BENSON
RADIANT TUBE

Natural or Propane
(Gas fired)

INSTALLATION COMMISSIONING
SERVICING
USER INSTRUCTIONS

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

The GasRad 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

Maximum installation heights

GRHU 20/6 = 5 mtrs
GRHU 30/6 = 6 mtrs
GRHU 35/6 = 7 mtrs
GRHU 40/6 = 10 mtrs
GRHU 45/9 = 9 mtrs
GRHU 50/12 = 9 mtrs

Technical Data

Model GRHU-U on /off		**20/6**	**30/6**	**35/6**	**40/6**	**45/9**	**50/12**
Input	kW	20	30	35	40	45	50
Burner	Type	Atmospheric					
Gas G20	m^3/h	1.8	2.7	3.1	3.6	4.05	4.5
Consumption G31	m^3/h	.72	1.1	1.3	1.4	1.6	1.8
Gas connection	Ins	½					
Head pressure G 20	mbar	8.5	8.5	8.5	8.5	8.5	8.5
Inlet pressure G 20	mbar	20					
Gas Press switch G20	mbar	9 – 10					
Nozzle size G20	No	2 x 2.8	3 x 2.8	4 x 2.8	4 x 2.8	4 x 2.8	4 x 3.2
Head pressure G31	mbar	36	36	36	36	36	36
Inlet pressure G31	mbar	37					
Gas Press switch G31	mbar	30 – 31					
Nozzle size G31	No	2 x 1.55	3 x 1.55	4 x 1.45	4 x 1.55	4 x 1.65	4 x 1.70
Fan Restrictor plate size	Ø	42	42	nil	nil	nil	nil
Electricity supply	Volts	230v / 1ph / 50Hz					
Power consumption	Watts	56	56	56	56	56	56
Electrical Power	Amps	0.5	0.5	0.5	0.5	0.5	0.5
Burner heads	No	2	3	4	4	4	4
Weight	Kg	108	108	108	108	147	185
Length of pipes	mtrs	6	6	6	6	9	12
Exchanger tube Ø	mm	89					
Air intake Ø	mm	100					
Flue Ø	mm	100					
Combustion Air	m^3/h	40	60	80	80	80	80

Model GRHU 2-U hi/lo		**20/6-2**	**30/6-2**	**35/6-2**	**40/6-2**	**45/9-2**	**50/12-2**
Input	kW	20	30	35	40	45	50
Burner	Type	Atmospheric					
Gas G20	m^3/h	1.8	2.7	3.1	3.6	4.05	4.5
Consumption G31	m^3/h	.72	1.1	1.3	1.4	1.6	1.8
Gas connection	Ins	½					
Head pressure G 20	mbar	8.5	8.5	7.0	7.0	11	6.5
Inlet pressure G 20	mbar	20					
Gas Press switch G20	mbar	9 – 10					
Nozzle size G20	No	2 x 2.8	3 x 2.8	4 x 2.8	4 x 2.8	4 x 2.8	4 x 2.8
Head pressure G31	mbar	36	36	36	36	36	36
Inlet pressure G31	mbar	37					
Gas Press switch G31	mbar	30 – 31					
Nozzle size G31	No	2 x 1.55	3 x 1.55	4 x 1.45	4 x 1.55	4 x 1.65	4 x 1.70
Fan Restrictor plate size	Ø	42	42	nil	nil	nil	nil
Electricity supply	Volts	230v / 1ph / 50Hz					
Power consumption	Watts	56	56	56	56	56	56
Electrical Power	Amps	0.5	0.5	0.5	0.5	0.5	0.5
Burner heads	No	2	3	4	4	4	4
Weight	Kg	108	108	108	108	147	185
Length of pipes	mtrs	6	6	6	6	9	12
Exchanger tube Ø	mm	89					
Air intake Ø	mm	100					
Flue Ø	mm	100					
Combustion Air	m^3/h	40	60	80	80	80	80

General arrangement

1 & 3 Self tapping screws

2 Reflector

4 End Plate

5 Pipe Flange

6 U Tube

7 Expansion Piece

8 Exchanger Support Bracket

9 Exchanger Pipe (Painted)

10 Reflector Support Bracket

11 Mains Plug

12 Cover Clips

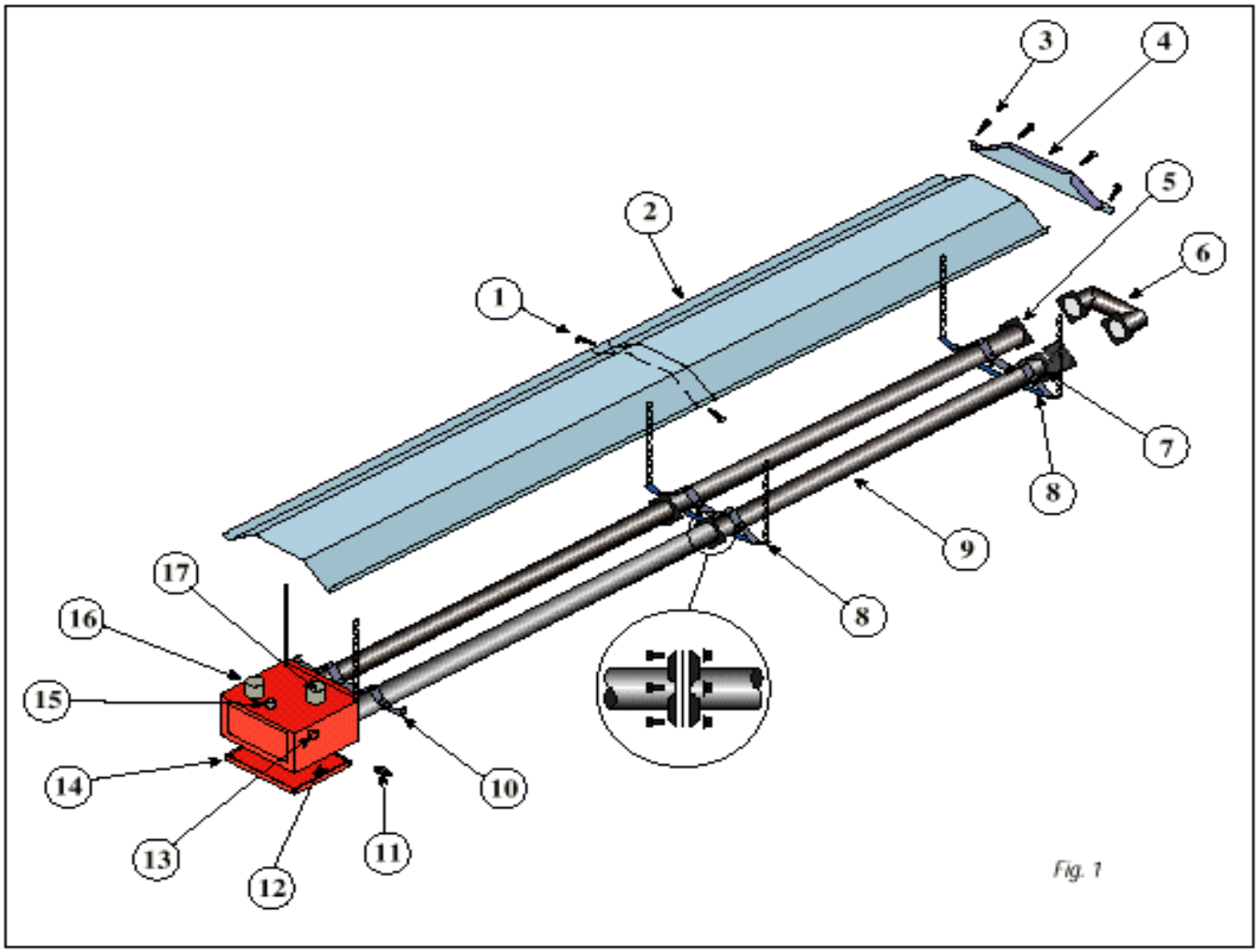
13 Mains Socket

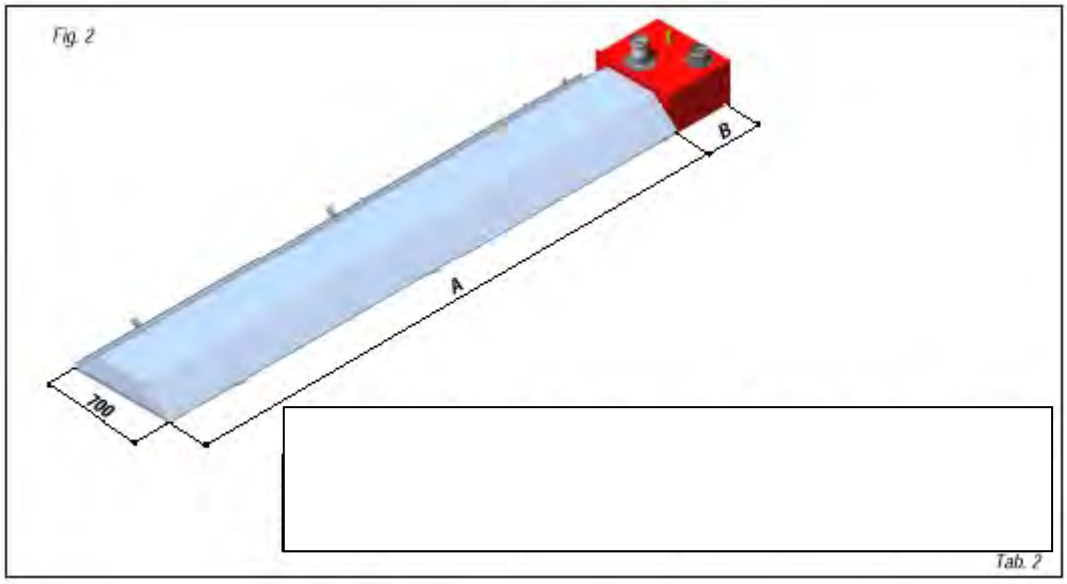
14 Cover Plate

15 Gas Connection 1/2”

16 Combustion Air Spigot

17 Flue Spigot

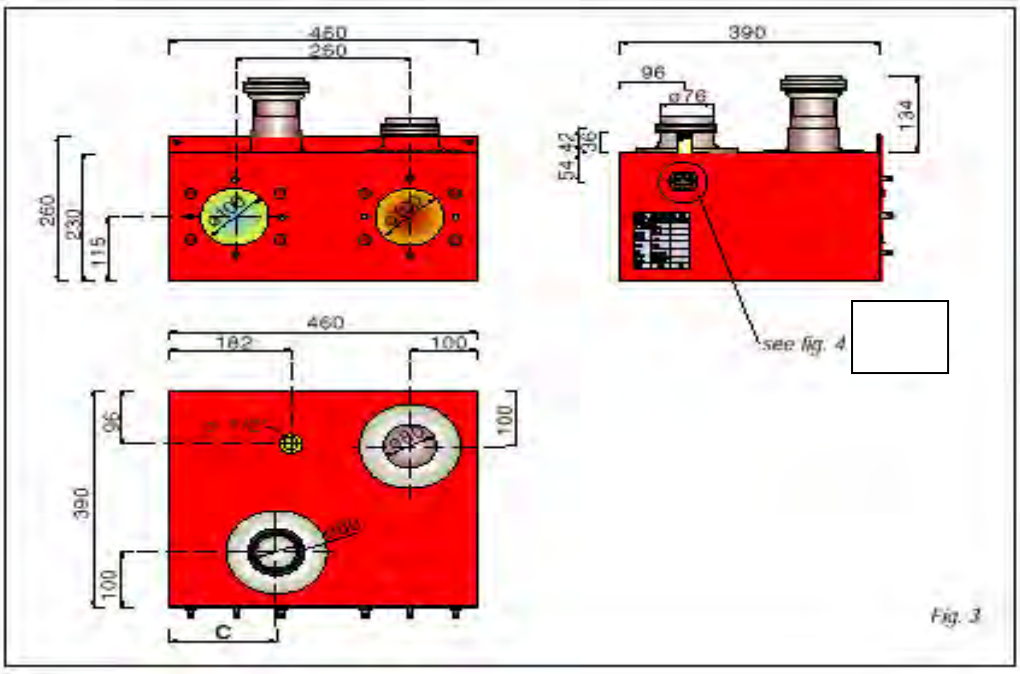




External Dimensions Radiating Panel

	GRHU20/6 GRHU20/6-2	GRHU30/6 GRHU30/6-2	GRHU40/6 GRHU40/6-2	GRHU35/6 GRHU35/6-2	GRHU45/9 GRHU45/9-2	GRHU50/12 GRHU50/12-2
A {mm}	6.060				8.970	11.900
B {mm}	390					
A + B {mm}	6.450				9.360	12.290

Burner External Dimensions



GRHU 20-30-35-40/6 & 6-2 DIMENSION C = 160mm
GRHU 45/9 & 9-2 GRHU 50/12 & 12/-2 C = 185mm

Burner Assembly viewed with burner assembly upside down.

1 Fan Casing

2 Electrode

3 Burner Heads

4 Control Box

5 Nozzle

6 Gas Manifold

7 Lockout Indication

8 Air Inlet Spigot

9 Gas Solenoid Valve

10 Gas Pressure Switch

11 Gas Connection

12 Air Pressure Switch

13 Operating Light Green

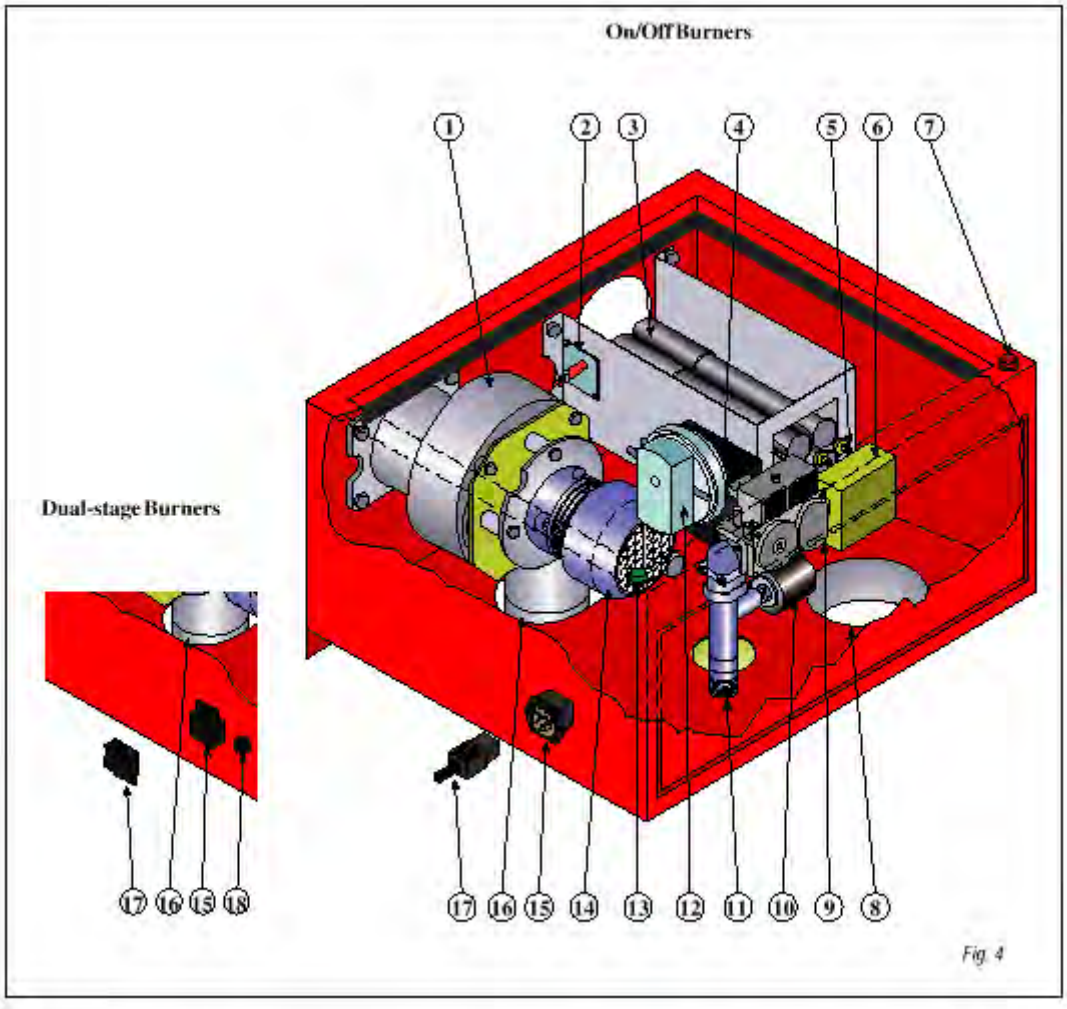
14 Fan Motor

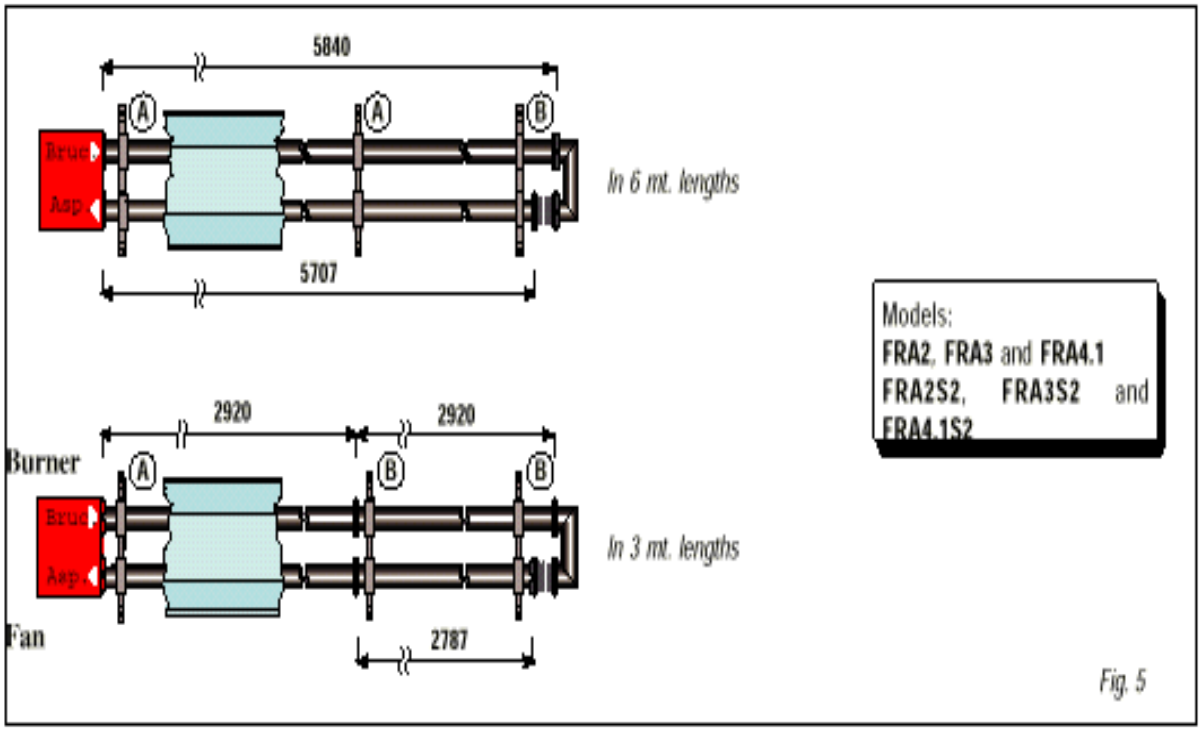
15 Plug Socket & Fuse

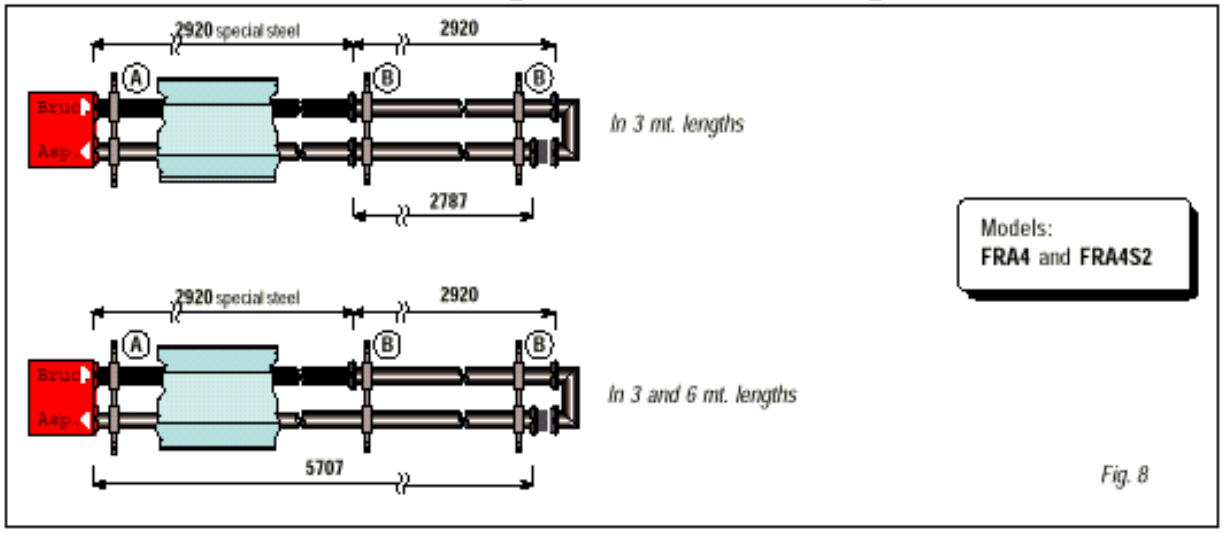
16 Flue Spigot

17 10 Amp Plug

18 Fuse Holder (Hi / Lo)




5840
A
A
B
Bruc
Asp
5707
In 6 mt. lengths
Models:
FRA2, FRA3 and FRA4.1
FRA2S2, FRA3S2 and
FRA4.1S2
2920
2920
Burner
A
B
B
Bruc
Asp
In 3 mt. lengths
Fan
2787
Fig. 5


2920 special steel
2920
A
B
B
Bruc
Asp
In 3 mt. lengths
2787
Models:
FRA4 and FRA4S2
2920 special steel
2920
A
B
B
Bruc
Asp
In 3 and 6 mt. lengths
5707
Fig. 8

ASSEMBLY OF HEAT EXCHANGER PIPES

Radiant Tube is composed of:
1) A combustion assembly inside a protective box;
2) Flanged pipes in different lengths;
3) A flanged head union;
4) A flanged expander;
5) A set of brackets type A and type B;
6) Reflecting dish .
7) A set of ceramic fibre gaskets with M8 nuts and securing screws.

After the above mentioned material has been checked, start assembly operation as follows:
a) Place the flanged exchanger pipes on the floor or on a flat surface, following outlines of page 8 and page 9 according to the model.
b) Place the pipe having the 5-holes flange of fig. 11 detail A on burner connection of cover fig. 12, so that the 5° hole of the flange is inserted
on the steel screw welded on the cover as shown in fig. 13 (burner side).
For ease of identification, the 5-holes flange is painted red.

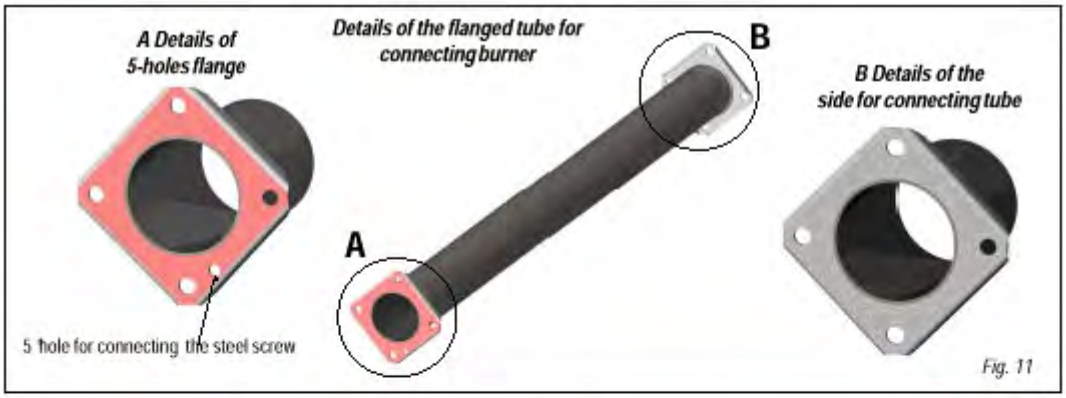


Fig. 11

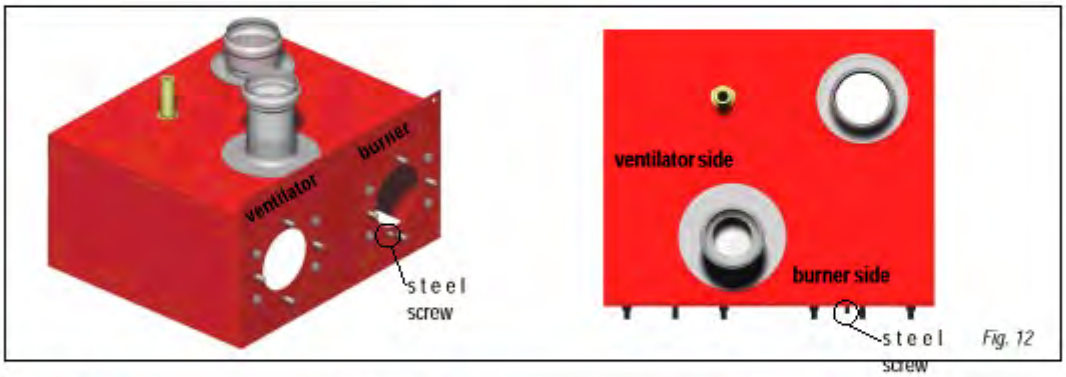


Fig. 12

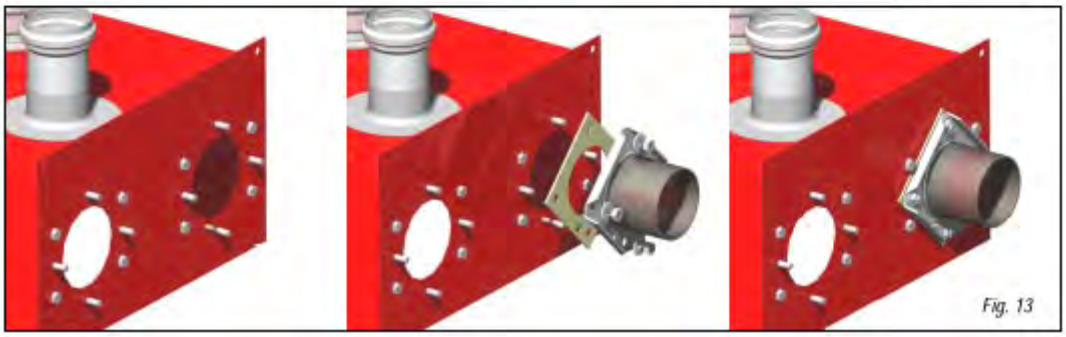


Fig. 13

c) Place **the flanged short pipe fig. 14 (2787 or 5707 mm. length)** ***on the side of the expander*** as shown on fig. 15-16.
To ease identification of this short pipe, the flange is white painted.

Key:
1 = Flanged head union
2 = M8 nut
3 = Washer
4 = Ceramic fibre gasket
5 = Flanged expander
6 = M8 screw
7 = Short flanged pipe
8 = Standard flanged pipe

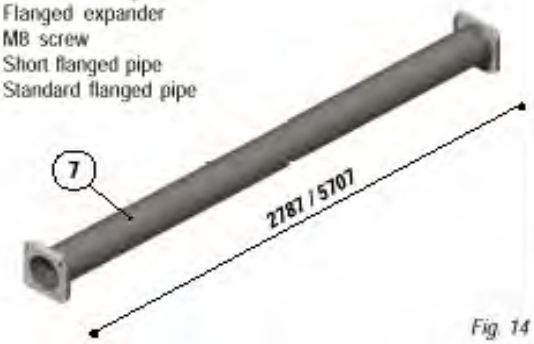


Fig. 14

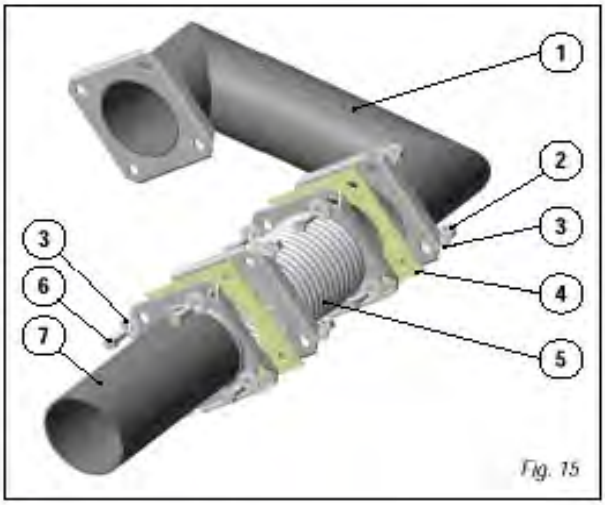


Fig. 15

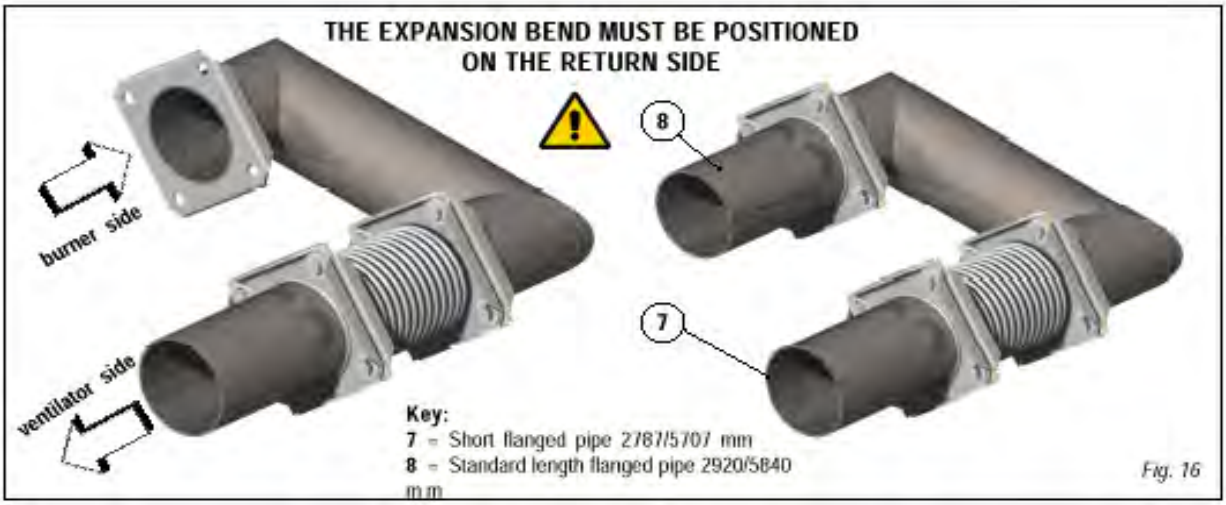


Fig. 16

d) Insert **one gasket** on every **connection between pipes** of the circuit (fig. 17), tighten through bolts and washers (fig. 18).

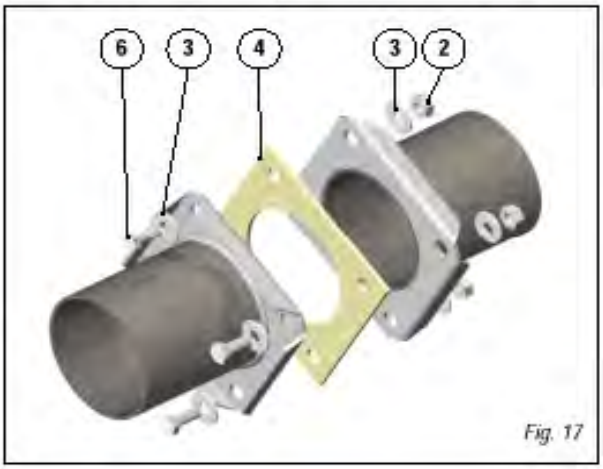


Fig. 17

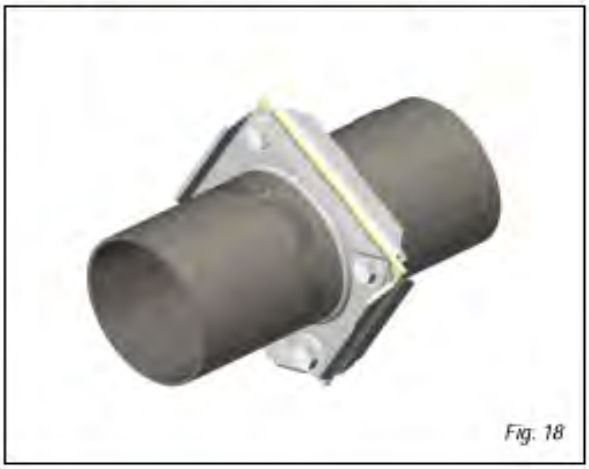


Fig. 18

e) Upon completion, be sure that radiant tube is as shown on fig. 19, otherwise repeat and check all operations as previously described.

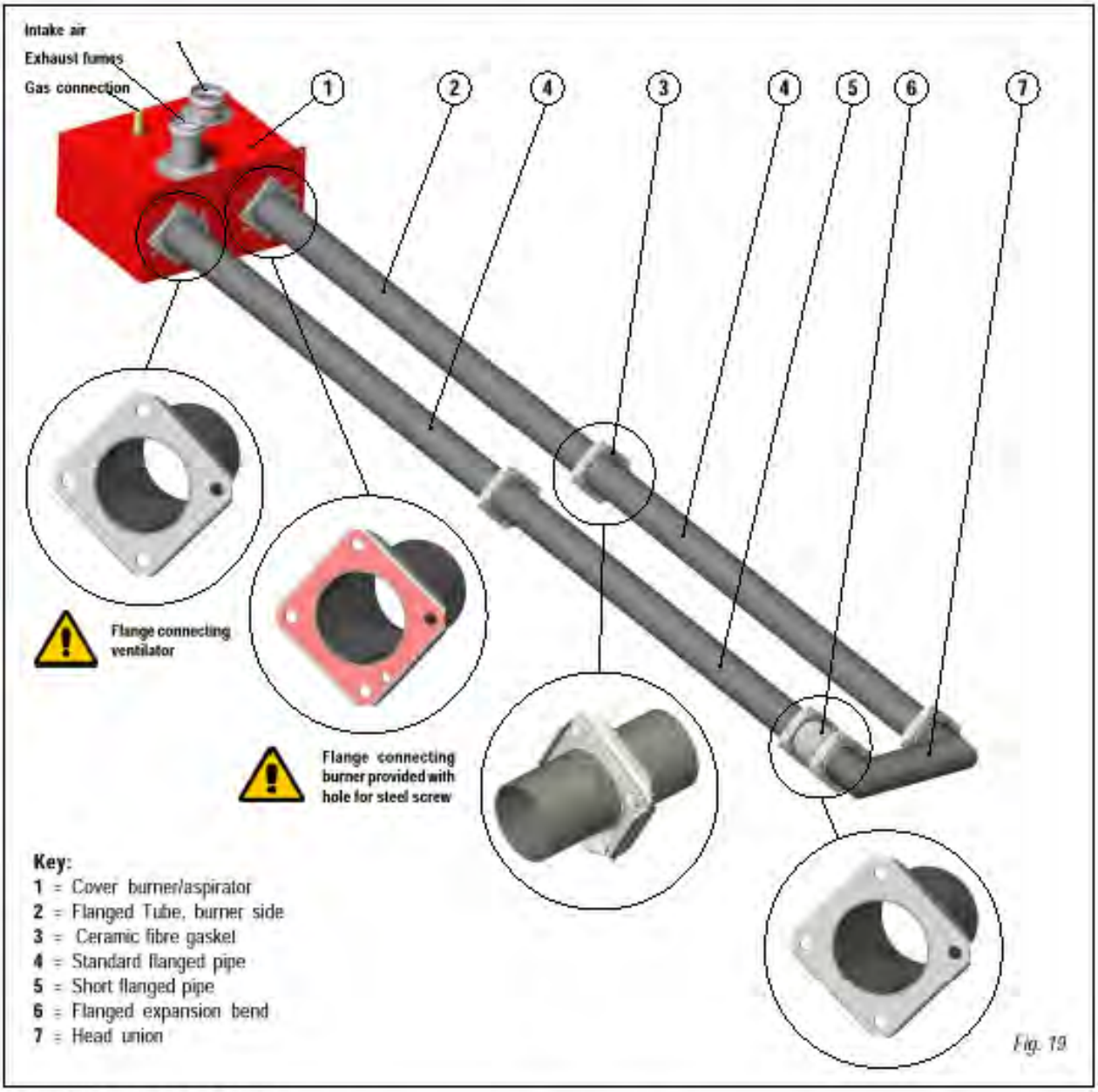


Fig. 19

WRONG INSTALLATION

On fig. 20 a **WRONG** installation is shown, the expansion bend must **NOT** be positioned on **delivery pipe** or burner side.

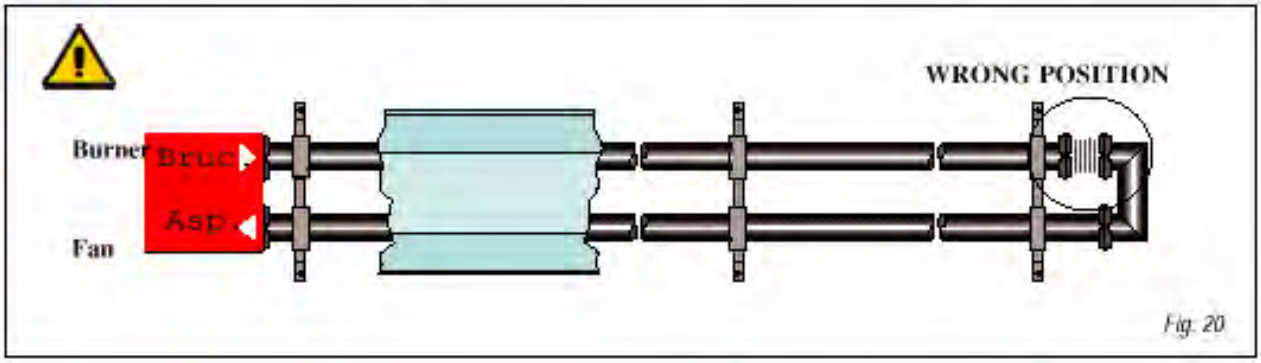


Fig. 20

ASSEMBLY OF CARRYING BRACKET type B

Place the carrying bracket type B fig. 21 as shown in fig. 5 - 6 - 7 - 8 - 9 – 10
Rest the brackets type B on the lower part of the pipes as shown in fig. 22 - 23.
Open the tabs on the small bracket slightly as shown in fig. 24 and insert the carrying bracket in the small bracket fig. 25, repeating this operation for the other exchanger and all the carrying brackets to be mounted.
Upon completion, close the tabs on the small bracket again, taking care not to break and/or crack the tab.

Fig. 21


Fig. 22


Fig. 23

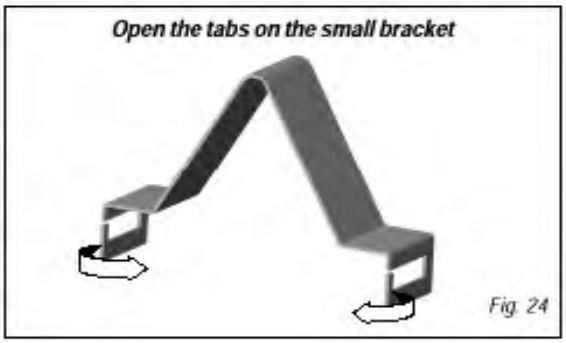


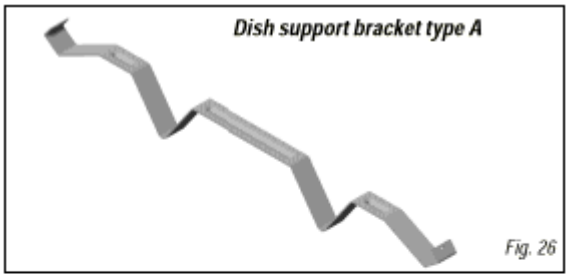
Fig. 24

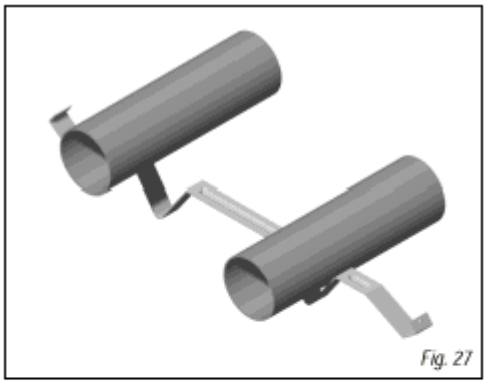
TAKE CARE NOT TO BREAK AND/OR CRACK THE TABS ON THE SMALL BRACKET.

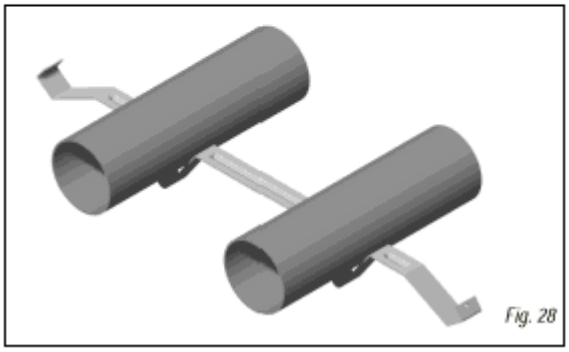
Fig. 25

ASSEMBLY OF DISH SUPPORT BRACKET type A

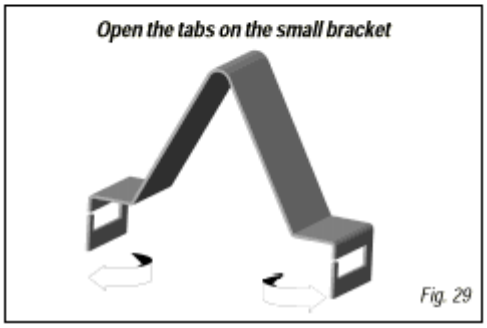
Place the dish support brackets type A fig. 26
As shown in fig. 5 - 6 - 7 - 8 - 9 - 10
Rest the brackets type A on the lower part of the pipes as shown in fig. 27 - 28.
Open the tabs on the small bracket as shown in fig. 29, then insert the carrying bracket in the small bracket fig. 30 repeating this operation for the other exchanger and all the dish support brackets type A to be mounted.
Upon completion, close the tabs on the small bracket again, taking care not to break and/or crack the tab.

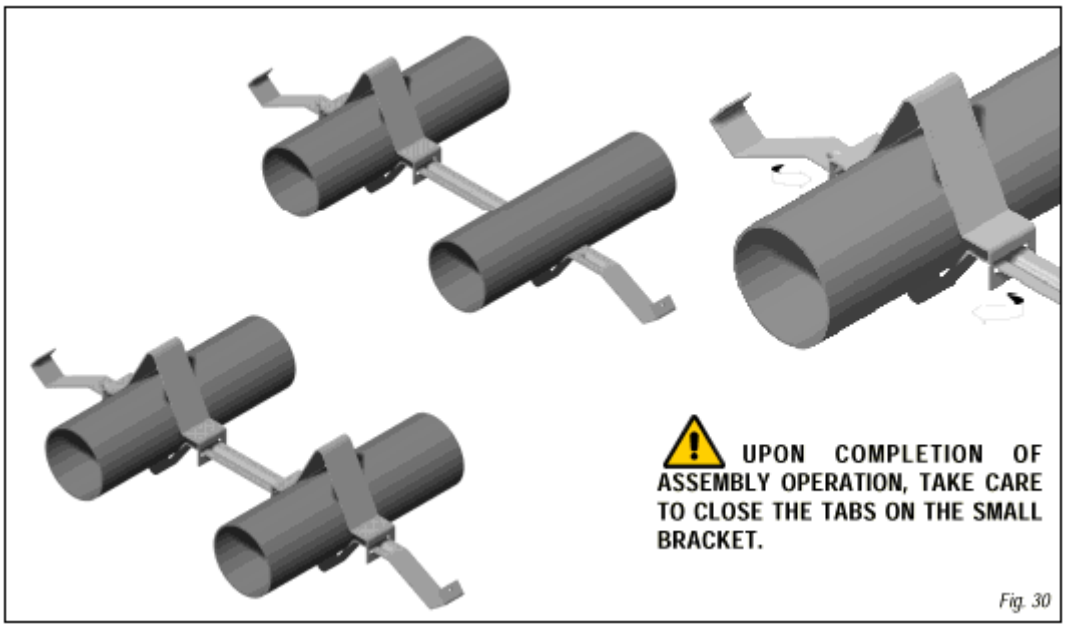






TAKE CARE NOT TO BREAK AND/OR CRACK THE TABS.





ASSEMBLY OF REFLECTORS

Take out the protective film covering the reflector of fig. 31;
Rest the reflectors on the brackets you have just assembled as shown in fig. 32 - 33;
Pass the spring supplied over the reflector between the brackets and insert the ends of the spring in the holes type A and type B, then fold the ends so that they cannot escape fig. 34.
This spring serves to fasten the reflector to the small bracket so that it does not vibrate.
Connect the reflectors each other applying a self-threading screw as shown in fig. 35.

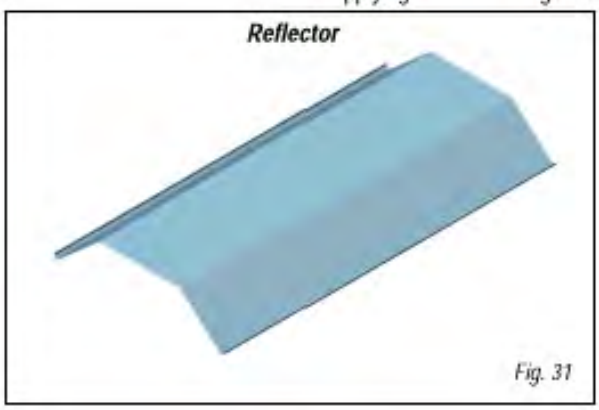


Fig. 31

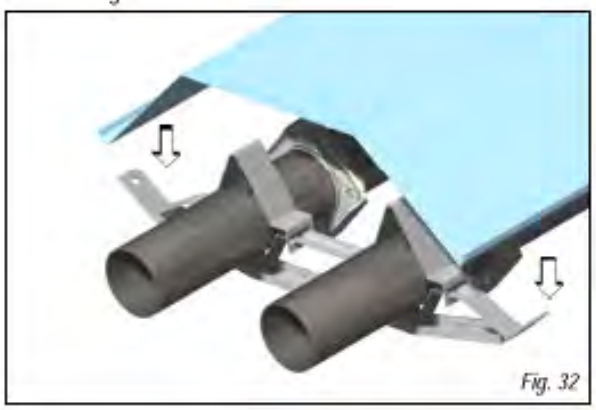
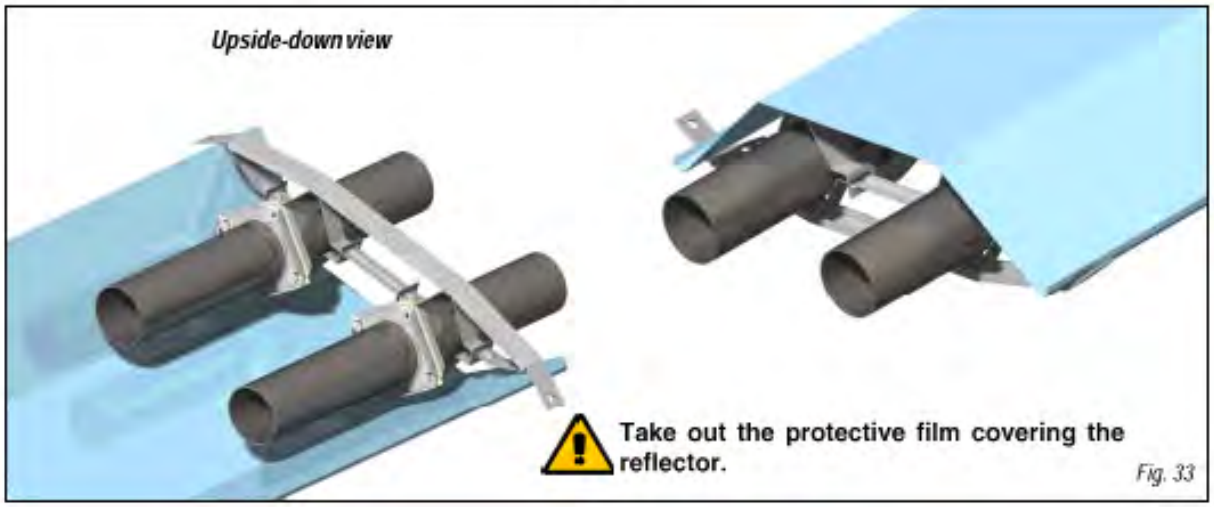
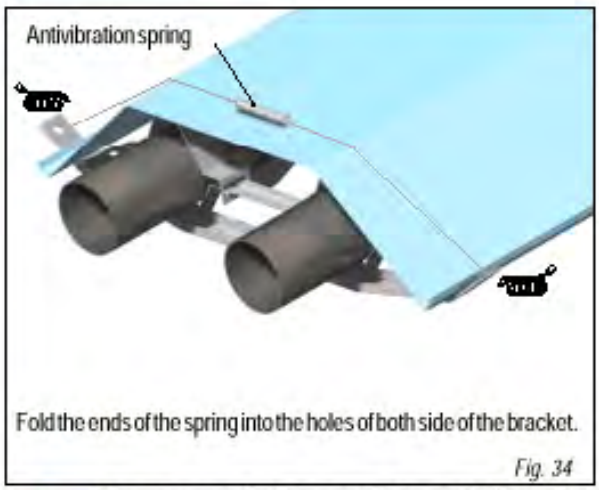


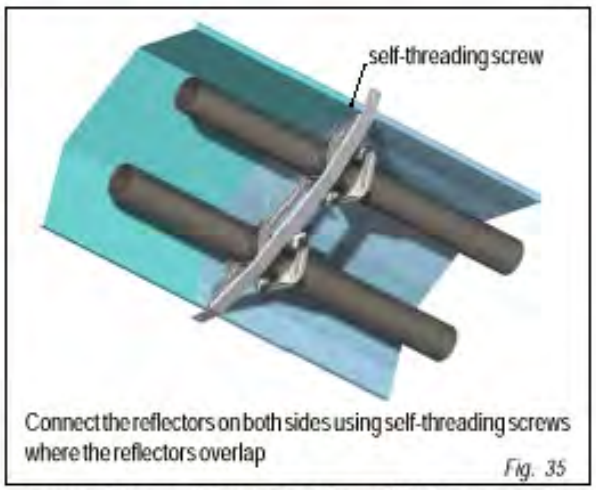
Fig. 32



Take out the protective film covering the reflector.
Fig. 33



Fold the ends of the spring into the holes of both side of the bracket.
Fig. 34



Connect the reflectors on both sides using self-threading screws where the reflectors overlap
Fig. 35

Upon completion, apply a self-threading screw in the point where the reflectors overlap taking care not to connect the reflector to the carrying bracket, check that the protective film has been taken out.

ASSEMBLY OF REFLECTOR END COVER

After that reflectors have been assembled to radiant tubes, insert the reflector end cover fig. 36 using self-tapping screws as shown in fig. 37.
Upon completion, take out the protective film covering the reflector end cover.
The distance between head union and reflector end cover must be at least 5 cm, so that the exchanger pipes cannot be in contact with the internal surface of reflector end cover while expanding.

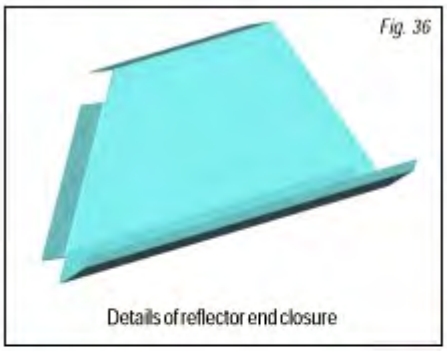


Fig. 36
Details of reflector end closure

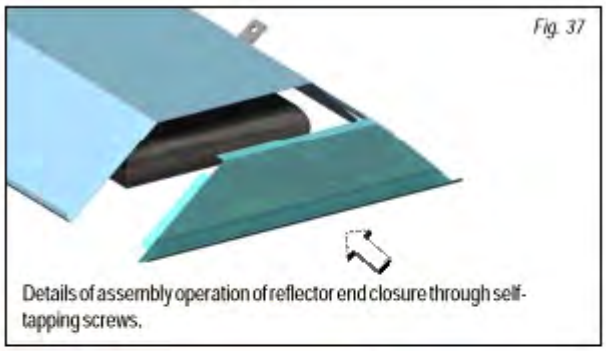


Fig. 37
Details of assembly operation of reflector end closure through self-tapping screws.

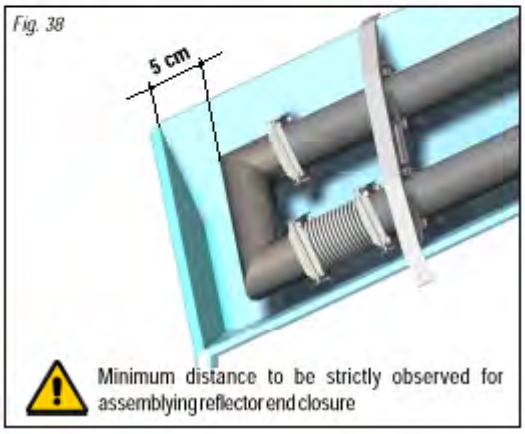
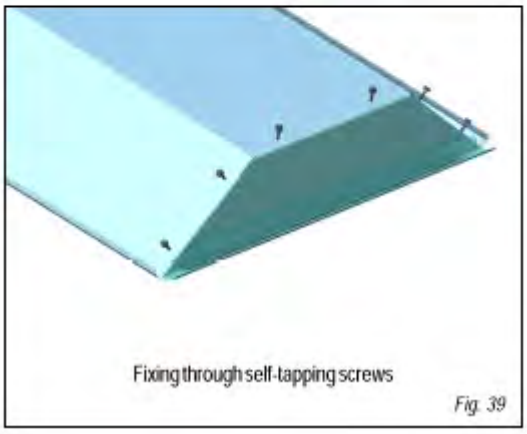


Fig. 38
Minimum distance to be strictly observed for assemblying reflector end closure


Fixing through self-tapping screws
Fig. 39

INSTALLATION OF UPPER INSULATION

A glasswool in rolls fig.40 is supplied standard for some GASRAD models and on request for remaining models in rolls fig. 40.
It has to be placed above reflector of radiant tube through some shaped sheet profiles fig. 41.
1) Stretch the insulating mattress above reflectors taking care that the aluminium foil is in the higher part, fig. 42
2) Lay out and cut the rolls to reflector end cover, fig. 43
3) Fix corner units on the reflectors through a screw to be placed down the middle, fig. 44.
4) Finally insert the anti vibration springs as per fig 34.


Fig. 40
Insulating mattress supplied in rolls

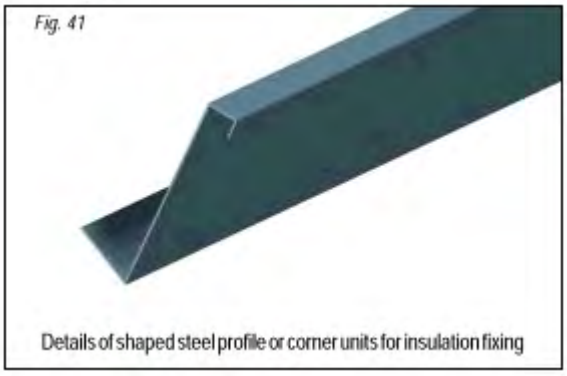
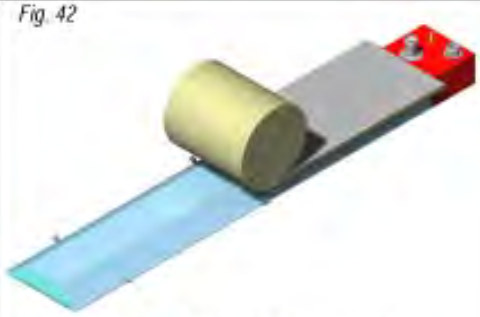


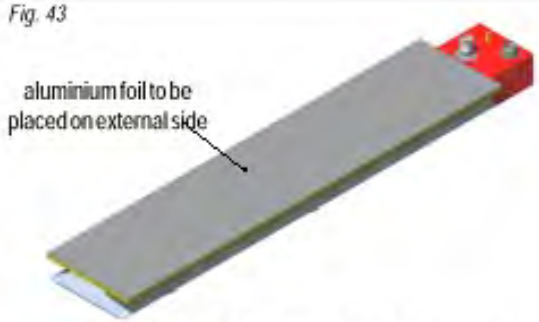
Fig. 41
Details of shaped steel profile or corner units for insulation fixing

Fig. 42



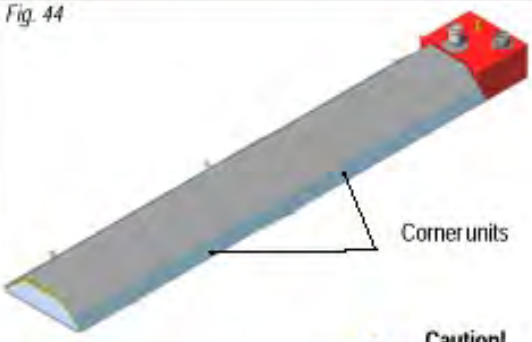
Stretch the insulating mattress

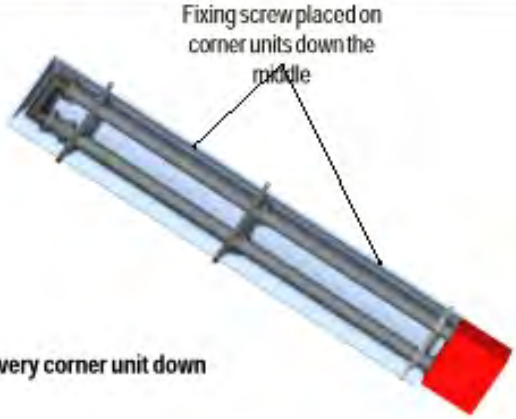
Fig. 43



Cut the insulating mattress made-to-measure

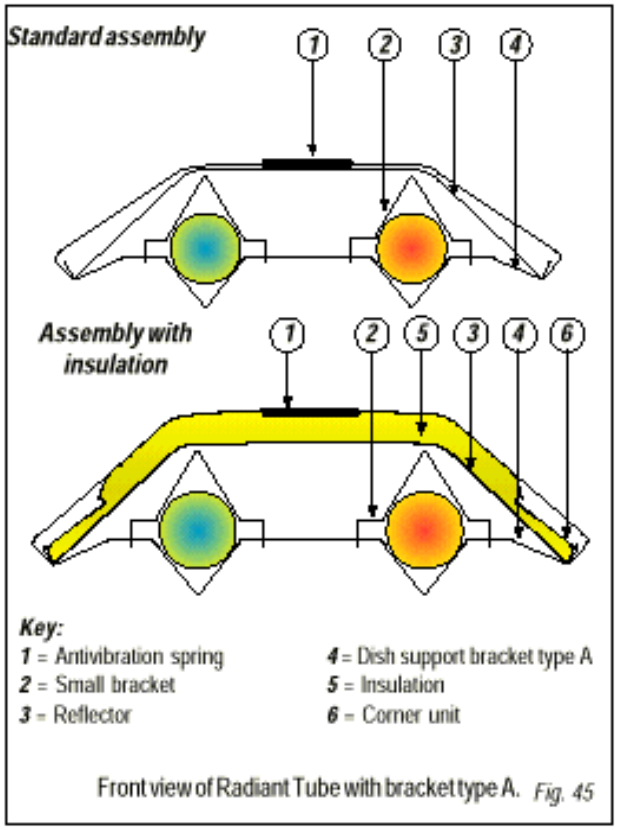
Fig. 44



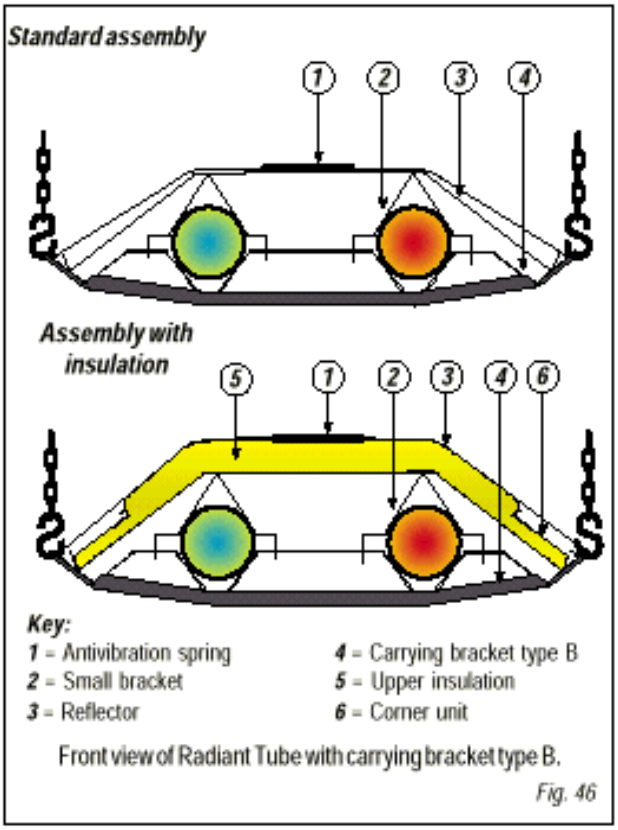


Caution!
Fix one screw on every corner unit down the middle

DETAILS OF ASSEMBLY



Front view of Radiant Tube with bracket type A. Fig. 45



Front view of Radiant Tube with carrying bracket type B.
Fig. 46

CEILING INSTALLATION

Radiant tube shall be installed as follows:

If roof is in reinforced concrete, hook the fastening eye bolts to the ceiling; if there is light roofing, hook the fastening eye bolts on bars placed between one upright and the next.

The chains should be placed crosswise with an distance of 70 cm between them, The two that are hooked to the burner and have an gap of 45 cm. The chains should be placed longitudinally the distances obtained between one carrying bracket and the next as shown in fig. 47;

Raise the radiant tube (completely assembled on the ground) up to the height of installation, then block it in place by inserting and tightening

the "S" hooks in the chains, so that it cannot move out as shown in fig. 48;

On a ceiling with Y beams, the fastening points for the chains can be obtained by fastening 1"1/4 pipes to the ends of the Y beams as show in fig. 49.

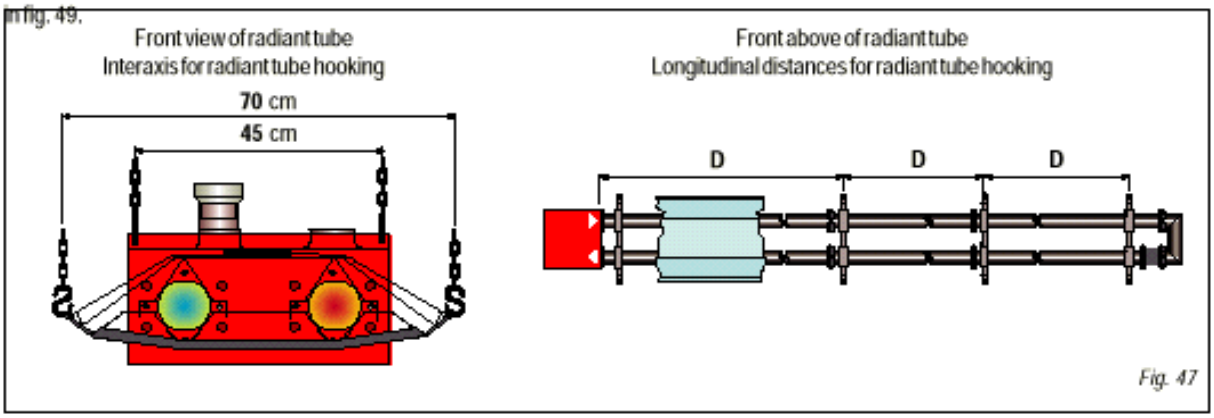


Fig. 47

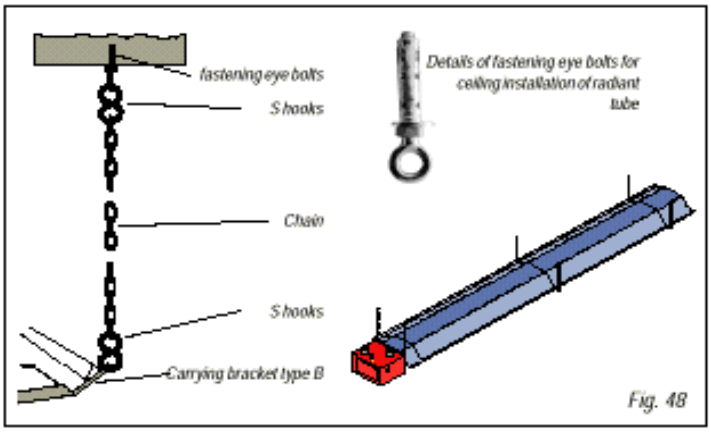


Fig. 48

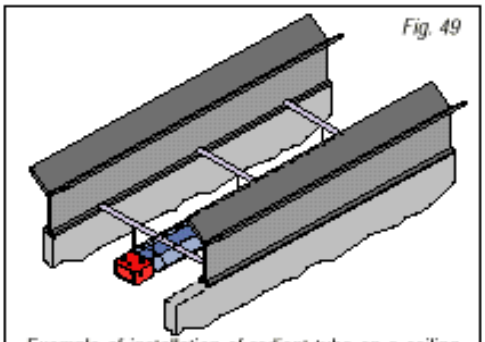


Fig. 49

Example of installation of radiant tube on a ceiling with "Y" beams. The chains can be hooked by fastening pipes to the ends of the beams and then using these pipes as fastening points for the chains

WALL INSTALLATION

If radiant tube is installed on wall, ensure the following clearances: On the "burner" side of reflector fix the extension, using self-tapping screws; Ensure the combustion spigot is higher than the flue spigot; **Maximum allowed angle is 25-30° as shown in fig.50**

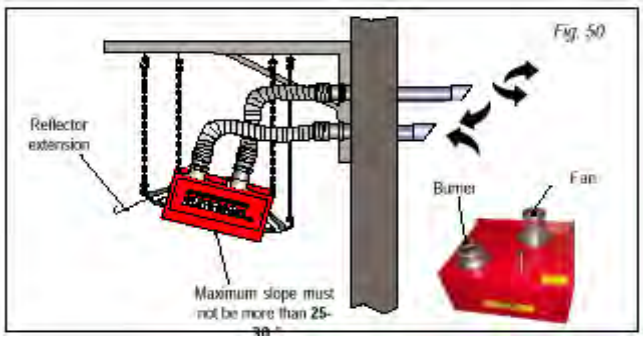


Fig. 50

INSTALLATION OF INTAKE AND EXHAUST CHIMNEY THROUGH ROOF

INSTALLATION CHIMNEY TYPE B $_{22}$ AND C $_{32}$

To correctly install the combustion and/or flue pipes, the following must be observed:

1) After fastening the Radiant Tube to the ceiling, drill a Ø 100 mm hole,
Drill one hole in the roof for chimney type B $_{22}$ see fig. 51 or two holes in the roof for chimney type C $_{32}$ vertical combustion and flue.

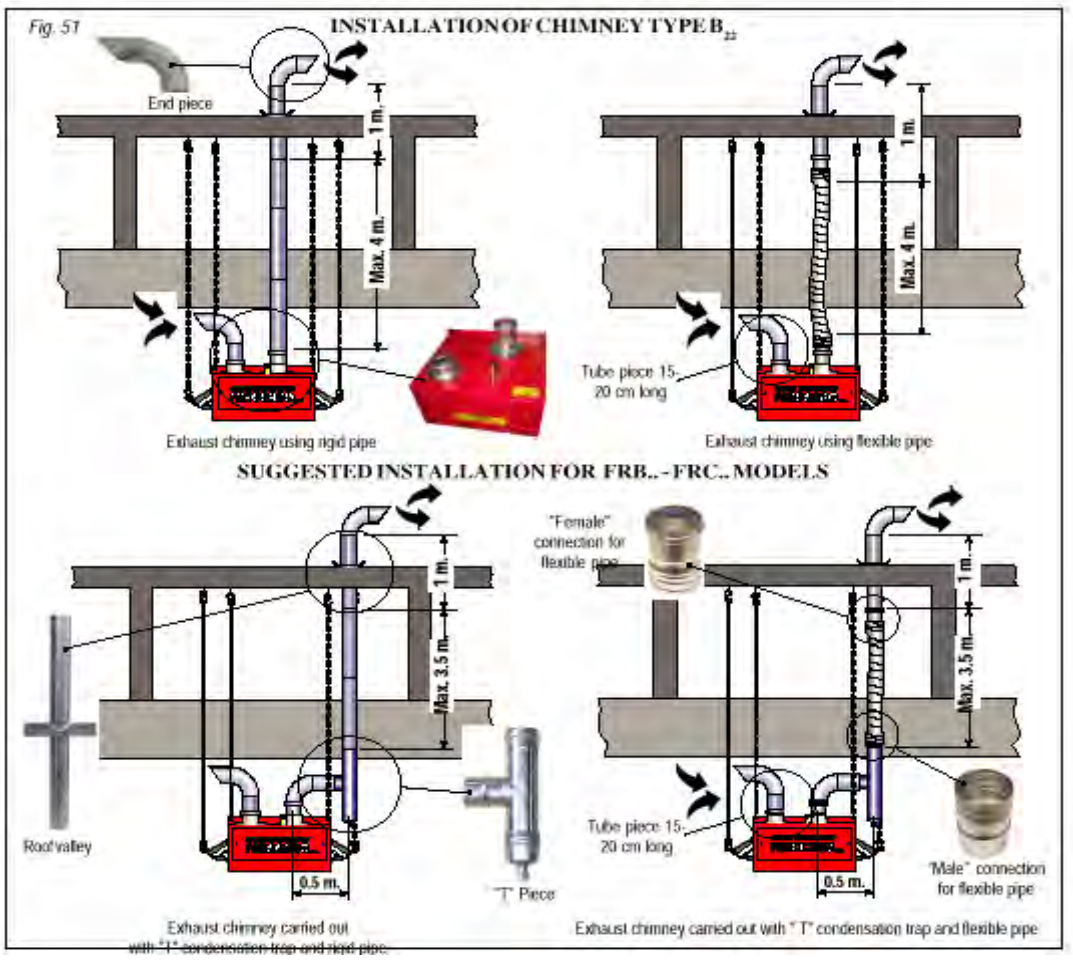
2) For Room sealed applications ensure that combustion intake faces in the opposite position to the flue pipe as shown to avoid drawing in the fumes as they are released by the flue.

3) **The total extension of each of the pipes for intake and exhaust should not be longer than 4 m**. **and should not contain any bends** If it should be necessary to insert any bend, calculate 1 linear meter less for each bend.
Diameter of intake and exhaust chimney 100 mm.

4) Ensure flue is sealed after installation with silicon. to prevent water ingress

5) Ensure all pipe connections are perfectly tight

6)Ensure cowls are fitted to both the combustion and flue spigotsr



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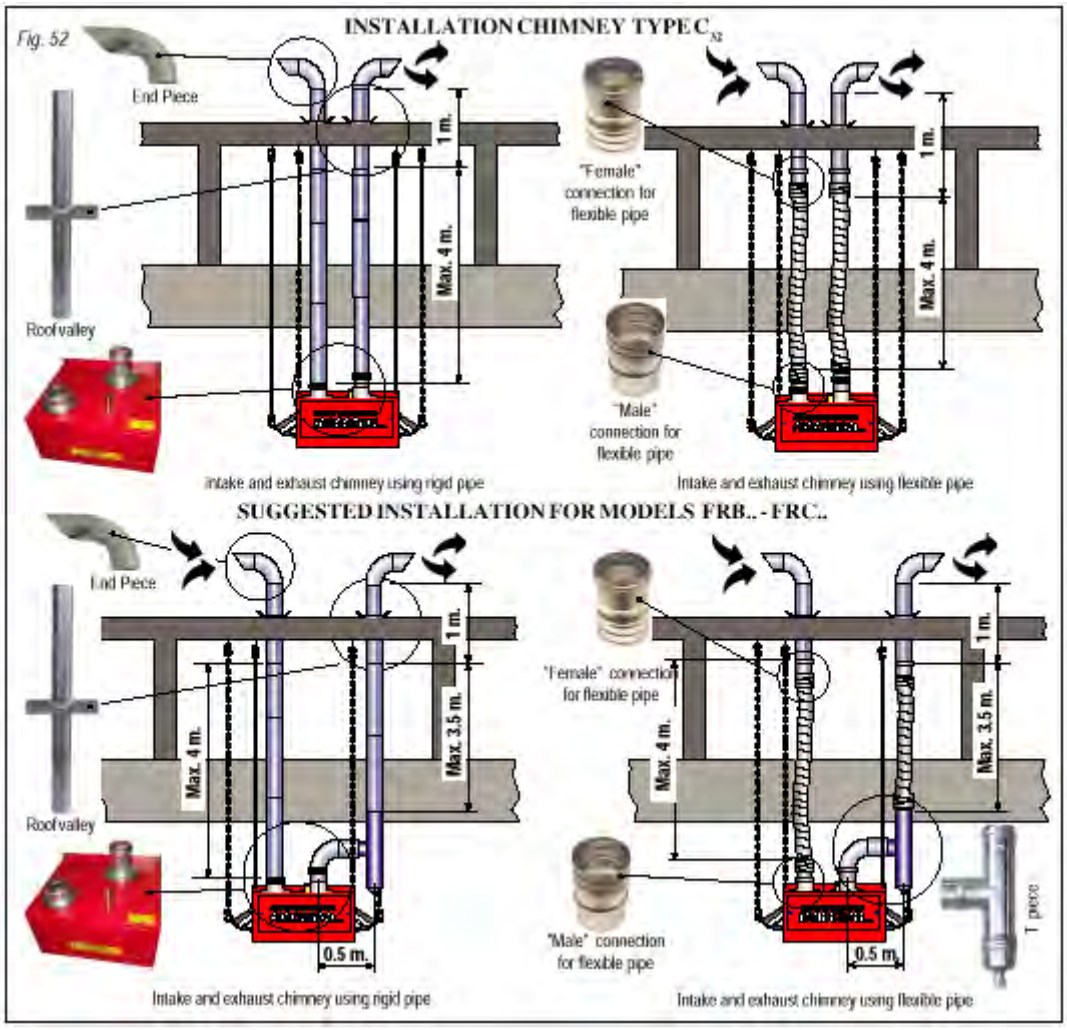


INSTALLATION OF INTAKE AND EXHAUST CHIMNEY THROUGH WALL

CHIMNEY INSTALLATION TYPE B 22 and C 12

To correctly install the combustion of flue pipes the following must be observed:

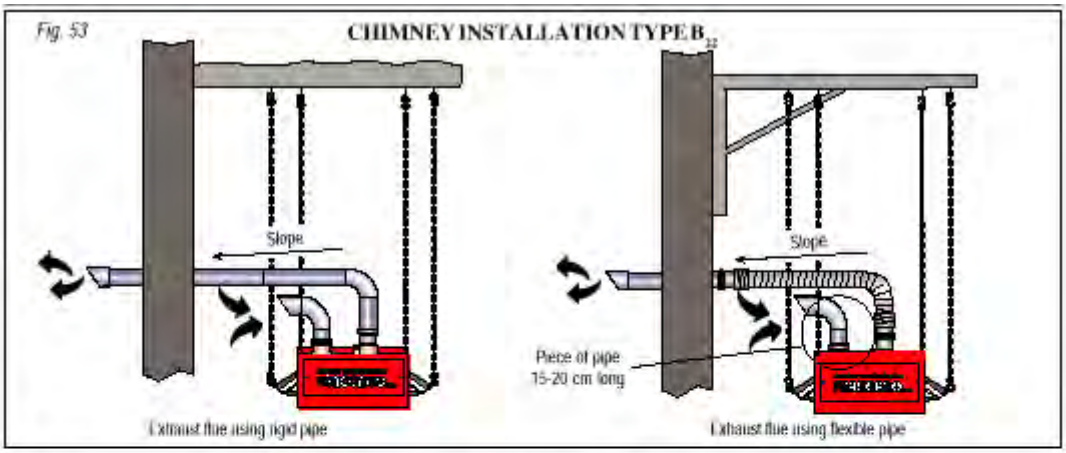
1) After fastening the Radiant Tube to the ceiling, drill a Ø 100 mm, hole
One hole in the roof for chimney type B 22 see fig. 53 or two holes in the roof for chimney type C 12 see fig. 54.

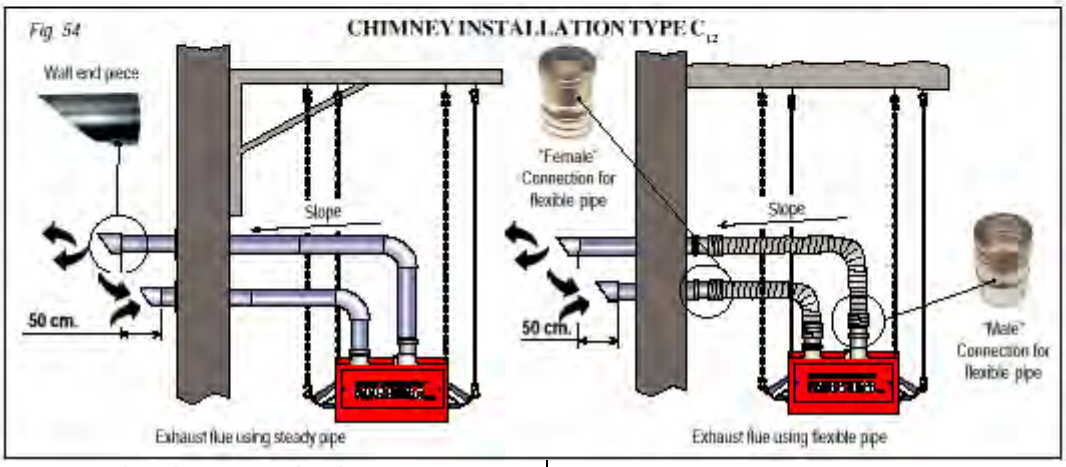
2) For room sealed installations the combustion pipe should be fitted lower on the wall than the flue pipe, a gap of at least 50 cm. should be maintained as shown in fig. 54.To prevent ingress of fumes into the combustion spigot.

3) The total extension for intake and flue should not be longer than 3,5 m.
Bends should be kept to a minimum If it should be necessary to fit a bend, calculate 1 linear meter less for each bend. Diameter of intake and flue is 100 mm.

4) Ensure all connections are perfectly tight.

5) Make sure that the intake and flue are fitted with cowls.





Concentric Flue Terminal

In order to install correctly exhaust and/or intake chimney follow the instructions as below:

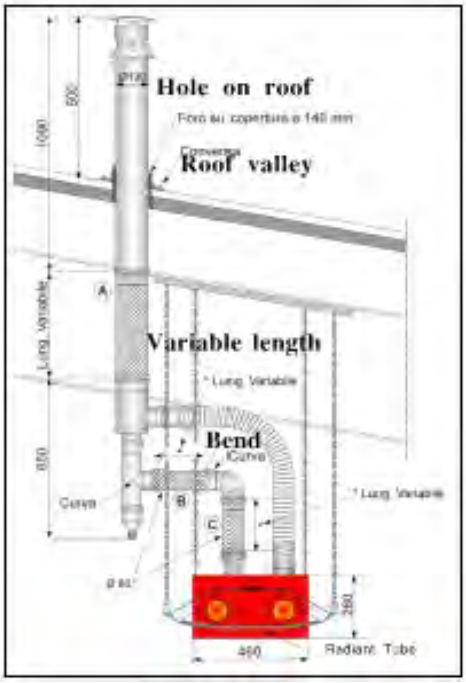
1) After fastening the radiant tube to the ceiling, use a milling drill Ø 140 mm and drill two holes in the roof as shown on fig. 55.

2) Concentric chimney should protrude from the roof at least 50cm;

3) The length of the flue system should be not longer than 6 m. virtual length. If it should be necessary to insert any bend, calculate one meter less for each bend.Total length of pipes A, B, C must not exceed 2,35 mtrs

4) Install the chimney taking care to seal any space between the flashing and the roof so that no moisture or water can leak in.

6) Ensure the terminal of the concentric chimney cannot become obstructed. 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
The diameter of the pipework from the cock to the burner connection must not be less than the diameter of the burner connection inlet. The installation must be purged and tested for soundness prior to commissioning.
Always ensure that the appropriate personal protective equipment is used.

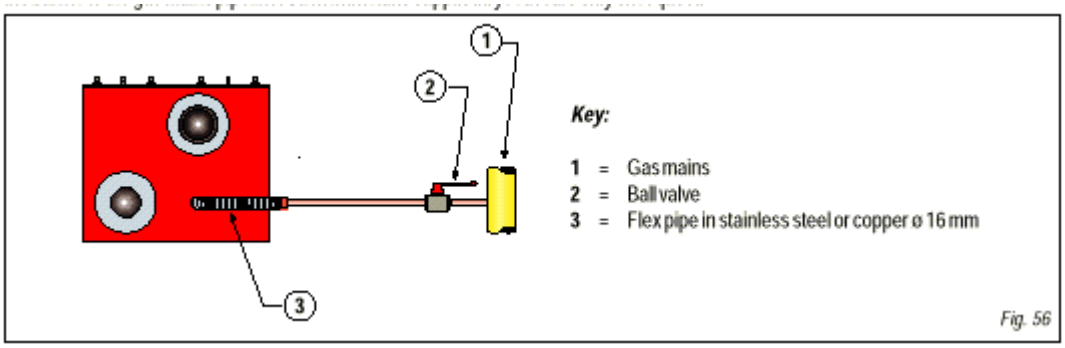


Fig. 56

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.
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 radiant tube. 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 heaters are supplied fused and pre-wired, all must be earthed.

WIRING DIAGRAM OF CONTROL PANEL WITH 2 THERMOSTATS FOR ON/OFF GASRAD

Key:

L1 = Power supply phase 220V 50 Hz
N = Neutral
PE = Earth
IG = Mains Isolator
Ign = Day-night manual switch
T1...T2 = Ambient thermostat

B1…B2 = Gasrad Burners
GL1…GL2 = Remote Sensor
IZ1…IZ2 = Zone Switch
KT1…KT2 = Control Relay

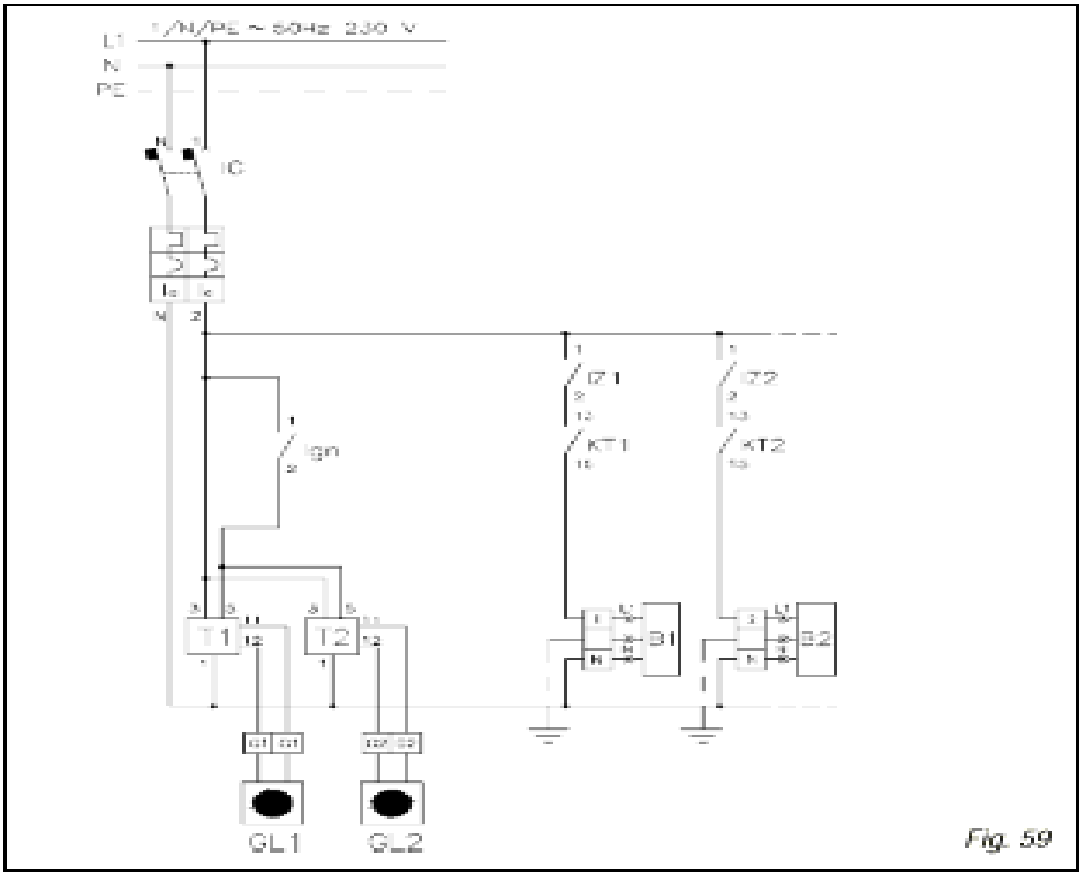


Fig. 59

WIRING DIAGRAM OF CONTROL PANEL WITH 2 THERMOSTATS FOR DUAL-STAGE GASRAD

Key:

L1 = Power supply phase 220V 50 Hz
N = Neutral
PE = Earth
IG = Mains Isolator
Ign = Day-night manual switch
MAN = Manual control switch

T1…T2 = Ambient Thermostat
B1…B2 = Gasrad Burners
GL1…GL2 = Remote Sensor
IZ1…IZ2 = Zone Switch
KT/1 = Control Relay 1st stage Gasrad
KT/2 = Control Relay 2nd stage Gasrad

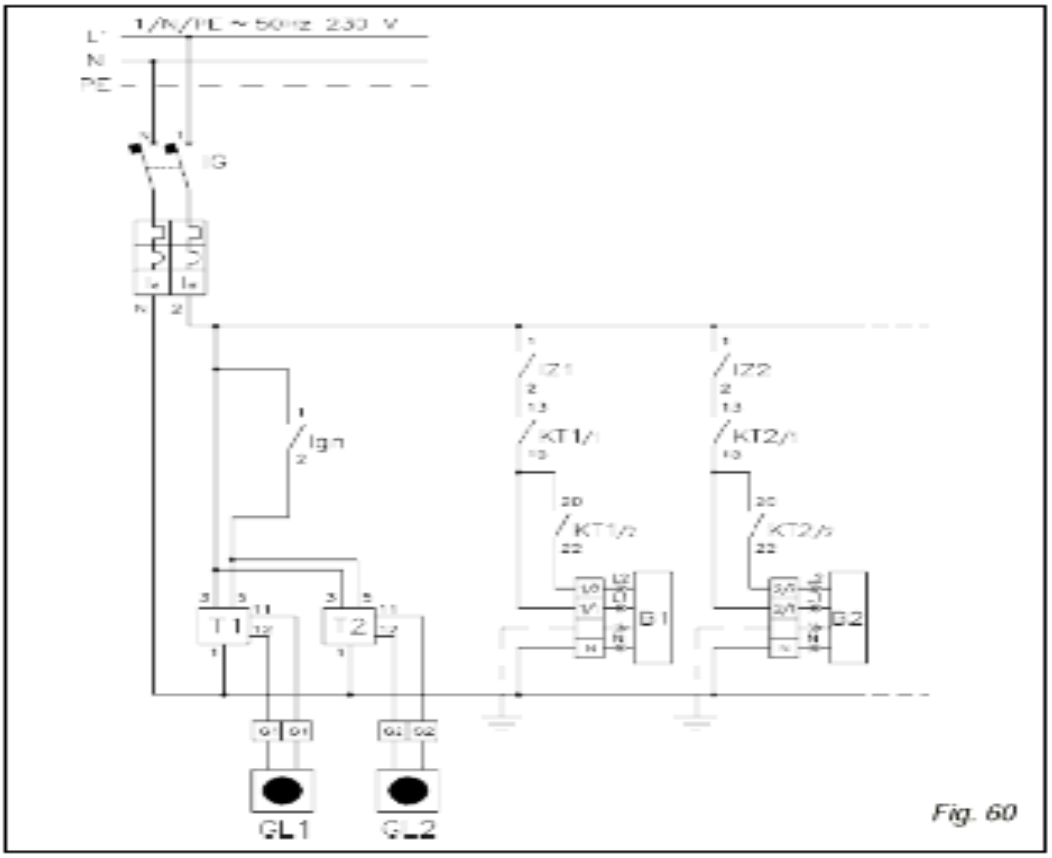
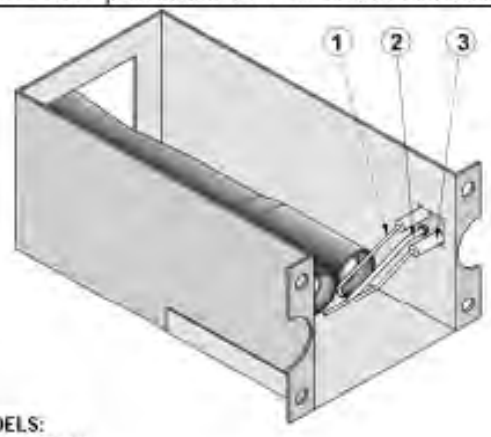


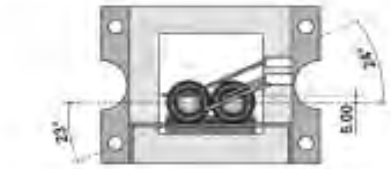
Fig. 60

POSITION OF THE ELECTRODES

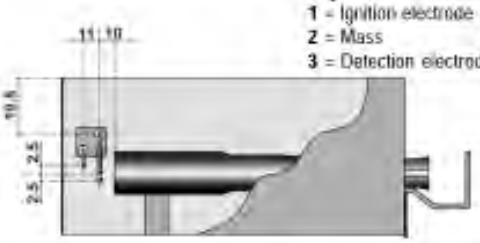
Proper position of electrodes inside its bearing block are shown herebelow. For every maintenance inspection, check that distances among electrodes are respected and that ceramic insulation is not damaged.

Fig. 79



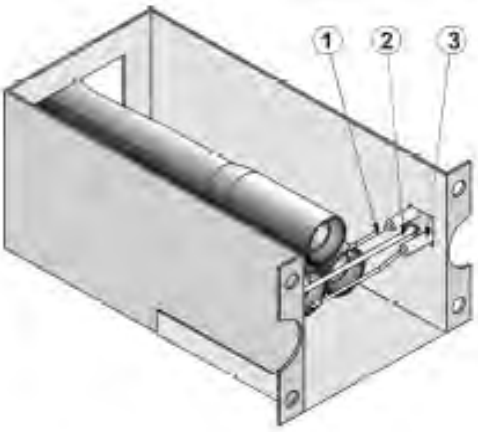


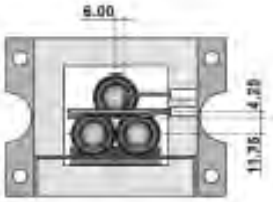
Key:
1 = Ignition electrode
2 = Mass
3 = Detection electrode



MODELS:
FRA2 - FRA2S2

Fig. 80





Key:
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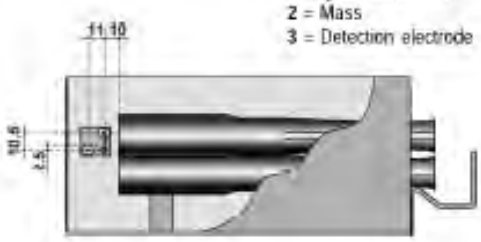
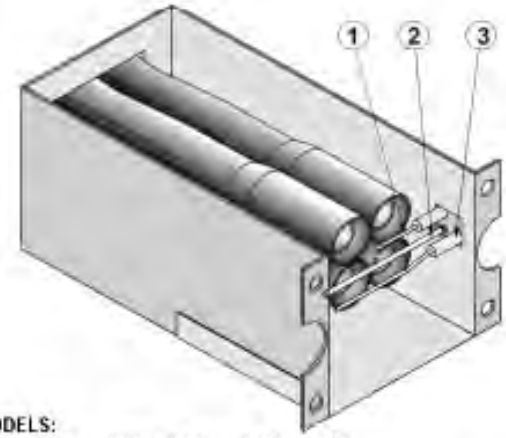
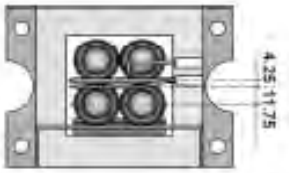
2 = Mass
3 = Detection electrode



MODELS:
FRA3 - FRA3S2 - FRB3

Fig. 81





Key:
1 = Ignition electrode
2 = Mass
3 = Detection electrode

MODELS:
FRA4 - FRA4.1 - FRB4 - FRB4.1 - FRC4 - FRC5
FRA4S2 - FRA4.1S2 - FRB4S2 - FRA4.1S2 - FRC4S2 - FRC5

START-UP

The following equipment will be required to commission linear tubes
a) Combustion gas analyzer;
b) Pressure gauge scale 0 - 50 mbar to measure gas pressure;
1) Check that the burner is correctly wired.
2) Open the gas tap and check that the type of gas and pressure correspond to the details on the burner plate and data table .
3) SEQUENCE OF OPERATION.
a) The fan starts.
b) The red LOCKOUT indicator lights up.
c) After a pre purge time of approx 30 sec., The burner will carry out ignition for 5 sec. If the gas pressure is correct the burner will light up.
The burner green operation light will light up during normal operation.
4) Always check combustion using the combustion analyzer,
Unscrew the bolt on the end of the scroll on the outside of the burner. The pressure measured should be within the limits on the data plate.
5) To reset lockout disconnect power for a few seconds with the gasrad isolating switch

SOLENOID VALVE ADJUSTMENT AND GAS PRESSURE CHECKS

To check and measure the gas intake pressure Pi unscrew the screw and connect the pressure gauge to the pressure attachment shown on° 1 fig. 82 - 83 - 84 and 85.
To check and measure the gas pressure to the nozzle Pu unscrew the screw and connect the pressure gauge to the pressure attachment shown on n° 2 of fig. 82 - 83 - 84 e 85.
If using gas of the II $_a$ family (G20), adjust the pressure to the nozzle Pu as shown on tables regulating the stabilizer on the solenoid valve. Remove the black plastic protection cap for the solenoid valves on fig. 84 and fig. 85 applying slight leverage on the edge, connect the pressure gauge to the pressure attachment downstream of the solenoid shown with n° 2, adjust the pressure at I° stage operating on the screw n° 4, adjust the pressure at II° stage operating on the bolt n° 3. For the solenoid valve of fig. 82, adjust the pressure to the nozzle operating on the screw indicated with n°3. For the solenoid valve of fig. 83, remove the screw n° 3, and adjust the pressure to the nozzle regulating the inside screw.
If using gas of the III a family (G31), adjust the pressure to the nozzle according to the data table following the same procedure as above.

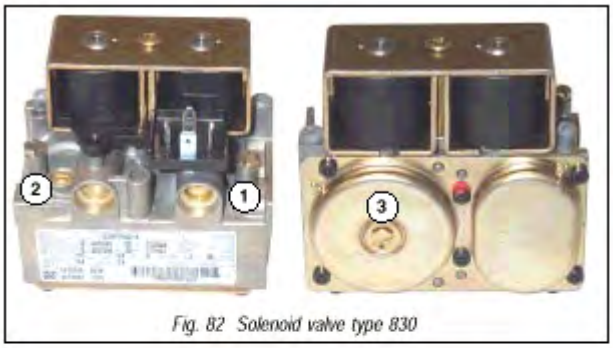


Fig. 82 Solenoid valve type 830

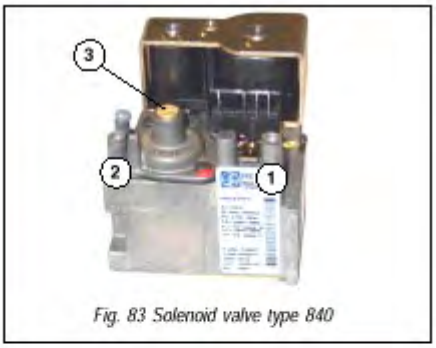


Fig. 83 Solenoid valve type 840

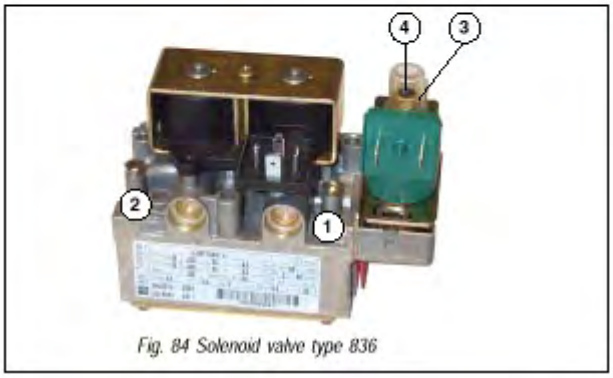


Fig. 84 Solenoid valve type 836

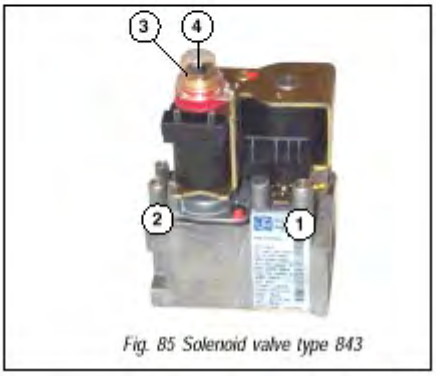


Fig. 85 Solenoid valve type 843

Gas valve

1 Gas inlet pressure test point

2 Gas head pressure test point

3 Gas pressure adjustment

4 Gas pressure adjustment 2nd stage

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

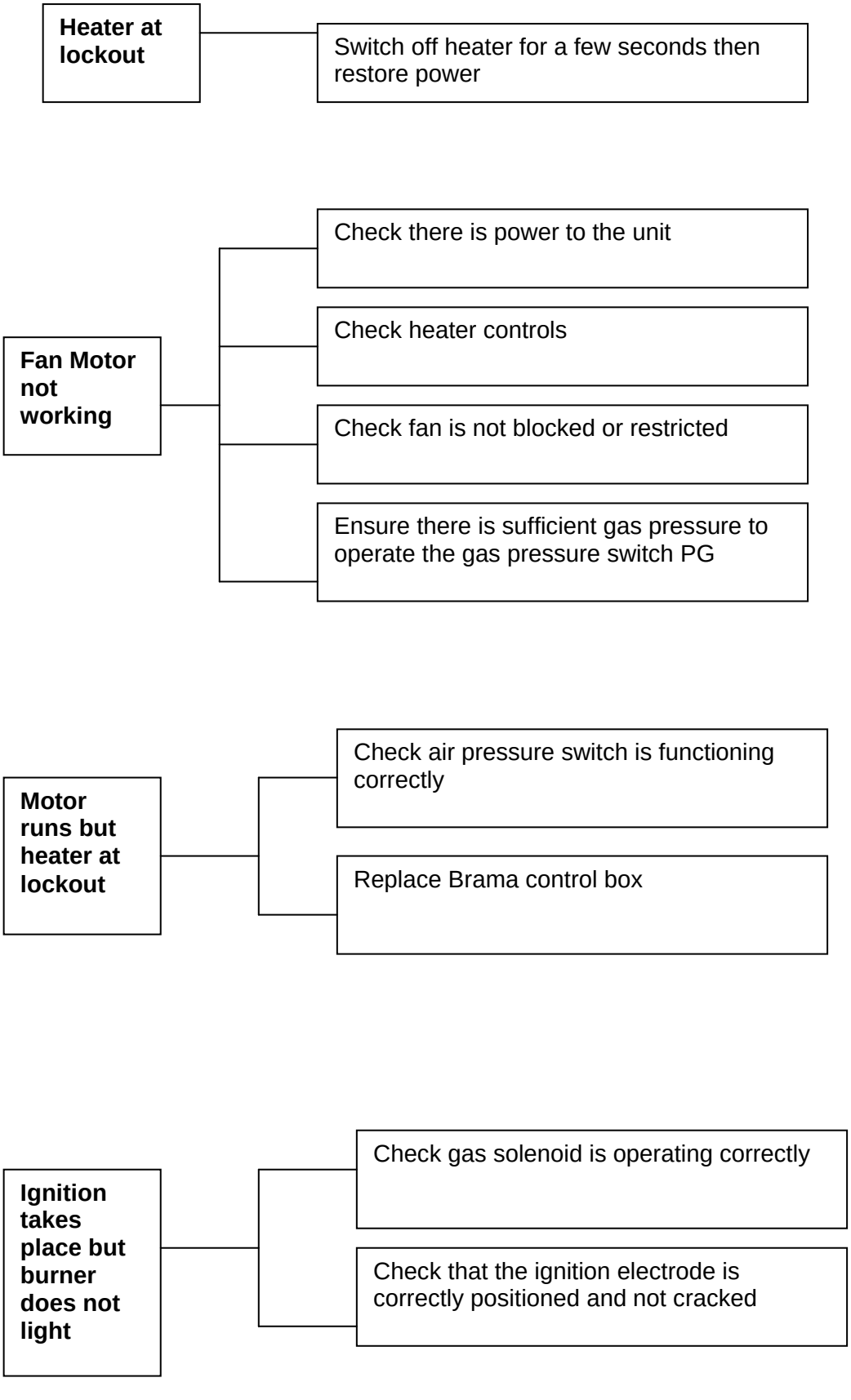
d) The power lamp will illuminate and the fan will start, for a short period the lockout indication lamp will also illuminate,

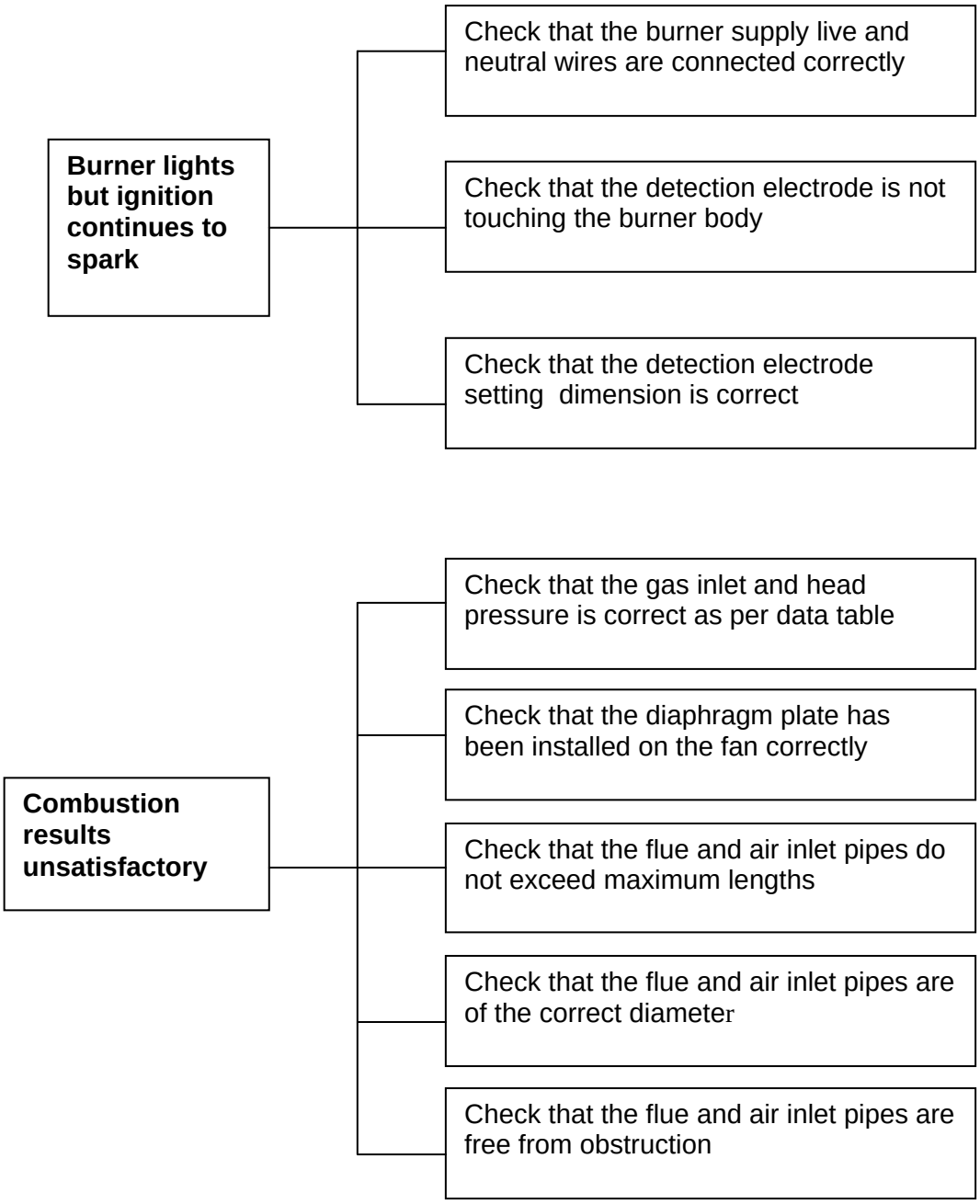
e) The fan will pre purge for 30 seconds and the 5 second ignition sequence will then take place

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


Heater at lockout
Switch off heater for a few seconds then restore power
Fan Motor not working
Check there is power to the unit
Check heater controls
Check fan is not blocked or restricted
Ensure there is sufficient gas pressure to operate the gas pressure switch PG
Motor runs but heater at lockout
Check air pressure switch is functioning correctly
Replace Brama control box
Ignition takes place but burner does not light
Check gas solenoid is operating correctly
Check that the ignition electrode is correctly positioned and not cracked


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
Check that the flue and air inlet pipes are of the correct diameter
Check that the flue and air inlet pipes are free from obstruction

Servicing

It is recommended that the GasRad 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
1) To change from gas of the II^ to gas of the III^ family, and vice versa, the nozzles have to be changed and solenoid calibrated as per table
The gas pressure switch has to be re-calibrated and the ignition procedure repeated. This operation should always be performed by suitably qualified engineer
2) When adjusting the pressure of the burners, ensure they are set asper the data sheet
Failure to commission Gasrad as data sheet will invalidate any warranty and/or responsibility on the part of BENSON CLIMATE SYSTEMS, for damage
DISTANCE FROM FLAMMABLE MATERIALS

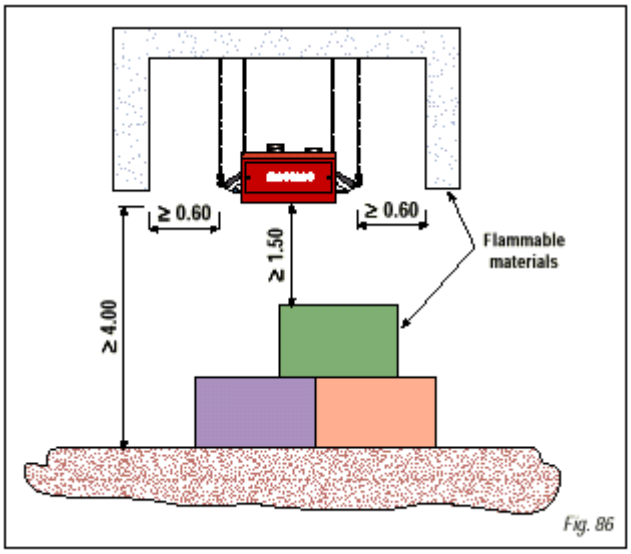


Fig. 86

1) Minimum distance in the vertical position of Radiant Tube from flammable materials should be at least 1.5 m.

2) Minimum distance of the insulated sides of Radiant Tubes from flammable materials should be at least 60 cm.

3) Minimum distance in the vertical position of Radiant Tubes from the floor should be at least 4.0 m.

Centre to Centre Distance **I**

INSTALLATION HEIGHT									
MODEL	4m	5m	6m	7m	8m	9m	10m	11m	12m
20/6	7	9							
30/6		9	10	10					
35-40/6				10	12	12	12	11	11
45/9		9	10	10	12	12	12	11	11
50/12		9	10	10	12	12	12	11	11

Distance D

INSTALLATION HEIGHT									
MODEL	4m	5m	6m	7m	8m	9m	10m	11m	12m
20/6	4.5	5							
30/6		5	5	5					
35-40/6				5					
45/9		5	5	5.5	5.5				
50/12		5	5	5.5	5.5				

EXAMPLES OF INSTALLATION

20/6 10-20 kW H = 5m

30/6 20-30kW H = 6m

35/6 & 40/6 30-40kW H = 10m

EXAMPLES OF INSTALLATION

45/9 30-40 kW H = 9m

50/12 30-40kW H = 10m

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Benson Heating is a division of Benson Climate Systems Ltd