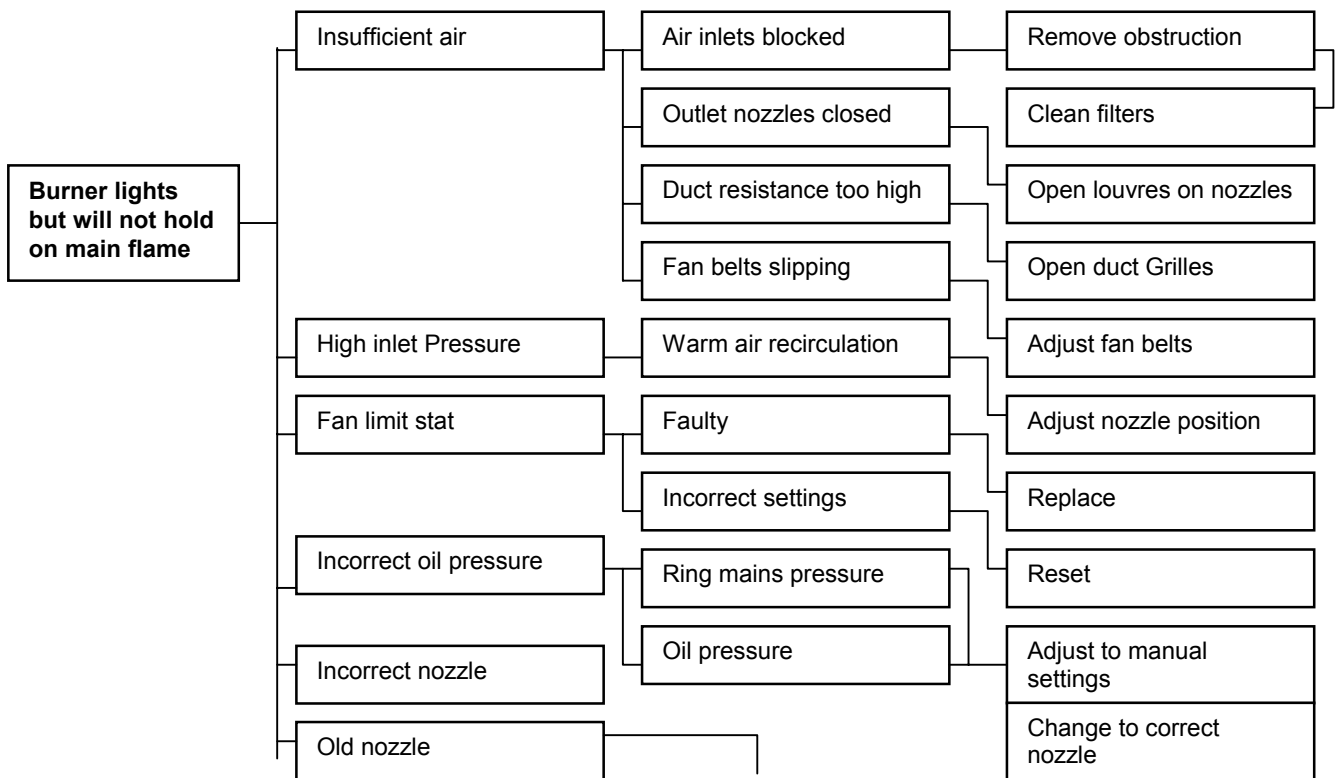
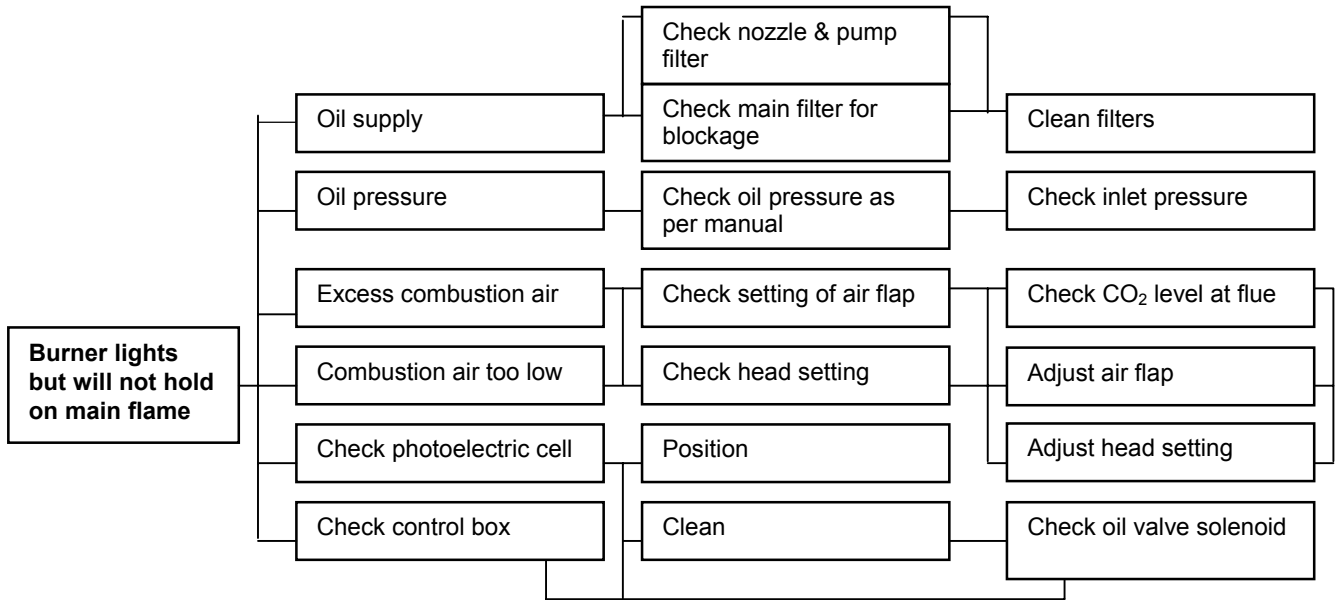
6.3 Re-Commissioning

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.

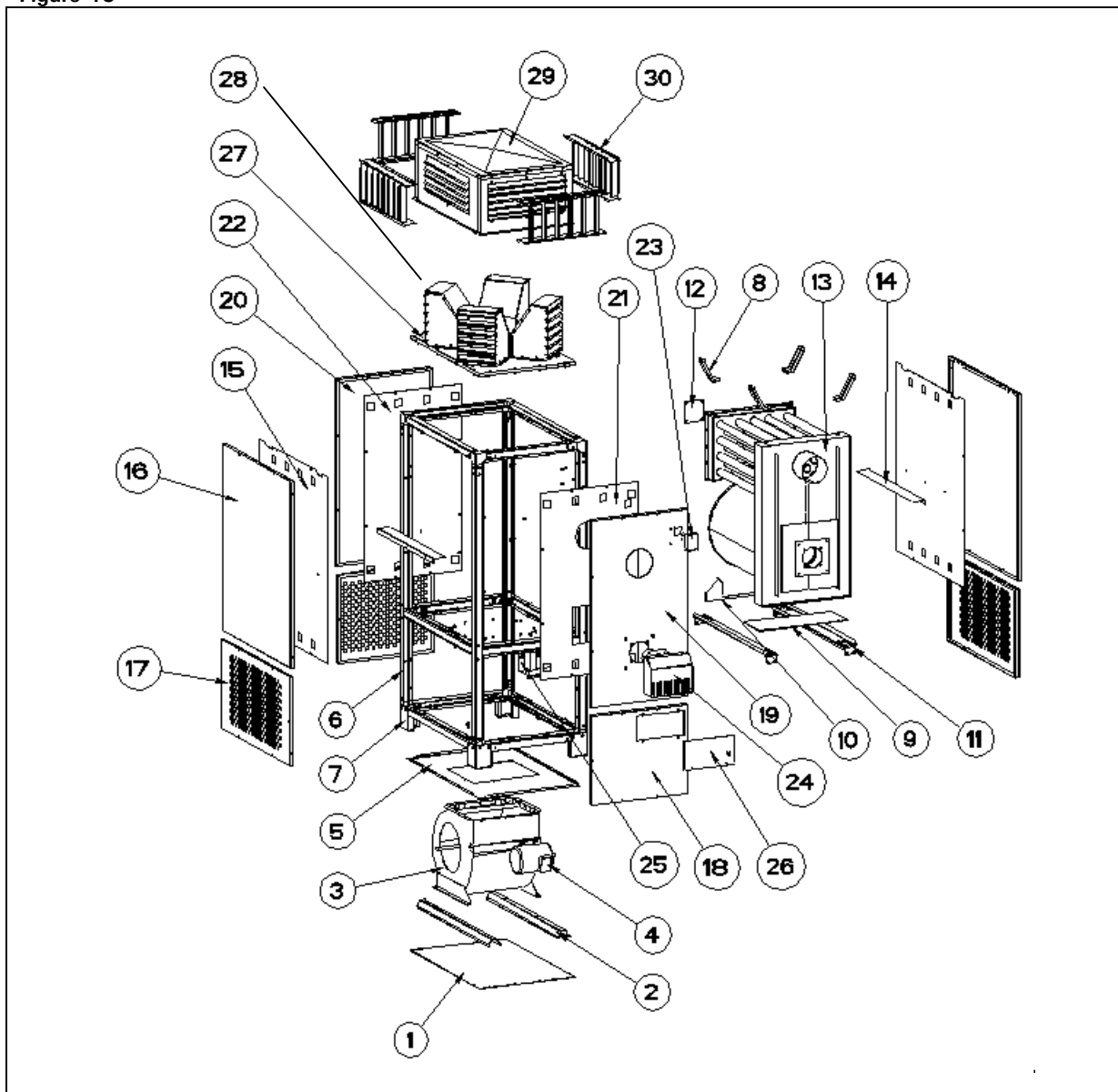
7.0 Fault Finding





8.0 Spare Parts & part numbers

Figure 15



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 |
| 4. | belt driven fan unit (frame III, IV & V) | 18. | lower control panel |
| 5. | electric motor | 19. | top front panel |
| 6. | fan baffle plate | 20. | top rear panel |
| 7. | basic frame skeleton | 21. | front inner skin |
| 8. | lower corner profile | 22. | rear inner skin |
| 9. | heat exchanger fixation profiles | 23. | Honeywell thermostat |
| 10. | combustion chamber (CC) air deflector | 24. | burner unit |
| 11. | fixation plate HE | 25. | control unit |
| 12. | sliding bracket HE | 26. | control unit cover |
| 13. | over-pressure relief panel | 27. | nozzle panel |
| 14. | heat exchanger (combustion chamber) | 28. | nozzles |
| | 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
Clock (optional)	Diehl SER 884	03 25162	all sizes
Room stat (optional)		03 25123	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
Motortype	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	5.5 kW 3 ph

10.0 Reference Standards

BSEN292

Parts 1 & 2 Safety of Machinery.

BSEN 60335

Part 1:

Safety of Electrical Appliances.

BSEN 60204

Part 1:

Safety of Machinery Electrical.

BSEN 55014

Electromagnetic Compatibility

BSEN 50165

Safety of Electrical Equipment

BS 5440

Part 1:

Specification/Installation of Flues.

BS 5854

Code of Practice – Flues/Flue Structures

BS 715

Metal Flue Pipes & Fittings

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