BENSON LINEAR RADIANT TUBE

Natural or Propane (Gas fired)

I N S T A L L A T I O N C O M M I S S I O N I N G
S E R V I C I N G
U S E R I N S T R U C T I O N S

September 2001

CONTENTS

Any reference made to Laws, Standards, Directives , Codes of Practice or other recommendations governing the application and installation of heating appliances and which may be referred to in Brochures, Specifications, Quotations, and Installation, Operation and Maintenance manuals is done so for information and guidance purposes only and should only be considered valid at the time of the publication. Benson Heating cannot be held responsible from any matters arising from the revision to or introduction of new Laws, Standards, Directives, Codes of Practice or other recommendations.

Compliance notices

The Benson Gas Rad range of linear radiant tube heaters detailed herewith are manufactured for Benson Heating within a strictly controlled environment within the parameters of ISO9002

The Gas Rad range has been independently tested and assessed, and has been found to meet the Essential Requirements of the following European Directives.

Gas Appliance Directive (90 / 396 / EEC)
Machinery Directive (89 / 392 EEC)
Low Voltage Directive(73 / 23 / EEC & 93 / 68 / EEC)
Electromagnetic Compatibility Directive (98 / 336 / EEC & 91 / 31 / EEC)
Product Liability Directive 65 / 374 / EEC)

The manufacturer has taken reasonable and practical steps to ensure that Gas Rad range of Heaters are safe and without risk when properly used. These heaters should therefore only be used in the manner and purpose for which they were intended, and in accordance with the recommendations detailed herewith. The heaters have been designed, manufactured, assembled, inspected, and tested, with safety and quality in mind, there are certain basic precautions which the installer and user should be aware of, and they are strongly advised to read the appropriate sections of the information pack accompanying the heater, prior to installation or use.

Benson Heating supports all new products being supplied to their customers with a comprehensive information pack; this clearly defines mandatory instructions for the safe installation, use, and maintenance, of the appliance(s).

Where proprietary items are incorporated into Benson Heating products, detailed information and instructions are also provided as part of the information pack.

It is the responsibility of the installer, owner, user, or hirer, of such products supplied by Benson Heating, to ensure that they are familiar with the appropriate information/manuals, supplied by the manufacturer, and that they are suitably aware of the purpose of the manuals and the safety instructions. In addition, operators must be suitably trained in the use of the appliance so as to ensure its continued safe and efficient use.

Benson Heating has a commitment to continuous improvement, and therefore reserves the right to amend or change the specification of the Heater range subject to agreement from The Notified Body.

Contained within the text of the manual, the words '**Caution'** and **'Warning'** are used to highlight certain points.

Caution is used when failure to follow or implement the instruction(s) can lead to premature failure or damage to the heater or its component parts.

Warning is used when failure to heed or implement the instruction(s) can lead to not only component damage, but also to a hazardous situation being created where there is a risk of personal injury.

Certificates of conformity

Declarations and Certificates are available upon request from the Quality Control Department at Benson Heating .

Notified Body PIN Reference is 49AR1806 49AR1653 49AR1654

THE WARRANTY REGISTRATION AT THE REAR OF THIS MANUAL MUST BE COMPLETED AND RETURNED TO BENSON HEATING ON COMPLETION OF COMMISSIONING

Warranty claims made without this condition being fulfilled will not be processed

General requirements

Caution
Ensure that the gas service to the appliance carries the correct gas type and that the supply pressure is in accordance with the supply type and pressure stated on the appliance data plate.

Installation, commissioning, and servicing must only be carried out by appropriately qualified and competent persons.

Warning
Unauthorised modifications to the appliance, or departure from the manufacturers guidance on intended use, or, installation contrary to the manufacturers recommendations may constitute a hazard.

Note
To ignore the **warning** and **caution** notices, and to ignore the advice from the manufacturer on installation, commissioning, servicing, or use, will jeopardise any applicable warranty, moreover, such a situation could also compromise the safe and efficient running of the appliance itself, and thereby constitute a hazard.

The installation of the appliance must meet all the relevant European, national, and local criteria.

Prior to installation the following points should be considered;

a) The position of the heater for the optimum efficient distribution and circulation of warm air

b) The position of the heater relative to the route of the flue

c) The position of the heater relative to the supply of gas

d) The position of the heater relative to the electrical services, wiring routes, and if appropriate, any additional controls.

e) The position of the heater relative to the supply of fresh air

f) The position of the heater relative to potential stratification / circulation problems, which generally occur at higher levels and which may be overcome through the provision of a suitable de-stratification unit.

g) The position of the heater relative to service and maintenance requirements

Caution
The heater **must not** be installed within an area where the conditions are unsuitable, e.g. where the atmosphere is highly corrosive, has a high degree of salinity, or where high wind velocities may affect burner operation. Suitable protection should be provided for the appliance when it is located in a position where it may be susceptible to external mechanical damage from; for example, fork lift trucks, overhead cranes etc.

Mounting Heights

The Minimum installation height of the radiant tube from floor level is not less than 4 Mtrs

The minimum installation height from combustible material should be not less than 1.5 Mtrs below and 60 Cms to the sides

Technical Data

Model GRH-L		**30/12**	**35/12**	**40/12**	**45/18**
Input	kW	30	35	40	45
Burner	Type	Atmospheric			
Gas G20	m^3/h	2.85	3.33	3.81	4.28
Consumption G31	kg^3/h	2.14	2.50	2.85	3.21
Gas connection	Ins	½	½	½	½
Head pressure G 20	mbar	8.5			
Inlet pressure G 20	mbar	20			
Gas Press switch G20	mbar	9-10			
Nozzle size G20	No	3 X 2.8	4 X 2.8	4 X 2.8	4 X 2.8
Head pressure G31	mbar	36			
Inlet pressure G31	mbar	37			
Gas Press switch G31	mbar	30-31			
Nozzle size G31	No	3 X 1.55	4 X 1.45	4 X 1.55	4 X 1.65
Electricity supply	Volts	230v/1ph/50Hz			
Power consumption	Watts	56			
Electrical Power	Amps	0.5			
Burner heads	No	3	4	4	4
Weight	Kg	108	108	147	147
Length of pipes	mtrs	12	12	12	18
Exchanger tube Ø	mm	89			
Air intake Ø	mm	80	80	80	80
Flue Ø	mm	80	80	80	80
Combustion Air	m^3/h	60.00	75.00	80.00	90.00
Model GRH-L-2		**30/12-2**	**35/12-2**	**40/12-2**	**45/18-2**
Input	kW	30	35	40	45
Burner	Type	Atmospheric			
Gas G20	m^3/h	1.9 - 2.85	2.85 – 3.33	2.85 – 3.81	2.85 – 4.28
Consumption G31	kg^3/h	1.42 – 2.14	2.14 – 2.50	2.14 – 2.85	2.14 – 3.21
Gas connection	Ins	½	½	½	½
Head pressure G 20	mbar	8.5			
Inlet pressure G 20	mbar	20			
Gas Press switch G20	mbar	9 – 10			
Nozzle size G20	No	3 X 2.80	4 X 2.80	4 X 2.80	4 X 2.80
Head pressure G31	mbar	36			
Inlet pressure G31	mbar	37			
Gas Press switch G31	mbar	30 – 31			
Nozzle size G31	No	3 X 1.55	4 X 1.45	4 X 1.55	4 X 1.65
Electricity supply	Volts	230v/1ph/50Hz			
Power consumption	Watts	56			
Electrical Power	Amps	0.50			
Burner heads	No	3	4	4	4
Weight	Kg	108	108	147	147
Length of pipes	mtr's	12	12	12	18
Exchanger tube Ø	mm	89			
Air intake Ø	mm	80	80	80	80
Flue Ø	mm	80	80	80	80
Combustion Air	m^3/h	60.00	75.00	80.00	90.00

General Arrangement

1 Aluminium reflector

2 Combustion air intake

3 ½ Gas Connection

4 Burner Access Cover

5 Electrical Plug 6 pole

6 Mains socket

7 Access Cover Locks

8 Mains Plug

9 Reflector Support Bracket

10 Exchanger Pipe

11 Reflector Spring Clips

12 Flue Spigot

13 Fan Access Cover

Burner External Dimensions

Fan External Dimensions

Burner Assembly and Fan Assembly

viewed with assemblies upside down.

1 Lockout Neon (red)

2 Gas Manifold

3 Burner Heads

4 Gas valve

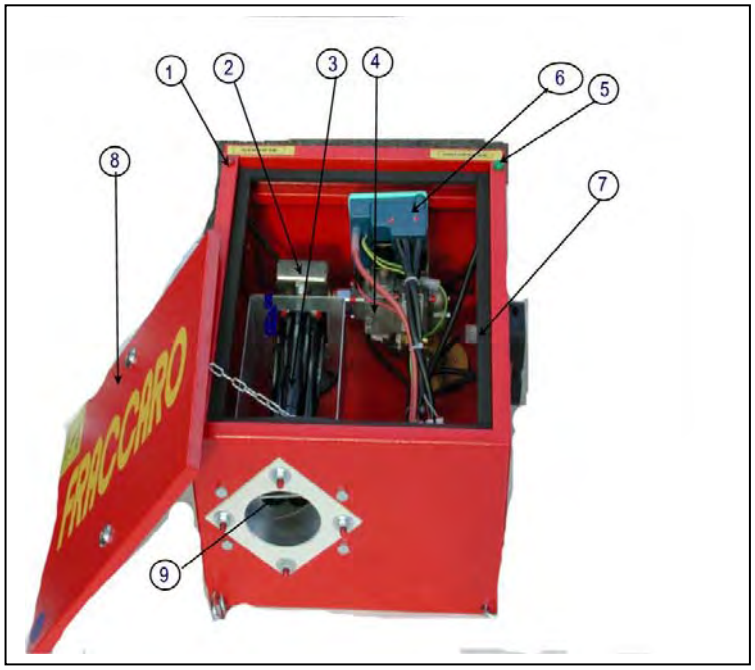
5 Operating Neon (green)

6 Control Box

7 Gas Connection

8 Access Lid

9 Electrodes



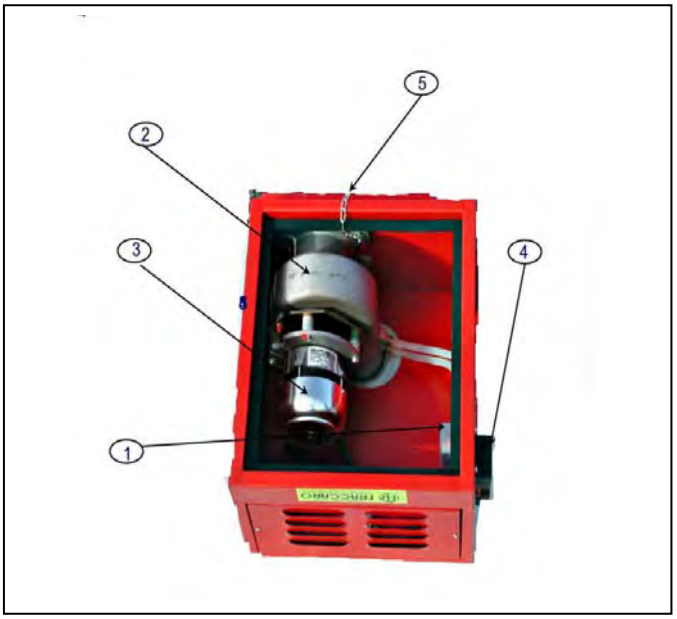
1 Air Pressure Switch

2 Fan Casing

3 Fan Motor

4 Plug 6 Pole

5 Access Lid



Heat Exchanger Assembly Dimensions

A Reflector Support Brackets

GRHL 30/12 GRHL 35/12 GRHL40/12

GRHL 45/18

Radiant Linear Tube Assembly Instructions

Assemble the exchanger pipes as shown inserting the ceramic fibre gasket between the pipe joints.
Ensure that the first tube on the burner side, is the pipe having a painted red flange.
Secure the pipes together with 8mm fittings ensuring that the insides are clean. Fit gaskets to the burner assembly casing and fan assembly casing ensure that when fitting in position on to the tubes that the burner and fan access doors are facing downward, and the intake and flue pipe spigots face upwards
Secure both burner and fan to the exchanger pipes to complete the assembly.

Bracket assembly

Bend the tabs on the reflector support brackets at 90 deg 2 outer tabs one side and the centre tab to the opposite side. Repeat this operation on all the reflector brackets (Bracket **A**) and clamp the bracket to the tube with the U clamp and secure with the 6mm fixings provided.

Assembly of Reflectors

Remove the protective film from the reflectors
Place the reflectors in the assembled brackets and overlap them slightly
Secure with the self tapping screws
Then using the spring clips provided secure the reflectors to the brackets by stretching the wire over the reflector and secure each end to the Bracket A.

Diagrams showing support assembly

INSTALLATION OF EXHAUST CHIMNEY THROUGH ROOF

Installation type B

1) After securing linear tube in position drill a 80Ø hole in the roof for the chimney (see illustrations)
2) The total extension for the flue pipe should not be longer than **4mtrs** if it is necessary to insert a bend calculate 1mtr for each bend the diameter of the exhaust should not be less than 80mm.
3) Install the flue pipe in the hole previously drilled ensure that the flue pipe is adequately sealed to prevent water ingress
4) Ensure all flue connections are sealed, if using flexible flue pipe ensure that the correct fittings are used.
5) Ensure a cowl is fitted to the end of the flue

INSTALLATION OF EXHAUST CHIMNEY THROUGH WALL

Installation type B

1) After securing linear tube in position drill an 80Ø hole through the wall
2) The total extension for the flue pipe should not be longer than **3.5mtrs** if it is necessary to insert a bend calculate 1mtr for each bend, the diameter of the exhaust should not be less than 80mm
3) Install the flue pipe ensure that all the flue connections are sealed, if using flexible flue pipe ensure that the correct fittings are used.
4) Ensure a cowl is fitted to the end of the flue
5) If using flexible flue pipe ensure that the correct fittings are used.

INSTALLATION TYPE B

INSTALLATION TYPE B

Flue using Rigid pipe

Flue using Flexible pipe

Radiant Tube

Roof Installation
Hook the support chains on to the roof fittings previously fabricated on site.
The chains should be fixed **45cm** apart on the exchanger sections and on the Burner and Fan Units.
Raise the Linear Tube Assembly and secure to the chains,
After securing the Linear Tube to the roof fixings 2 x 80 Ø holes should be cut in the roof for the air inlet and flue pipes.
The air inlet and flue pipes should not exceed **4 mts** and should not normally contain any bends or restrictions. If it is necessary to include a bend each bend should be regarded as a metre length.
Ensure the air intake and flue are sealed through the roof to prevent any water ingress And ensure a cowl is fitted to both terminals.

Gas supply general

The Benson range of radiant tube gas fired heaters are all manufactured and pre-set for use with natural gas classified under the following categories, based upon the destination of the heater I_{2H} , I_{2L}, I_{2Es} , $I_{2E(R)B}$, I_{2Esi} ,

The heater must be compatible with the gas supply, and each heater must be installed with a separate approved isolating gas cock positioned adjacent to and upstream of the union between the service pipe and the heater.

The gas supplier should have been contacted to confirm that the supply feed (pipework and metering) is capable of delivering the required dynamic volume of gas, thereby ensuring that the minimum burner pressure can be achieved. Consideration should have also been given to the pressure drop on single and multiple heater installations, and the affect that such installations will have upon other plant sharing the gas supply.

If it is necessary to fit a gas booster, the controls must include a low pressure cut-off switch which must be fitted on the supply side of the booster. It is also a requirement that the gas supplier is contacted prior to the fitting of the unit.

Note
Reference to the Institute of Gas Engineers publication UP-1 and UP-2 together with BS6891 is strongly advised.
Service and Installation pipework must be of a diameter equal to or greater than the inlet connection on the heater, all joints must be sealed using an approved sealing compound, and the system purged and tested for soundness.

Gas Installation/connection

Service pipework must terminate at an approved gas cock, and be adjacent to the position of the heater.
The connection to the heater can be made by way of an approved flexible coupling, .
Threaded connections must comply with ISO288/1 of ISO 7/1, further information concerning the accepted practice in European countries is detailed in the June 1995 version of prEN 1020 annex A7

Electrical supply

Wiring external to the Radiant Tube heater must be installed in accordance with any local, national, and European regulations, as well as meeting the appropriate requirements of IEE regulations.

The means of connection to the main electrical supply must allow for complete electrical isolation of the heater. Icn 6KA Vn 400 Ian 0.03A

Furthermore, the supply should only be used to serve the heater itself and no other plant or equipment.

The position of the isolation switch must be such that it is adjacent to the heater and easily accessible at all times. In addition, the isolator itself must have a contact separation of not less than 3mm as per BS5991 clause 20.2.

The Control Fuse ratings are detailed on the appliance data plate.

Warning Ensure that the electric and gas supplies are turned off before any electrical work is carried out on the heater. Ensure that wiring cannot make contact with any surfaces liable to be subject to high temperatures or where the insulation of the wiring could be impaired as a result of such contact.

All Benson Gas Rad Heaters must be earthed.

Caution

The main electrical supply must not be switched off or disconnected as a method for stopping the heater, the exception to this is in an emergency, or during servicing, when the heat exchanger has been allowed to cool sufficiently to prevent any damage from occurring. Claims for damage will not be considered if they have resulted from incorrect wiring or the incorrect use of the heater.

Electrical Installation/connection

Benson Radiant Tube heaters are 230V 50Hz 1PH

It is recommended that reference is made to the wiring diagrams contained within this manual prior to installation or connection to the supply.

The electrical supply must be as specified and suitable for the heater, and must be run within conduit to a point adjacent to the heater, and be terminated to provide an isolation point that will prevent remote or inadvertent activation.

Cables, conduit, and fittings that are used to make the connection between the isolator and the heater must conform to the appropriate IEE regulations.

All radiant tubes are supplied fused and pre-wired, all must be earthed.

WIRING DIAGRAM OF CONTROL PANEL WITH TWO THERMOSTATS ON/OFF

KEY

L1 Power supply 230/1ph/50Hz
N Neutral
PE Earth
IG Fused isolator
ID Differential switch
Ign Day Night Manual Switch
T1 T2 Thermostat
B1 B 2 Burners
GL1 GL2 Probe
IZ1 IZ2 Zone switch
KT1 KT2 Control Relay
MAN Manual Override

WIRING DIAGRAM OF CONTROL PANEL WITH TWO THERMOSTATS TWO STAGE

KEY

L1 Power supply 230/1ph/50Hz
N Neutral
PE Earth
IG Fused isolator
ID Differential switch
Ign Day Night Manual Switch
T1 T2 Thermostat
B1 B2 Burners
GL1 GL2 Probe
IZ1 IZ2 Zone switch
KT1 Control Relay 1st Stage
KT2 Control Relay 2nd Stage
MAN Manual Override

WIRING DIAGRAM OF CONTROL PANEL WITH TWO THERMOSTATS AND CLOCK ON/OFF

KEY

L1 Power supply 230/1ph/50Hz
N Neutral
PE Earth
IG Fused isolator
ID Differential switch
TI Time Clock
Ign Day Night Manual Switch
T1 T2 Thermostat
B1 B 2 Burners
GL1 GL2 Probe
IZ1 IZ2 Zone switch
KT1 KT2 Control Relay
MAN Manual Override

WIRING DIAGRAM OF CONTROL PANEL WITH TWO THERMOSTATS AND CLOCK TWO STAGE

KEY

L1 Power supply 230/1ph/50Hz
N Neutral
PE Earth
IG Fused isolator
ID Differential switch
Ti Time Clock
Ign Day Night Manual Switch
T1 T2 Thermostat
B1 B2 Burners
GL1 GL2 Probe
IZ1 IZ2 Zone switch
KT1 Control Relay 1st Stage
KT2 Control Relay 2nd Stage
MAN Manual Override

Radiant Tube

Gas Supply Connections

1 Burner

2 Flexible Pipe

3 Isolating Valve

4 Mains Gas Supply

Sample Electrical Layout

CONTROL PANEL DESCRIPTION

Electrical control panels can be supplied for operation with 1 - 2 thermostats or 3 - 10 thermostats on request, to ensure that the heating system is both comfortable and cost effective .

Supplied in a Control Box with an IP 65 Rating with the following :-
Two pole isolating switch
1 – 2 or 3 – 10 stats
Time clock

Electrode positions

The illustrations below show the correct positioning of the electrodes in the holder block .
Ensure that the gap is set as per dimensions shown and the ceramic insulation is not cracked or broken

A Ignition Electrode

B Fixed earth electrode

C Detection Electrode

B Fixed earth electrode

B Fixed earth electrode

Radiant Tube

Commissioning – Pre-test

Check to ensure electrical safety, and inspect and check the installation, testing for leaks.
(a) Ensure that the electrical supply is turned off.

(b) Ensure that the gas supply is turned off.

(c) Check that all panels and fasteners are secure and in place.

(d) Check that the heater is installed so that it is square and that the support is adequate.

Start up

a) Switch on Electrical supply

b) Turn on Gas supply

c) Connect manometer to test point

d) The power lamp will illuminate and the fan will start, for a short period the lockout indication lamp will also illuminate,

e) The fan will pre purge for 30 seconds and the 5 second ignition sequence will then take place

f) The flame will be detected by the flame probe the lockout will extinguish and the heater will run the power light will remain illuminated

g) Adjust burner gas pressure on gas valve to settings advised on data sheet

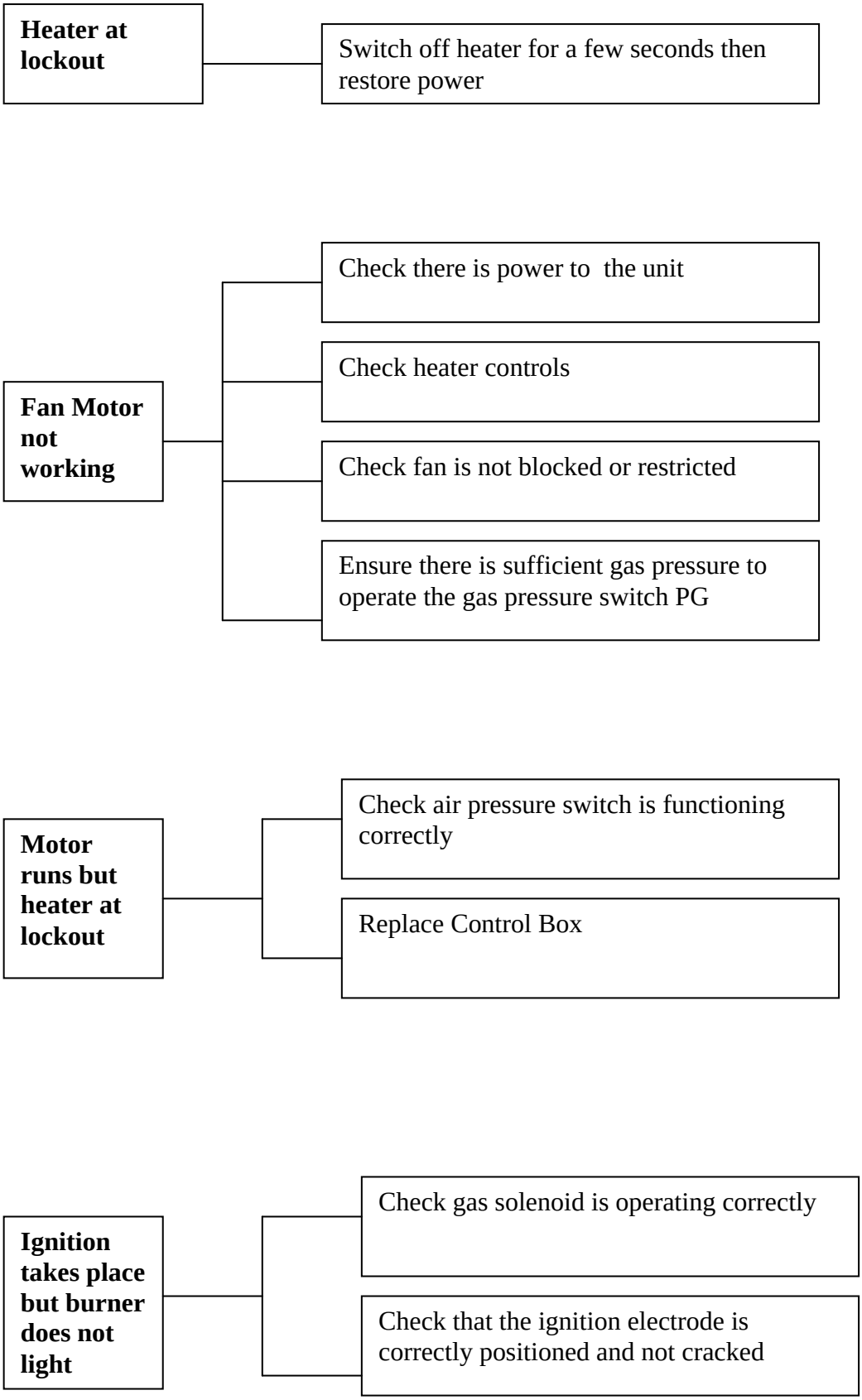
h) Check combustion figures with gas analyser

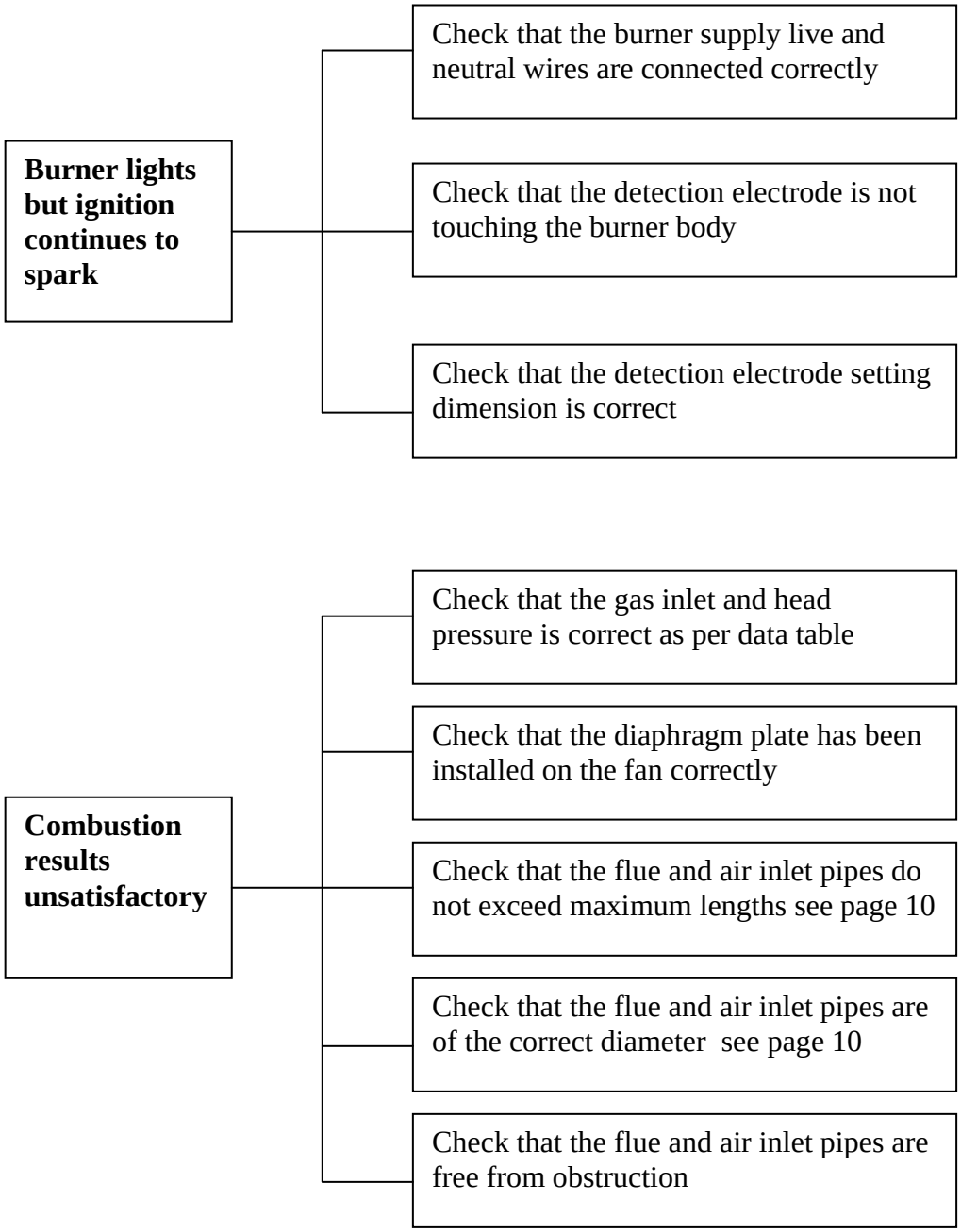
Gas valve

1 Gas inlet pressure test point **2** Gas head pressure test point
3 Gas pressure adjustment screw

Gas Valve Hi / Lo
3 Gas pressure adjustment screw 2nd stage **4** Gas pressure adjustment screw 1st stage

Radiant Tube




Burner lights but ignition continues to spark
Check that the burner supply live and neutral wires are connected correctly
Check that the detection electrode is not touching the burner body
Check that the detection electrode setting dimension is correct
Combustion results unsatisfactory
Check that the gas inlet and head pressure is correct as per data table
Check that the diaphragm plate has been installed on the fan correctly
Check that the flue and air inlet pipes do not exceed maximum lengths see page 10
Check that the flue and air inlet pipes are of the correct diameter see page 10
Check that the flue and air inlet pipes are free from obstruction

Radiant Tube

Radiant Tube

Servicing

It is recommended that the Gas Rad is serviced annually, however in exceptional conditions more frequent servicing may be required.
It is important to ensure that the heaters are suitably suspended and that heavy items and ladders are not rested against the heaters.

Turn off and disconnect the electrical and gas supplies

Radiant Tube