CARLIEUKLIMA
ENERGY AND COMFORT

EURAD

GAS-FIRED RADIANT TUBES

TECHNICAL MANUAL

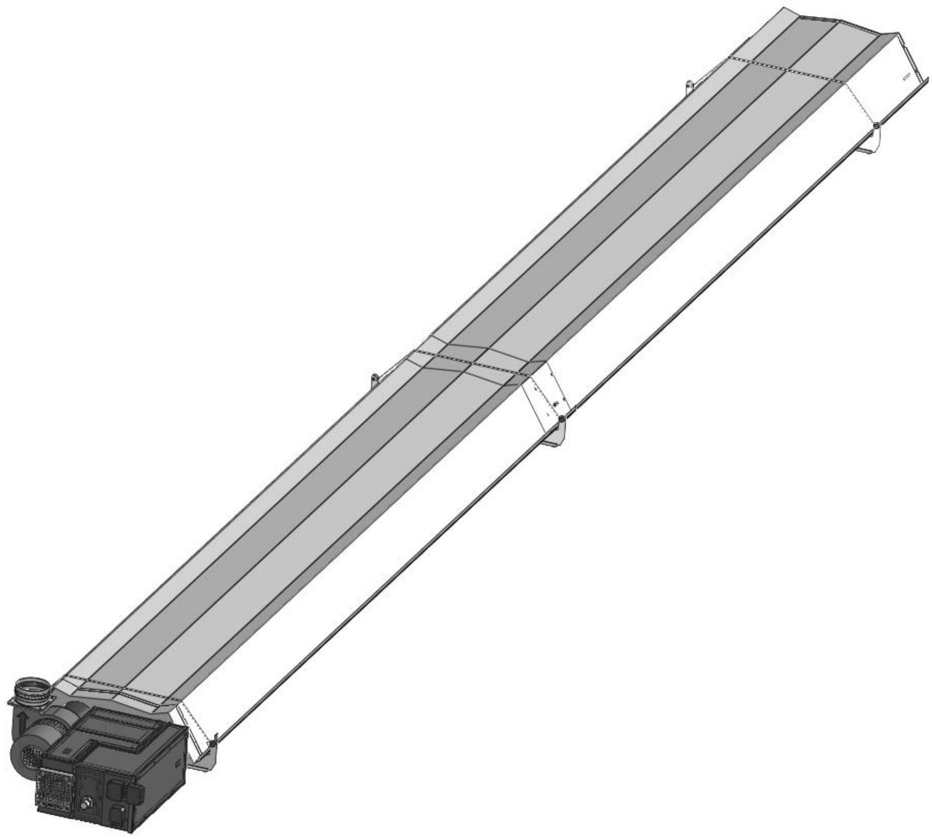
INDEX

4. STARTING THE SYSTEM, USE AND MAINTENANCE

1. CHARACTERISTICS OF THE EURAD SYSTEM

The EURAD system is a radiant heating system that operates on methane gas or LPG. Designed to solve heating problems in small and medium-sized rooms, thanks to its autonomous operation it has as its main advantage a high degree of flexibility in installation which makes it suitable to meet all the needs of rooms with special layouts (recesses, hard-to-reach compartments and portions of large areas).
The EURAD radiant tube modules are composed of a burner, a fume expulsion fan, radiant tubes, and a parabolic reflector. The production of the heat required to heat the radiant tubes takes place by means of an aspirated burner and an electric fan for the expulsion of fumes.
The length of the radiant tube modules is inclusive between 3 and 18 metres. The set-up can be U-shaped, with the burner and the fan on the same side (models MSC and MSU) or with burner and fan on opposite sides of the tube (model MSM). The burner can be either inside or outside the building to be heated, with power inclusive between 15 and 50 kW. The tubes, which are heated to a temperature of approximately 400°C, emit the infrared rays which are required to heat the room. The tubes have a diameter of 100 mm and are made of a special steel that is resistant to high temperatures and which are surface-treated to increase the efficiency of emission. The aluminium or stainless steel parabolic reflectors are located above the radiant tubes to allow excellent radiance towards the ground. The MSC model is equipped with a single parabolic reflector for two radiant tubes (single reflector). The MSU model has two separate reflectors (one for each radiant tube) and the MSM model has a single reflector.

Figure 1.1
EURAD radiant tube modules
MSC model



1.1. Advantages of the EURAD radiant tube modules

While providing the same level of comfort, a EURAD heating system offers a number of advantages as compared to a convection system:

■ **Greater comfort with lower air temperature**

The perception of comfort in a room has to do not only with the air temperature (as is commonly believed) but also with the temperature of the surfaces around the body (mean radiant temperature). In a room heated with EURAD radiant tube modules there is an increase in the mean radiant temperature, and therefore, with the same degree of comfort, a reduced temperature of the air, which is transparent to radiance and is heated only upon contact with the floor and other surfaces. The thermal load of the system is thus reduced because energy is not used to heat high volumes of air directly.

■ **Lack of thermal gradient resulting in reduced dispersion**

In rooms heated with EURAD radiant tube models, the lack of a marked thermal gradient reduces air layering and therefore also the thermal load required to heat the room. In a room heated with a conventional heating system, thermal layering leads to very high temperatures in the upper parts of the room, thus creating a substantial increase in dispersion.

■ **No air movement and lack of suspended dust particles**

In convection systems, dust and any other particles which may or may not be harmful due to manufacturing processes are constantly held suspended in the air due to the ventilation which is typical of those kinds of systems.
By adopting an EURAD radiant tube module, there is no air movement. This substantially reduces the raising of dust and makes it perfectly suitable for use in any kind of building with any sort of working process.

■ **Low thermal inertia**

The EURAD radiant tube modules have a low thermal inertia, which allows them to be brought up to full operating power quickly, thus reducing their operating times compared to a convection system.

■ **Possibility to heat by zones** It is possible to heat single zones or workstations without having to heat the entire room, and the ambient temperature can be adjusted on a zone-by-zone basis.

■ **Energy savings and concern for the environment**

The strength of radiant heating is in its higher performance as compared to other systems with the same power, with clear fuel savings thanks to:

- Lower dispersion due to lower air temperature;
- Lower dispersion due to lack of thermal layering;
- Possibility to heat by zones, turning the system on only where it is actually required;
- Lower operating time of the system, thanks to the low thermal inertia.

The speed with which the system can be brought up to full operating power and the extremely low maintenance costs complete the economic picture of EURAD system operation.

1.2. Components of the EURAD radiant tube module

The following points list the components of the EURAD radiant tube modules.

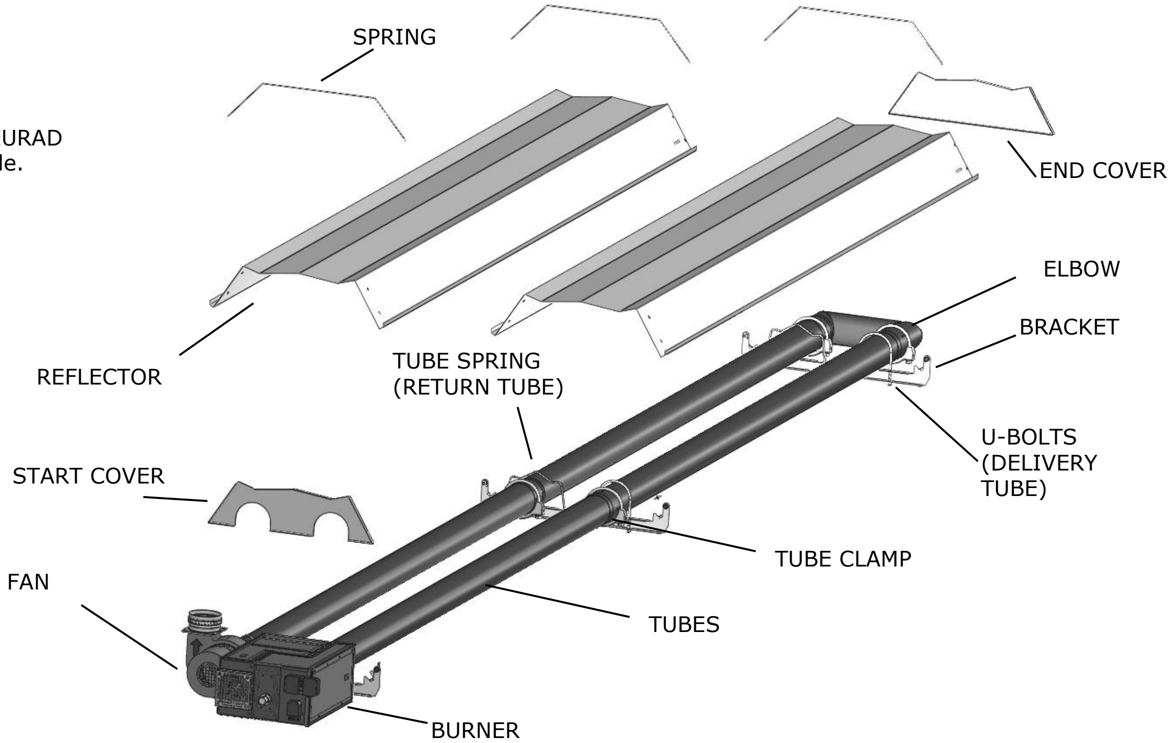
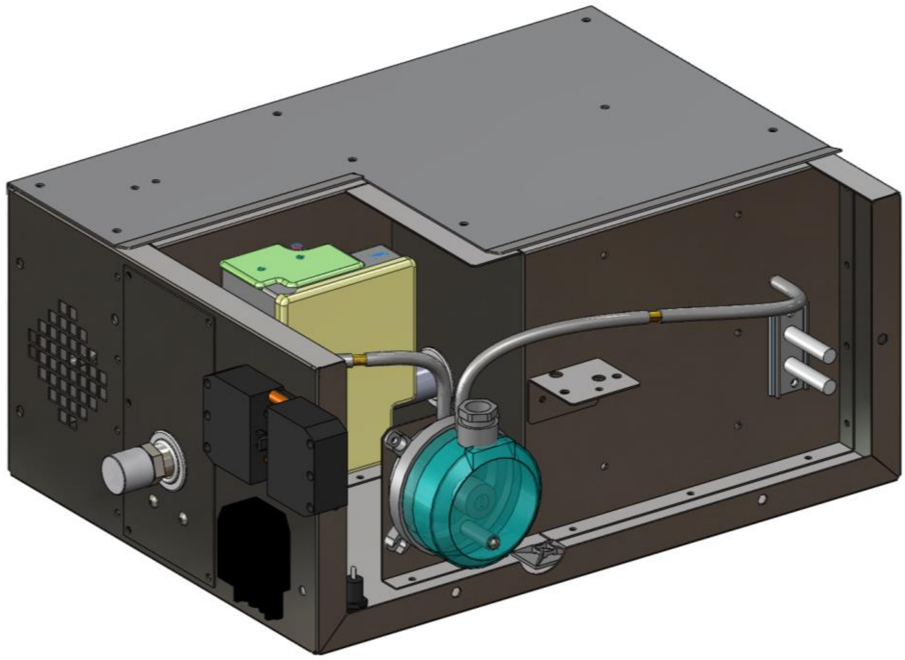


Figure 1.2
Exploded view of EURAD radiant tube module.

■ BURNER

The burner has a stainless steel torch and a separate chamber with constant control of depression. It is equipped with a dual valve in series with a slow ignition device, electronic discharge ignition and ionisation flame detection.

Figure 1.3
Burner

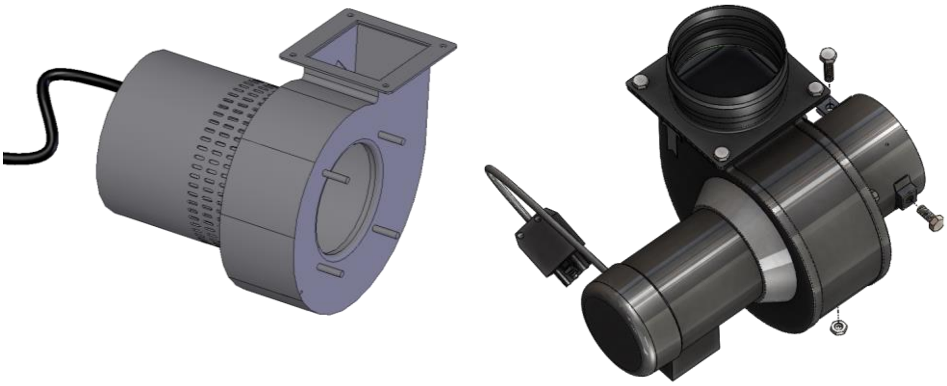


■ FAN

The fume extraction fan is separate from the burner. Developed specifically for use with radiant tubes, it is equipped with a steel rotor that is resistant to high temperatures.

Figure 1.4
CA and CS fans

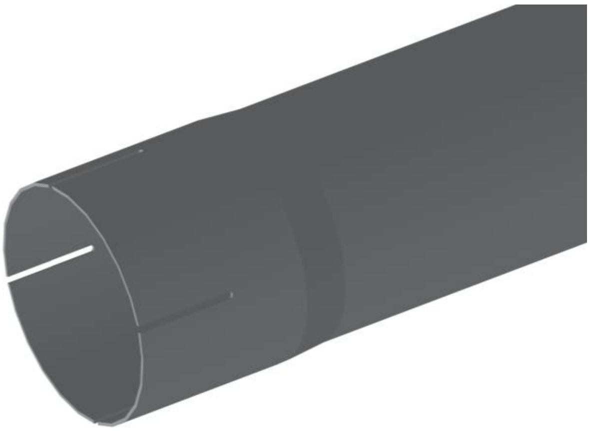
CA CS



■ TUBES

The tubes have a diameter of 100 mm and are made of aluminised steel. The thermo-chemical process which the tubes undergo, known as calorizing, ensures they have high emitting power for the entire life cycle of the system.

Figure 1.5
Tubes



■ ELBOW

In the MSU and MSC models the 180° connection elbow is made of the same material as the tubes.

Figure 1.6
New elbow
From 01/10/2012

■ REFLECTOR

The parabolic reflectors of the EURAD radiant tube modules are realized in mirror-polished aluminium with high reflecting power. A special design of the profile of the parabolic reflector ensures correct direction of radiance towards the ground, thus avoiding upward dispersion. On request, for installation in especially dusty areas, the EURAD radiant tube modules can be supplied with the parabolic reflector in stainless steel.

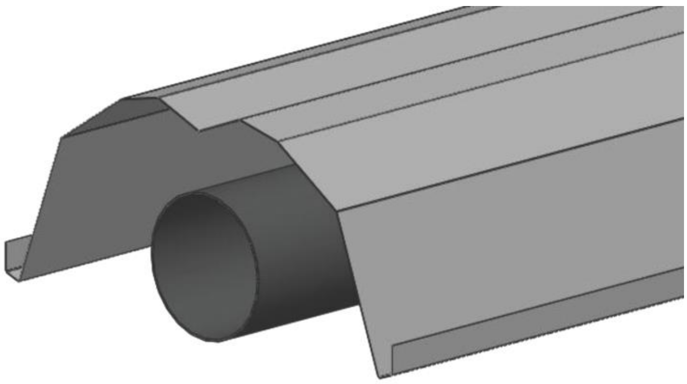
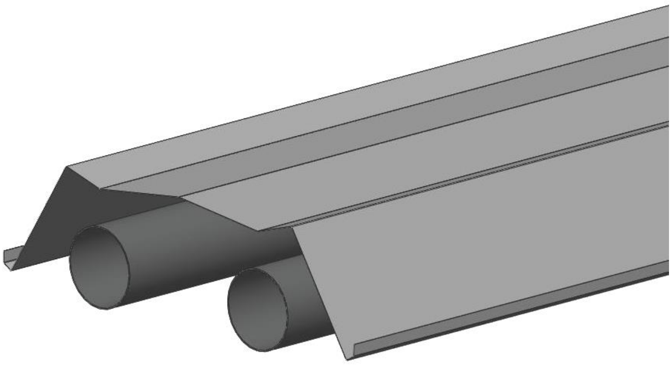


Figure 1.7
Section of a reflector
MSU and MSM.

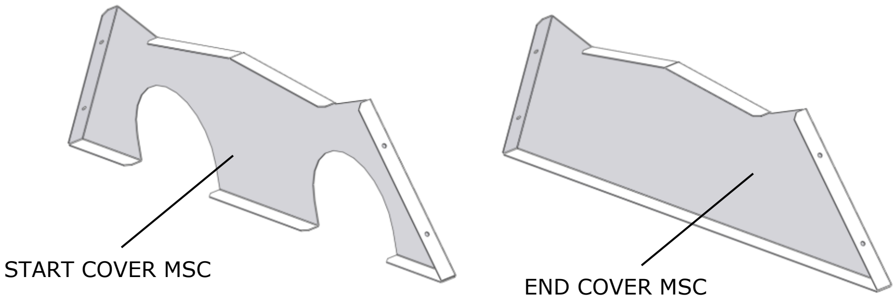
Figure 1.8
MSC reflector



■ CLOSURE PLUGS

In the MSU and MSC models, closure plugs are used near the elbow(at the end of the reflector), the burner and the fan (at ab. 65mm from the beginning of the reflector) to limit the loss of convection.

Figure 1.9
COVER



■ BRACKETS

The aluminised steel brackets can be either fixed (models MSC and MSM) or direction-adjustable (MSU model). The latter allow wide flexibility in the installation of radiant tube models, thus ensuring excellent orientation of radiance.

Figure 1.10
EURAD MSC bracket

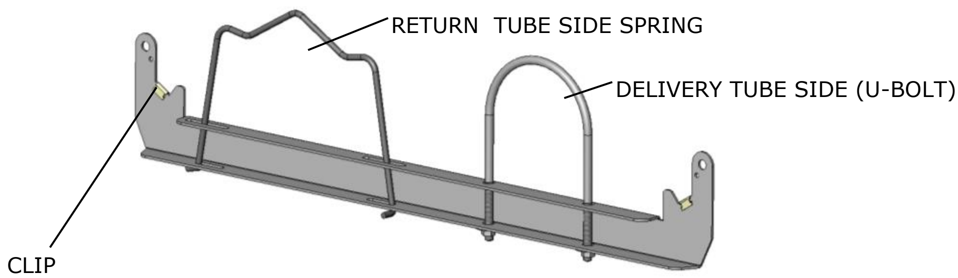


Figure 1.11
EURAD MSM bracket

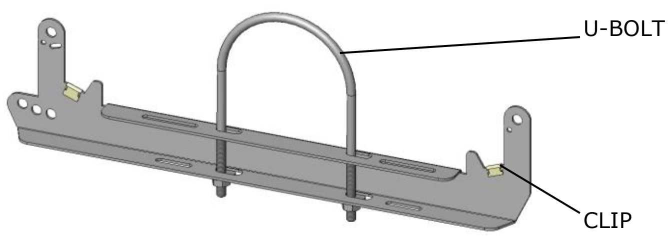
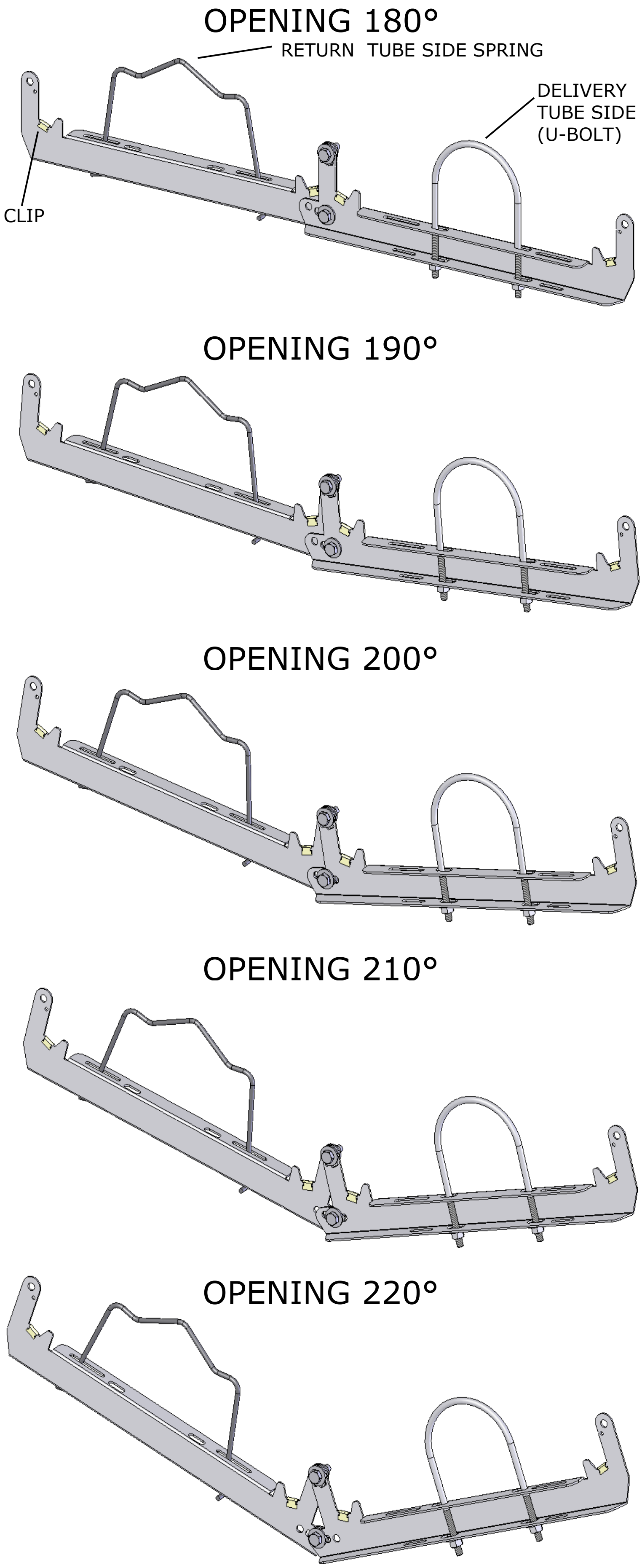


Figure 1.12
MSU model adjustable bracket



■ SPHERE SENSOR

Figure 1.13
Sphere sensor

In order to ensure the most effective monitoring possible, we have realized a room sphere sensor which can measure the operative temperature (of comfort) which is obtained through the use of radiant tube modules. This temperature is the average of the air temperature and the mean radiant temperature, provided by thermal radiance. The sphere sensor can indeed detect this physiological temperature, thus perfecting the adjustment of thermal radiance systems. Finally, thanks to its reduced size and sealed ABS container, the sphere sensor can be installed anywhere.

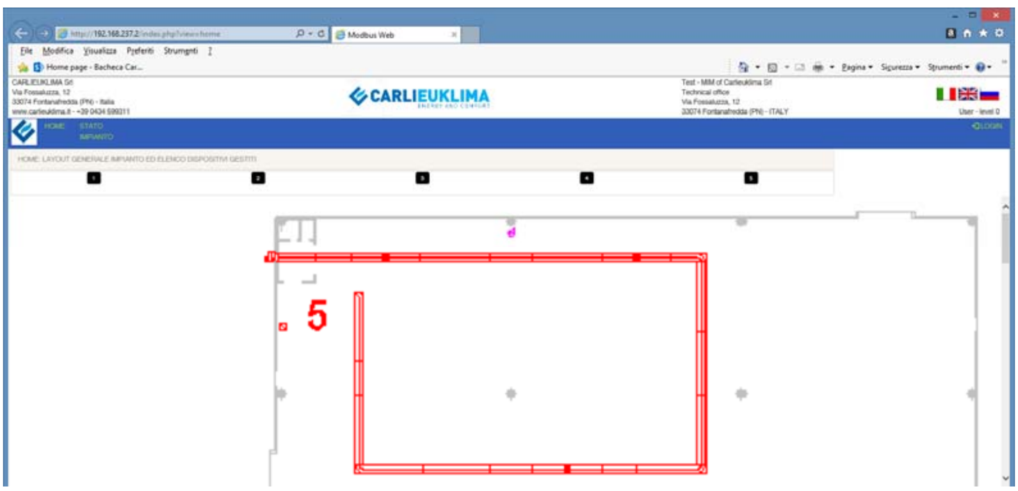
■ UNIT ADJUSTMENT SYSTEM

The adjustment of EURAD radiant tube modules can take place by means of a PC with the “Carlieuklima 2k16” program, or in the "Local" version by means of a CTR room thermostat.

PC VERSION

In the PC version, the programming of the single units can be carried out only through the “Carlieuklima 2k16” program. It is customized for each system, supplied exclusively by CARLIEUKLIMA and installed on a suitable PC. For instructions on the use and installation of this program, please refer to the specific manual provided with the software.

Figure 1.14
Carlieuklima 2k16
Control Software



LOCAL VERSION

With the “Local” version, the regulation of the radiant tube modules is performed by means of a room thermostat.
For a proper management of the radiant systems, according to their type and the different requirements, it is very important to flexibly program a wide number of parameters (specifics).
For this purpose, CARLIEUKLIMA has developed a weekly thermostat called CTR-01, able to satisfy multiple requests and to single manage up to maximum 8 zones (single stage version) or 4 zones (2-stage version).

Figure 1.15
Room thermostat

1.3. Technical specifications and available models

EURAD radiant tubes are classified based on current standards and are certified by category and type of unit:

Unit category: **II 2H3+**

This category includes radiant modules which are set up to use gases of the second family (group H, methane G20) and gases of the third family (group 3+, butane/propane G30/G31).

Type of unit:

■ **B 22**
A unit which is to be connected to a flue pipe that discharges the flue gases to the outside. Combustion air is taken directly from the room. The unit is equipped with a fan installed downstream from the combustion chamber.

■ **C 12**
A unit whose combustion circuit (air supply, burner, heat exchanger and release of flue gases) is sealed off from the room where the unit is installed, connected by two horizontal ducts, one for the entry of fresh combustion air and the other for the expulsion of fumes, near enough to one another to be in the same wind conditions.

■ **C 32**
A unit whose combustion circuit (air supply, burner, heat exchanger and release of flue gases) is sealed off from the room where the unit is installed, set up for connection by means of separate ducts that allow for both the entry of fresh air to the burner and for the discharge of flue gases to the outside, with openings that are either concentric or near enough to one another to be in the same wind conditions.

■ **C 42**
A unit whose combustion circuit (air supply, burner, heat exchanger and release of flue gases) is sealed off from the room where the unit is installed, set up for connection by means of collective ducts that allow for both the entry of fresh air to the burner and for the discharge of flue gases to the outside. The collective duct for air and the collective duct for the expulsion of fumes are separate.

Table 1.1 (on the next page) shows the general technical characteristics which are applicable to all models.

Table 1.1
General characteristics of
EURAD radiant tube modules

Radiant Module	**Technical characteristics**	
Type of fan	CS 65 W	CS 180 W
Electrical power supply	230Vac / 50Hz	
Current absorbed (A)	0,654	0,964
Recommended fuse (A)	T 2.0	
Electrical power (W)	92	218
Max. temperature radiant tube	470°C	
Gas attachment	1/2"	
Attachment for external air intake Ø	100 mm	
Fume discharge attachment Ø	100 mm	
Flame control card type 579 402	**Technical characteristics**	
Electrical power supply	230Vac / 50-60Hz	
Current absorbed (A)	0,05	
Electrical power (VA)	12	
Safety time (sec)	10	
Pre-purge time (sec)	5	
Ignition voltage (kV)	15	
Ignition frequency (Hz)	25	
Min. current for flame detection (uA)	0,9	
Min. current recommended for flame detection (uA)	>2,7	
Temperature of use (°C)	-20°C - 60°C	
Ignition attempts	1	
Lockout	volatile	
Gas valve type SIT 843 SIGMA 0843008	**Technical characteristics**	
Electrical power supply	230Vac / 50Hz	
Current absorbed EV1 (A)	0,04	
Electrical power EV1 (VA)	9.2	
Current absorbed EV2 (mA)	0.012	
Electrical power EV2 (VA)	2.8	
Class of valves	EV1 class B; EV2 class J	
Closing time	<1sec	
Current absorbed valve High-Low (mA)	0.012	
Electrical power valve High-Low (VA)	2.8	
Max. pressure gas inlet (mbar)	60	
Outlet adjustable pressure (mbar)	3…50	
Temperature of use (°C)	-15..60°C	
Gas attachment inlet / outlet	1/2" female / 1/2" female	
Fan CS	**Technical characteristics**	
Type of fan	CS 65 W	CS 180 W
Electrical power supply	230Vac / 50Hz	
Max. current absorbed (A)	0,54	0.85
Max. electrical power (W)	65	191
Max. air flow rate (m^3/h)	130	489
RPM	1440	2690

The wide range of models of EURAD radiant tube modules makes it possible to heat any room suitably based on its height, thermal dispersion and the type of activity that is performed there. Tables 1.2, 1.3 and 1.4 show the characteristics of the available models.

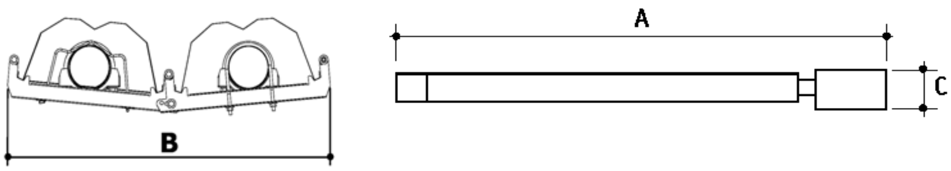


Table 1.2
Characteristics of MSU modules of EURAD radiant tubes

Model	Fan type	Power*	Dimensions					Weight	
			A	B1	B2	C1	C2	ALUMINIUM	STAINLESS
		(kW)	(m)	(m)	(m)	(m)	(m)	(kg)	(kg)
MSU 3 M	65 W	15.1	3.5	0.8	0.9	0.3	0.3	47.0	55.3
MSU 6 L	180 W	27	6.3	0.8	0.9	0.3	0.3	77.0	93.5
MSU 6 H	180 W	37.8	6.3	0.8	0.9	0.3	0.3	77.0	93.5
MSU 9 L	180 W	42.2	9.1	0.8	0.9	0.3	0.3	106.0	130.5
MSU 9 H	180 W	51.9	9.1	0.8	0.9	0.3	0.3	106.0	130.5

*Hs in compliance with EN 437

B1- C1 Dimensions for MSU version with openings of brackets of 180°.
B2- C2 Dimensions for MSU version with openings of brackets of 220°.

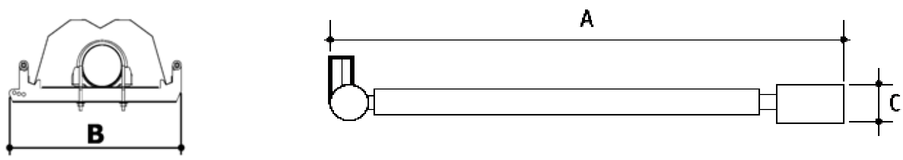


Table 1.3
Characteristics of MSM modules of EURAD radiant tubes

Model	Fan type	Power*	Dimensions			Weight	
			A	b)	C	ALUMINIUM	STAINLESS STEEL
		(kW)	(m)	(m)	(m)	(kg)	(kg)
MSM 12 L	65 W	27	11.8	0.4	0.3	72.8	89.0
MSM 12 H	180 W	37.8	11.8	0.4	0.3	72.8	89.0
MSM 18 L	180 W	42.2	17.3	0.4	0.3	100.7	125.5
MSM 18 H	180 W	51.9	17.3	0.4	0.3	00.7	125.5

*Hs in compliance with EN 437

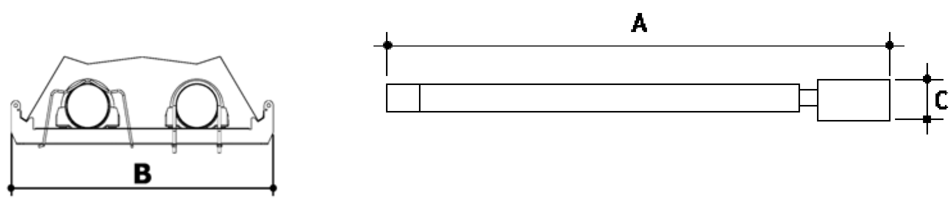


Table 1.4
Characteristics of MSC modules of EURAD radiant tubes

Model	Fan type	Power*	Dimensions			Weight	
			A	b)	C	ALUMINIUM	STAINLESS STEEL
		(kW)	(m)	(m)	(m)	(kg)	(kg)
MSC 6 L	65 W	20.5	6.3	0.6	0.3	70.5	81.5
MSC 6 H	180 W	32.4	6.3	0.6	0.3	70.5	81.5
MSC 9 L	180 W	27	9.1	0.6	0.3	96.0	112.5
MSC 9 H	180 W	42.2	9.1	0.6	0.3	96.0	112.5
MSC 12 M	180 W	37.8	11.8	0.6	0.3	123.0	145.5

*Hs in compliance with EN 437

2. DESIGN OF THE EURAD SYSTEM

The CARLIEUKLIMA technical department is always available to help designers in sizing the EURAD radiant tube modules. The following paragraphs describe the procedure recommended by CARLIEUKLIMA for correct sizing.

2.1. Total heating

Total heating of a room with EURAD radiant tube modules makes it possible to obtain the best distribution of heat and the highest degree of comfort for the occupants. The steps to follow in sizing a system with radiant tube modules are listed in the following paragraphs.

2.1.1. Calculation of thermal power to install

The first step in designing a EURAD radiant tube module system is the determination of the thermal power required to meet the thermal needs of the room under consideration. It is possible to use the CARLIEUKLIMA simplified dimensioning method (illustrated in chapter 4.3 of the CARLIEUKLIMA "Radiance" Manual). To perform the calculation of dispersion, the designer must choose the installation height of the EURAD radiant tube modules, keeping in mind that Italian law requires the height to be greater than four metres.

2.1.2. Choice of version of unit

Three versions of CARLIEUKLIMA radiant tube modules are available: MSU (with burner and fan located on the same side, elbow and reflectors separate), MSC (burner and fan located on same side, single elbow and reflector) and MSM (with burner and fan located on opposite sides and single reflector). The CARLIEUKLIMA technical office is always available for designers, to assist in the selection of the type of radiant tube module that is best suited to the characteristics of the area to be heated. The general instructions are the following:

- For installation heights up to 6 metres it is advisable to install MSC or MSM versions;
- For installation heights inclusive between 6 and 8 meters all versions are suitable;
- For installation heights of over 8 metres it is advisable to install the MSU version;
- For partial heating the use of the MSU version is recommended.

Figure 2.1
Available EURAD models

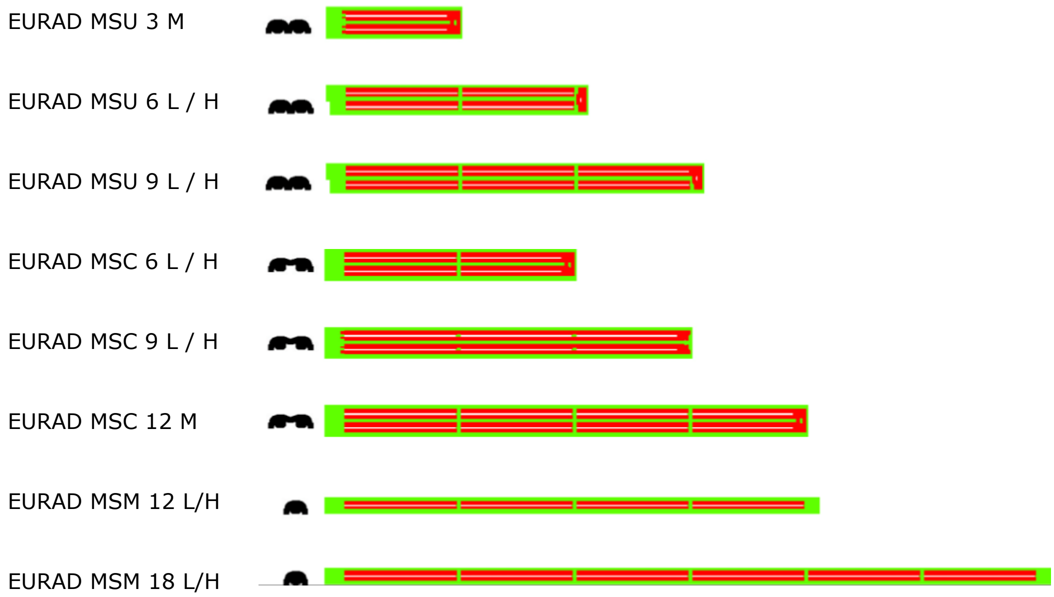


Table 2.1
Powers of EURAD models available

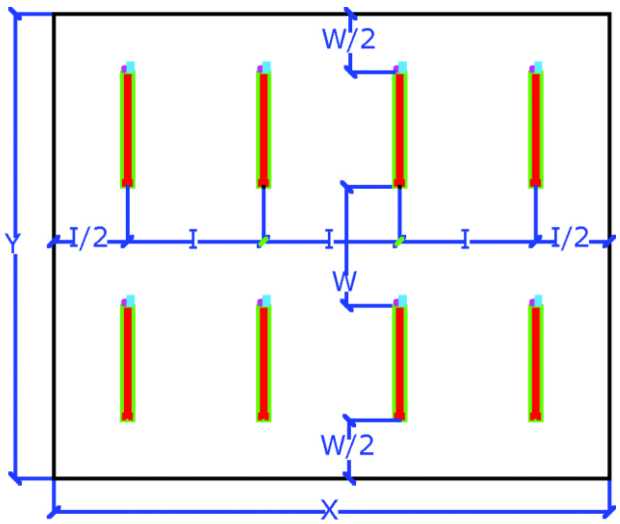
Model	Power* (kW)
MSU 3 M	15.1
MSU 6 L	27
MSU 6 H	37.8
MSU 9 L	42.2
MSU 9 H	51.9
MSC 6 L	20.5
MSC 6 H	32.4
MSC 9 L	27
MSC 9 H	42.2
MSC 12 M	37.8
MSM 12 L	27
MSM 12 H	37.8
MSM 18 L	42.2
MSM 18 H	51.9

*Hs in compliance with EN 437

2.1.3. Determination of number of units and unit power

After selecting the EURAD radiant tube module to be used, you must determine the number of units to install in order to obtain best radiance distribution resulting in a good degree of comfort. The installation height (H) has been established for the calculation of thermal requirement. With this value, from Table 2.2 you obtain the maximum values of both transversal (I) and longitudinal (W) intervals of the unit.

Figure 2.2
Intervals I and W between modules of EURAD radiant tubes



I = Transversal interval between modules
W = Longitudinal interval between modules

Table 2.2
Maximum values suggested for installation intervals of EURAD radiant tube modules (total heating)

Installation intervals											
Installation height H	**(m)**	4	5	6	7	8	9	10	11	12	13
Transversal interval I	**(m)**	5	6	7	8	9	10.5	11.5	13	14	15
Longitudinal interval W	**(m)**	4	5	6	7	8	9	10	11	12	13

The designer then selects the most suitable length of the EURAD radiant tube modules and the direction to face the machines. In choosing the length, you need to consider that for large surfaces it is advisable, both technically and economically, to use the longer units, whereas for smaller surfaces or for higher degrees of partitioning it is advisable to use shorter units. Concerning the direction in which the machines will be facing, this depends on a number of factors (geometric layout of the room to be heated, presence of columns, skylights, and so on). Once the dimensions of the building are known, and the length of the units and the direction the machines will be facing has been decided, it is then possible to determine the number of units required in accordance with the procedure shown below:

X = represents the side of the building which is perpendicular to the axis of the EURAD radiant tube modules [m]

Y = represents the side of the building which is parallel to the axis of the EURAD radiant tube modules [m]

L = represents the length of the module [m]

I and **W** = suggested intervals (Table 2.2) [m]

The number of units placed along side X of the building is: $N_x = \frac{X}{I}$

The number of units placed along axis Y of the building is: $N_y = \frac{Y}{(L + W)}$

The total number of units **N** is calculated by rounding the product to the nearest whole number:

$N = N_X \cdot N_Y$

To determine the power of each unit, divide the value of the thermal power to be installed Φ' by the number of machines. Then choose the model of machine that is nearest the calculated power value.

P_{unit} = Φ'/ N ≥ [kW]

If the building has a floor plan that is not rectangular, the floor plan can in any case be divided up into several rectangular areas, and the indicated procedure can then be applied for each of these areas.
To improve the distribution of heat in the room for greater comfort, it is advisable to modify the obtained sizing slightly, placing units more closely together in colder areas such as along outer walls.

2.1.4. EXAMPLE OF DESIGN

Consider the dimensioning of the radiant system for the industrial warehouse shown in Figure 2.3.

Size of building:

Length:	**90 m**
Width:	**64 m**
Total height:	**9.5 m**

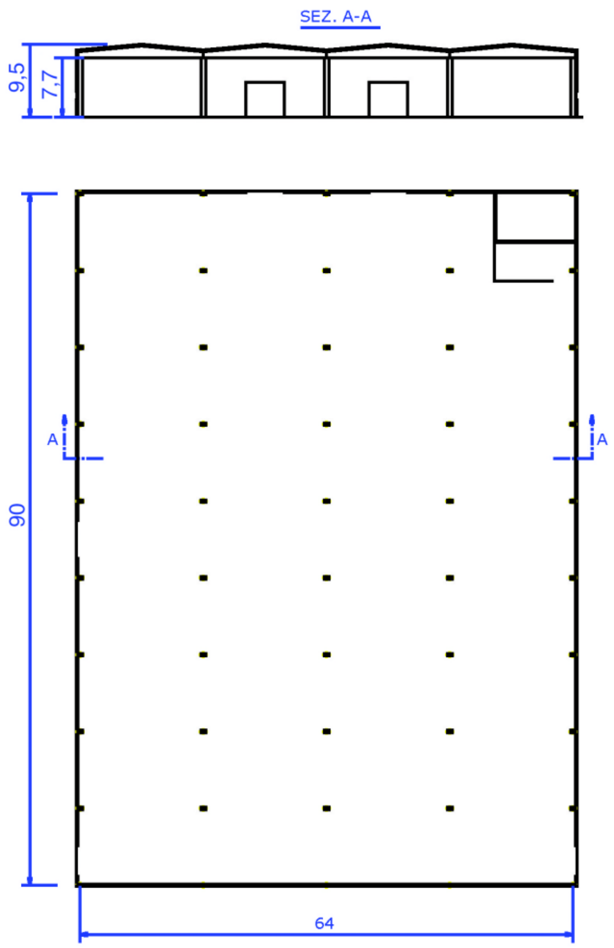


Figure 2.3
Industrial plant
to be heated
with EURAD modules of radiant tube

2.1.4.1. CALCULATION OF THERMAL POWER TO INSTALL

The total thermal dispersion was calculated with the CARLIEUKLIMA simplified method (the analytical calculation is found in chapter 4.3 of the "CARLIEUKLIMA Radiance" manual). For an installation height of 7.7 metres and an ambient operative temperature of 18 °C, the thermal power to be installed Φ' is equal to 825 kW.

2.1.4.2. CHOICE OF VERSION OF UNIT

Since the installation height is less than eight metres, installation of either MSU or MSC models is appropriate; in light of the medium-large size of the building it is unquestionably advisable to use nine-metre modules.

2.1.4.3. DETERMINATION OF NUMBER OF UNITS AND UNIT POWER

The calculation of the number of units and the determination of unit power are performed with the formulae indicated in paragraph 2.1.3.

Nx = 64/9 =7.11

Ny = 90/(8+9)=5.29

N = (7.11 x 5.29) = 37.61 ≅ 38

The specific power for each unit is:

$\mathbf{P_{unit}}$= 825/38 ≅ 21.7 kW

The EURAD MSC 9 L 25 kW unit is chosen and it is decided to distribute the units with a 7X5 layout, arranging 35 units as shown in Figure 2.4.
Another possible solution is to reinforce the coldest areas (those near the outer walls) as shown in Figure 2.5, installing 39 units (1 unit per wall)

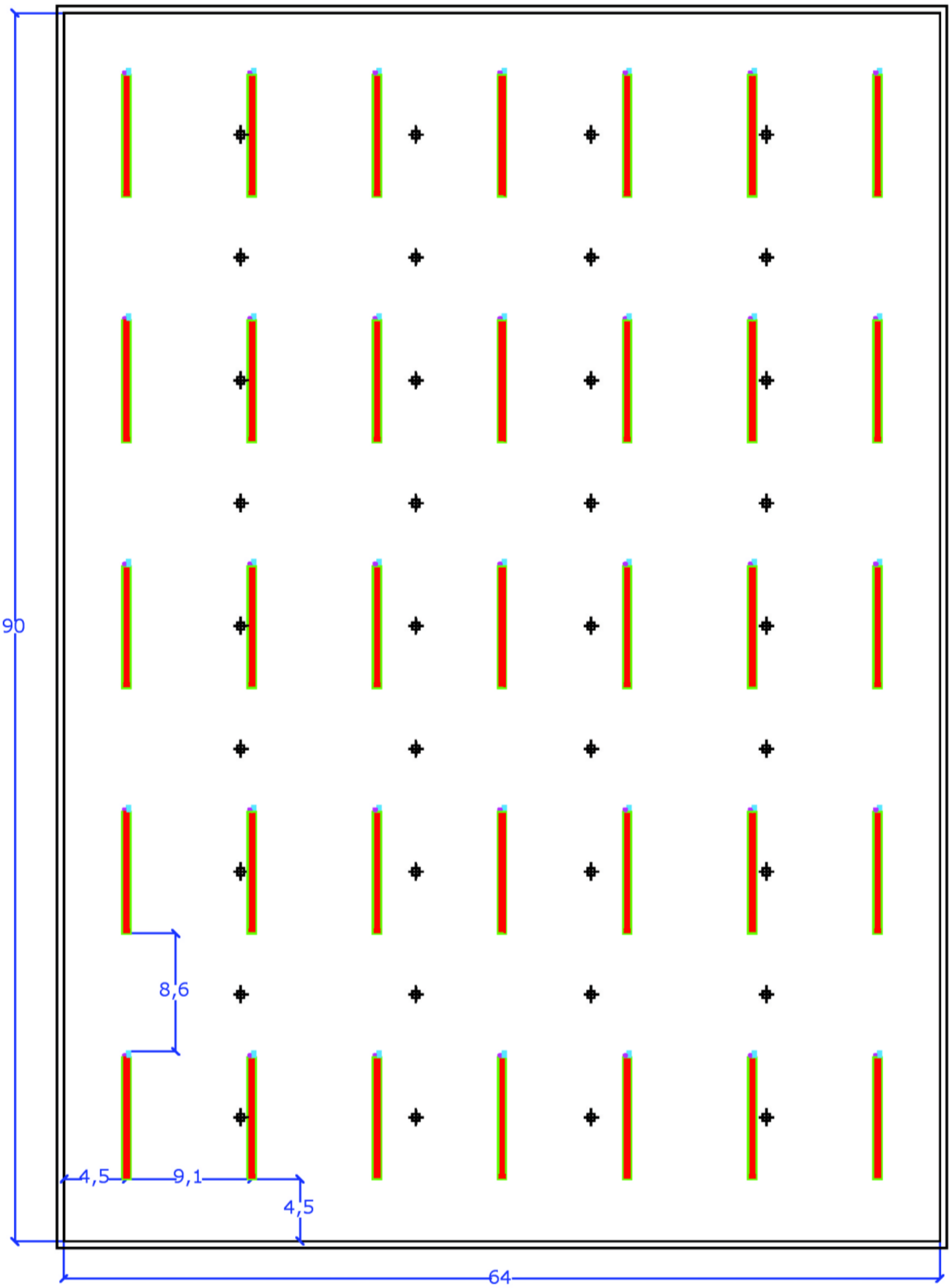


Figure 2.4
Distribution of units
EURAD MSC 9 L 25 kW

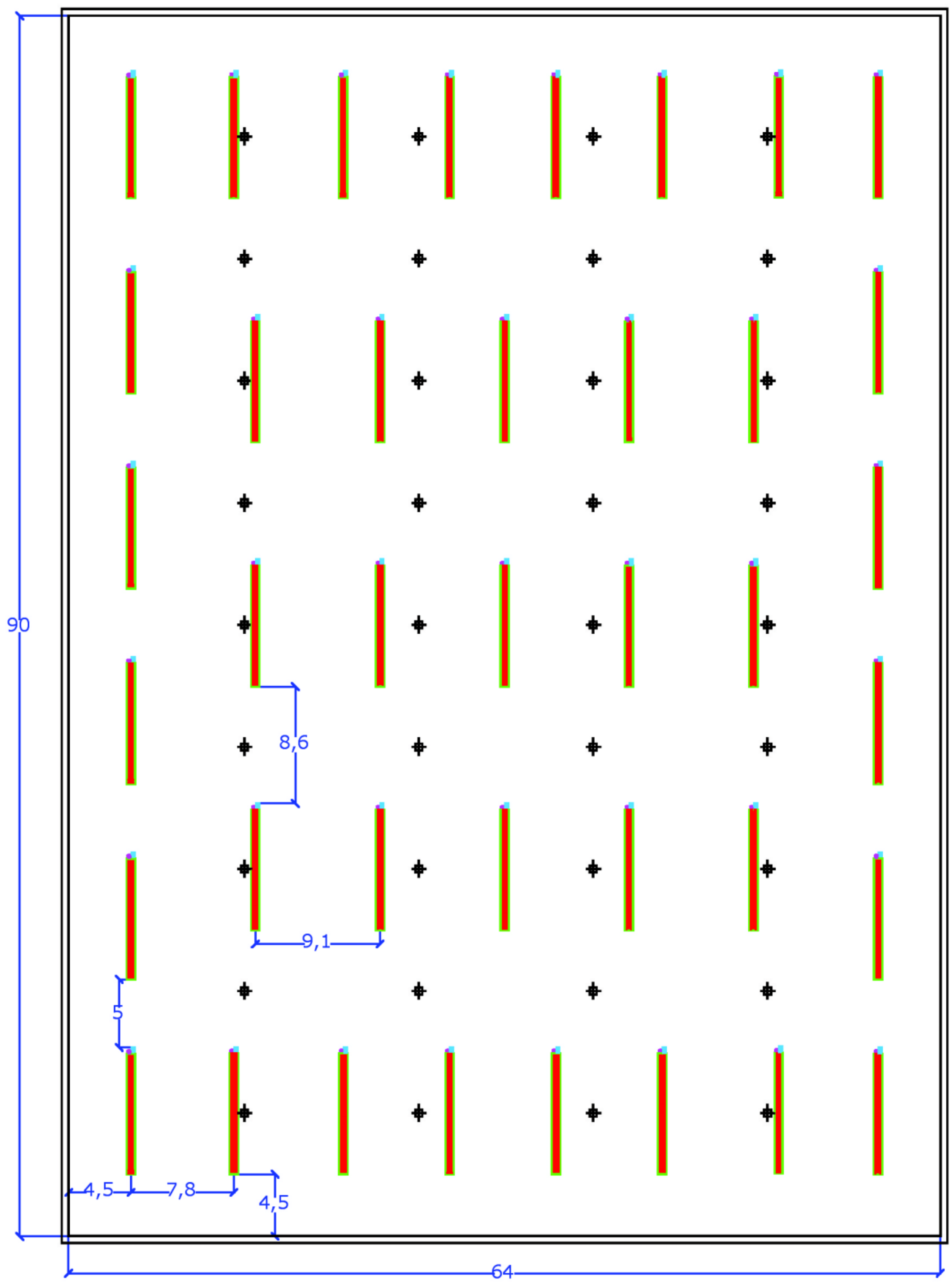


Figure 2.5
Distribution (with reinforcement of outer walls) EURAD MSC 9 L 25 kW units

2.2. Partial heating

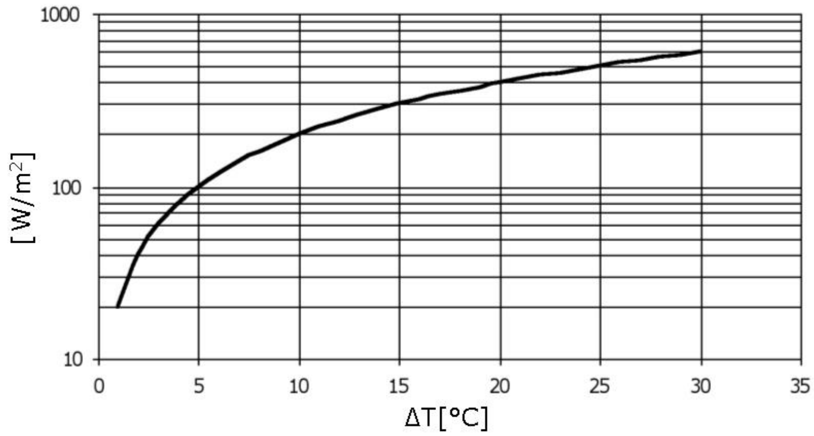
"Partial heating" means the heating of an open area (with high air exchange) or of a limited area inside an unheated building. The lack of containment structures and the high air exchange which concern this particular situation do not make it possible to provide heat to the air and hence heat it sufficiently. Radiance must therefore provide the required comfort by acting directly on individuals, without the contribution of structural thermal capacities and of the air. In these cases it is not possible to state that the entire system is operating at full power (building and heating system) but that a single machine (or group of machines) is, which rapidly reaches the nominal operating value.

2.2.1. CALCULATION OF THERMAL REQUIREMENT

The calculation of global dispersion cannot be used in this application due to the fact that a small part of the area is heated. The walls which are normally used in global thermal dimensioning are now represented by the air itself which surrounds the area to be heated and which, with rare exceptions, is in continuous movement, thus carrying off heat from the involved area. The term "infinite losses" was coined to best interpret the situation which is thus created.
To obtain good results, which reduce to a minimum the number of dissatisfied individuals, innumerable parameters must be considered, which differ on a case-by-case basis. To simplify the designer's work, a simple method for good dimensioning is provided, which is the result of various installations which have obtained satisfactory results.

First of all, evaluate the operative temperature which is necessary to guarantee by itself the degree of comfort depending on the activity performed in the room. The thermal requirement can be estimated as W/m², in terms of main radiated power needed to obtain a temperature difference DT of 18°C at 1.5 metres from the floor in still air conditions. It is difficult to obtain still air conditions, especially in working and commercial activities in rooms where doors are continuously opened for the transport and unloading of materials and goods.
Figure 2.6 shows, for a hypothesis of air speed of less than 0.2 m/s, the extent to which the specific power must be based on the desired thermal difference and on the quantity of heat actually radiated by the various systems. This may be a useful tool to have an estimate of involved powers in partial heating and as a comparison with those used in total heating.

Figure 2.6
Specific power requirement [W/m²] based on desired thermal difference ΔT as compared to air temperature Ta.



By means of the diagram in Figure 2.7, given the value of the partial surface to be heated and the desired thermal difference, it is possible to determine the value of the power install for the EURAD radiant tube modules.

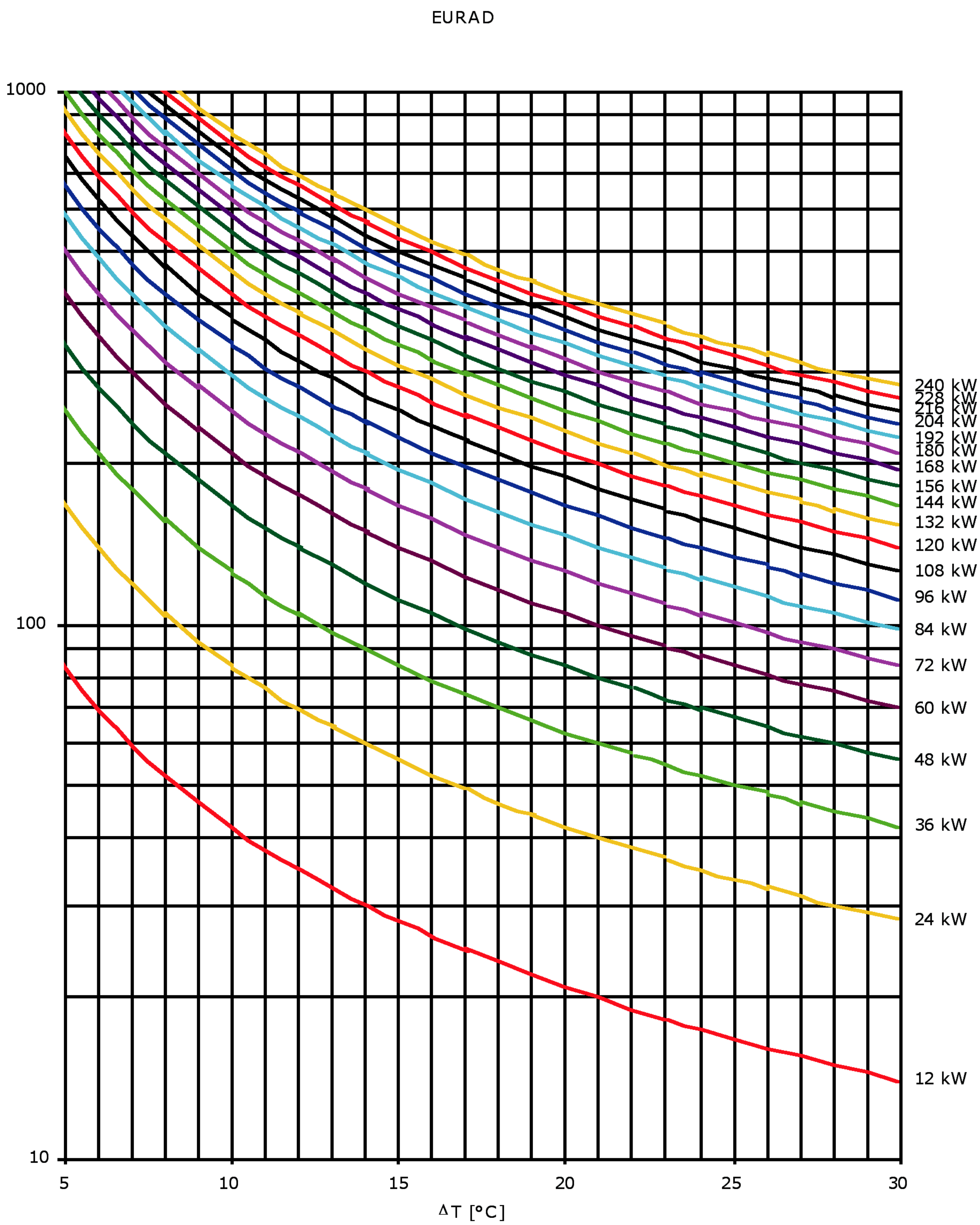


Figure 2.7
Thermal power to install [W] based on the thermal difference DT [°C] and on the surface to be heated [m²] with EURAD radiant tube modules.

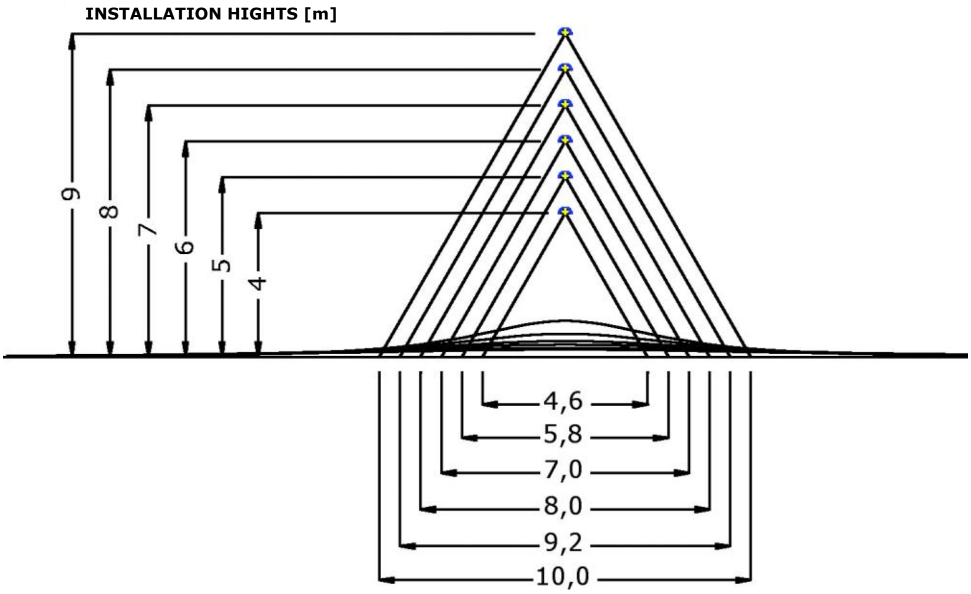
2.2.2. CHOICE OF VERSION OF UNIT

CARLIEUKLIMA recommends the use of the MSU version for partial heating; previous experience has shown that it provides the best performance in terms of comfort and consumption.

2.2.3. CHOICE OF TYPE AND NUMBER OF UNITS

The choice of the number of units depends on the geometric layout of the area to be heated and the installation height. The installation height is especially important in order to have a good partitioning of heating. Figure 2.8 shows the cones into which 66% of the energy radiated to the ground is emitted. For partial heating it is preferable to reduce the installation height to a minimum and in any case to avoid installations at a height of greater than 6-7 metres. With installations at greater heights, the radiance is distributed over too large an area and with an intensity that is too low for sufficient heating of the room.

Figure 2.8
Projection of cones which contain 66% of the energy emitted by radiance



2.2.3. EXAMPLES OF CALCULATION

In the following paragraphs, there are some examples of system sizing with partial heating.

2.2.4.1. EXAMPLE 1

You wish to use EURAD MSU radiant tube modules to heat surface S measuring 300 m^2 (15 x 20 metres).
You wish to determine the power, number, type, and position of the units to be installed so as to guarantee an operative temperature Top of 18 °C. The minimum air temperature measured in the concerned area Ta is 3 °C and the installation height H is 4 metres

$S = 15 \times 20 = 300$ [m^2]

$T_a = 3$ [°C]

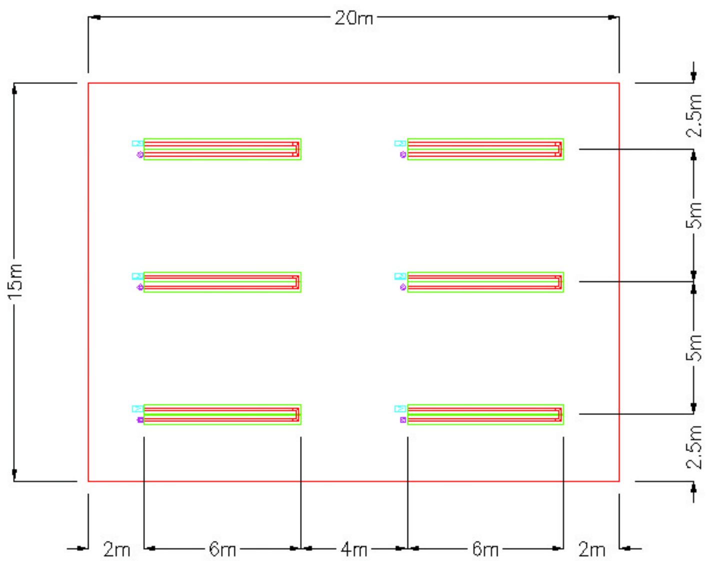
$T_{op} = 18$ [°C]

$\Delta T = T_{op.} - T_a$ [°C]

$H = 4$ [m]

The graph in Figure 2.7 provides, given a ΔT of 15 °C and an area to be heated of 300 m^2, a power to be installed of 132 kW.
In choosing the most suitable unit, you need to keep in mind that the installation height is low and it is advisable to use more units with lower power (per unit), thus avoiding the radiance of excessive specific power to the surface. As shown in table 2.3, the model MSU 6, installed at a height of 4 metres, covers a radiance area of 50 m^2. Six EUCERAMIC MSU L units are chosen, 25 kW each, for a total installed power of 150 kW. The layout of the units is carried out in accordance with the instructions in Table 2.2. For units installed at a height of four metres, the maximum transversal interval I is five metres and the maximum longitudinal interval W is four meters. The units can therefore be installed in groups of three in parallel as shown in Figure 2.9.

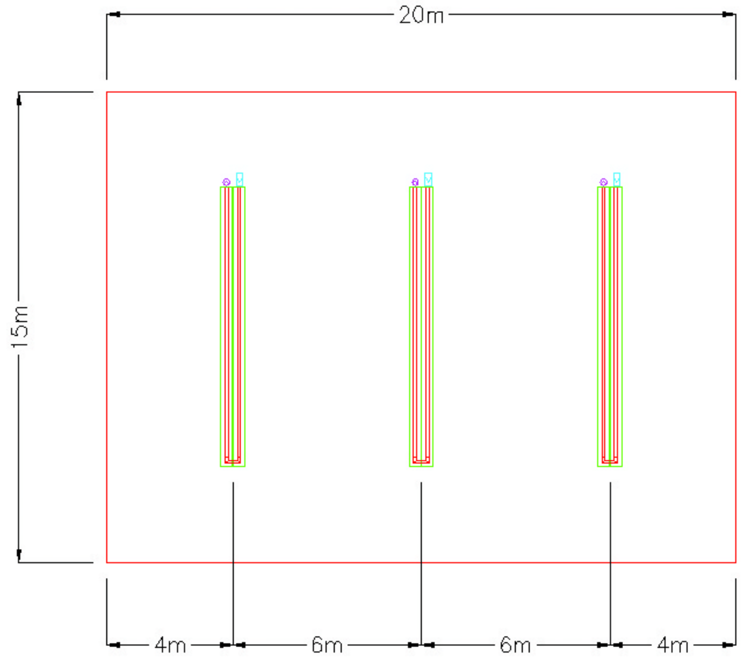
Figure 2.9
Arrangement of the six EURAD units in example 1 (partial heating)



2.2.3.2. VARIATION TO EXAMPLE 1

Suppose the conditions are the same as in the previous example, however with an installation height of seven metres. As the installation height increases, the radiance intensity decreases, and therefore it is possible to use units with a higher specific power. To reach the same installed thermal power, in this case three EURAD MSU 9 H of 50 kW each are installed, arranged as in 2.10. Table 2.3 shows how the use of this model amply covers the radiance zone requested.

Figure 2.10
Layout of the three EURAD units in the variation to example 1 (partial heating)



2.2.3.3. EXAMPLE 2

You wish to use EURAD units to heat an area of 100 m² and with an installation height of 7 metres which for technical reasons cannot be lowered. It will be seen that for small partial areas with high installation heights, it is necessary to oversize the system.

The room characteristics are the following:

S = 8 x 12 = 96 m²

T_a = 0 °C

T_{op} = 18 °C

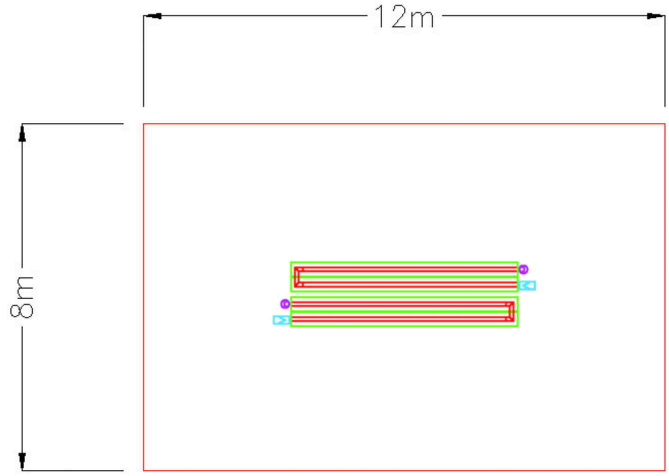
H = 7 m

From the graph in Figure 2.7, for a ΔT of 18°C and a surface of 100 m², you obtain a power to be installed Φ' =50 kW.
You could install two MSU 6 L 25 kW units, but Figure 2.8 shows that for an installation height of 7 metres the installed power is radiated to a surface which is greater than the one to be heated. As a result, it is not possible to provide the area with the total power but as shown in figure 2.8 only 66% of it. This means that a more powerful machine needs to be installed. Two MSU 6 H 35 kW machines are chosen, increasing the power in order to carry the lost heat outside the area to be heated.

2 MSU 6 L ea. 25 kW = 50 kW. With a height of 7 m, a cone of 8 m is covered, where 66% of installed power is radiated = 33 kW

2 MSU 6 H ea. 35 kW = 70 kW. With a height of 7 m, a cone of 8 m is covered, where 66% of installed power is radiated = 46 kW

Figure 2.11
Arrangement of the two EURAD units in the variant in example 2 (partial heating)



2.2.4. RAPID CALCULATION CHOICE

With this rapid calculation method, the maximum interval between the units is not the basis for consideration, but rather it is assumed that the established power to be installed is sufficient to heat the involved area. The units should be laid out in the most uniform manner possible, that is, placing the perimeter units so that their cone remains within the area and then placing the central units to complete the total number of units to be installed. The following points summarize the procedure:

- First of all, given the characteristics of the area to be heated in Figure 2.7, the power to be installed is determined.
- Given the power, the number and type of units are then determined, keeping in mind that for low installation heights it will be necessary to use modules with a lower specific power
- With the floor plan of the area to be heated, use Table 2.3 to attempt to arrange the units in accordance with the following criteria:
  • The single areas of radiance of the units must be contained as much as possible within the floor plan.
  • Overlapping of radiance areas (proportional to the installation height) must be as uniform as possible.

Table 2.3
Relation between heights of installation H and area of radiance for the various types of EURAD models

Installation height H (m)	Area MSU 3 (m²)	Area MSU 6 (m²)	Area MSU 9 (m²)
4	35-5.0x7.5	50-5x10.5	60-5x13.5
5	50-6.0x8.5	65-5.7x11.5	85-5.7x14.5
6	70-7.0x10	90-7.0x12.5	110-7.0x15.5
7	85-8.0x11	110-8.0x14	135-8.0x17

2.2.4.1. EXAMPLE OF CALCULATION

Refer to the previously provided examples. For points 1 and 2 the procedure remains unchanged. Proceed with the following points.
The areas shown with dotted lines represent the radiated cone which a single unit operates on. Outside this area there is however 33% of the power produced which, by overflowing into a wider area, provides a modest contribution in terms of temperature. On the other hand, the areas where cones overlap reinforce the temperatures produced by the single units. The following figures show the layouts for the previously provided examples with the rapid calculation method.

Figure 2.12
Radiance cone and their overlaps in example 1 (partial heating)

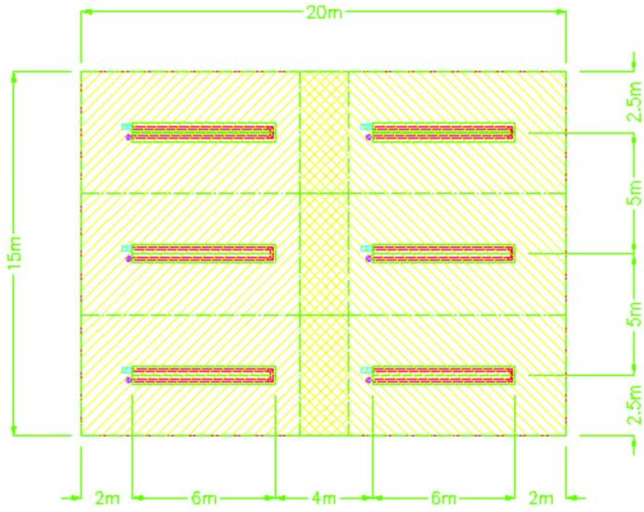


Figure 2.13
Radiance cone and their overlaps in the variant in example 2 (partial heating)

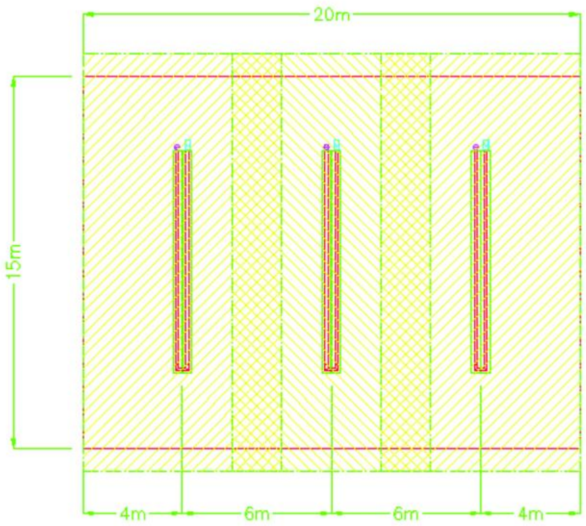
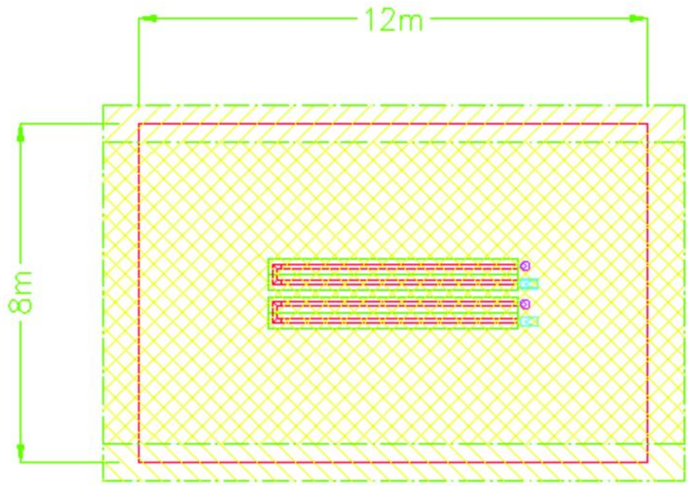


Figure 2.14
Radiance cone and their overlaps in example 2 (partial heating)



2.2.5. SPECIAL CASES

If the involved area is limited and can be heated with only one unit (hence the overlap of radiance cones is not possible) and if the installation height is necessarily high, it is necessary to increase the power of the unit beyond the values indicated in Figure 2.7.
The following example provides information on the procedure to carry out.

Partial area to be heated = 5 x 8 = 40m^2

T_a = 2 °C
T_{op} = 18 °C
H = 6 m

From figure 2.7, with a $\Delta T = T_{op.} - T_a$ = 16 °C and a surface of 40 m^2 a power to be installed of 20 kW is determined.
If you look at table 2.3, you will see that a module MSU 6 L of 25 kW installed at 4 metres covers the area in question, but unfortunately it is necessary to install the unit at 6 metres. Using this unit installed at 6 metres, radiance would expand over an area which is larger than the area in question (see Tab. 2.3 = 90 m^2) and the cone of usable radiance (≥ 66%) is 7m. (Fig. 2.8).
From the above, you can see that in order to properly heat the pre-determined area, it will be necessary to oversize the required power in accordance with the criteria set forth in Table 2.4.

Power increases to be implemented when changing from height H to a greater one for a single unit, exclusively for partial heating or for very limited areas

Table 2.3
Power increases

To change from...to	4 m	5 m	6 m	7 m
4 m	0	56%	125%	206%
5 m	-/-	0%	44%	96%
6 m	-/-	-/-	0%	36%
7 m	-/-	-/-	-/-	0%

If it were necessary to change from 4 to 6 metres, the required increase is 125%, thus changing from 20 to 45 kW.
The choice is for a EURAD MSU 9 H 50 kW unit.
Clearly the higher installed power is not wasted, but rather contributes to heating the surrounding area, significantly reducing the thermal difference (gradient) which individuals passing through the area would perceive.

2.3. Specification items

For specification items, visit www.carlieuklima.it.

3. MODELS AND INSTALLATION OF EURAD RADIANT TUBES

The EURAD module is supplied complete with the burner set up for the required power, radiant tube complete with elbow (if MSU or MSC double tube models), single or double upper parabolic reflector, and all material required for installation of the module except for the chains. The packaging of the module is divided into two basic parts. The first part contains the burner set up for the type of gas (methane or LPG and calibrated to the required power, a support bracket, the elbow (if MSU or MSC double tube models), the extractor, the discharge flange and the relative nuts and bolts. The second part of the packaging contains two tubes with a length of 3 metres, a bracket and two reflectors for versions with separate reflectors or linear models (models MSU and MSM) and one reflector if there is a single reflector (model MSC). The part that contains the radiant tubes multiplies depending on the length of the module.
The amount of material shipped corresponds precisely to the designed system as presented and submitted in advance to the customer by CARLIEUKLIMA by one of their representatives or by a technical studio authorized by them.

All models of the EURAD module are CE approved in accordance with directive **90/396** EEC concerning gas-powered equipment and its components**.**

The sizes of the modules vary depending on the models. The choice of models varies depending on the size of the room where they are to be installed and on the design.

The assigned installer shall receive all modules which are required for adequate coverage of the room to be heated. Also enclosed is a drawing to ensure exact placement of the single modules based on the design prepared by an authorized studio and compliant with current laws on design, installation, operation, and maintenance

The connection to the gas mains, the electrical connection between the module and the thermostat, and the connection to the electrical mains must be carried out by **qualified personnel** in compliance with standards **(EN- UNI - CIG and CEI) which are in effect** at the moment of installation of the system.
A working earth ground system is indispensable.
Check that the connection to the electrical mains is made with an earth wire that is a couple of centimetres longer than the other wires. The electrical diagram included with this manual concerns only the radiant module and the proper connection of the unit.
Installation of the radiant modules must be carried out with safety systems and work equipment which is **compliant with current labour and labour safety laws**. Installation must be carried out by **specialized and authorized firms**. Upon completion of work, the firm that carried out installation must **issue a certification** that work has been **properly** carried out, along with a declaration of material used (as required by current law).

IMPORTANT NOTICE

Instructions for installation and use are to be kept in a safe place and made available to workers. We recommend carefully reading the warning and instructions below for important information on safety, installation, use and maintenance of the product. These instructions are an integral part of the unit and must remain with the unit in the event of change of ownership.

This radiant tube module was designed and manufactured for the heating of industrial areas and workshops, sports areas, warehouses and covered outdoor areas. Thanks to the principle of thermal radiance, it offers ideal heating of the radiated zone with substantial thermal comfort.
The wide range of models allows for heating of even the most isolated areas such as under stairs, isolated warehouses, and so on.
It can also be used in animal raising and agricultural locations.

Installation of the units must be carried out so as to ensure expulsion of fumes to the outside. Intake may be performed from the inside, provided that current laws permit installation of type B units; otherwise it must be performed from the outside, if the installation of type C units is required.

Use is not permitted in areas where, due to working processes or material storage, there is the risk of the formation of gases, vapours or dusts in such quantities that they may be the cause of fires or explosions. The classification of areas which are to be considered as non-compliant or at risk for the installation of this product must be established by an analysis of the microclimate of said area.

It is hereby explicitly stated that failure to observe current standards may lead to death, serious injury or substantial material damage.

The installation or the start-up of the system, as well as any repair and/or maintenance work, must be carried out by qualified, authorized personnel who are responsible for compliance with current standards.

The manufacturer will not be held liable for any damage due to improper installation or due to incorrect and/or improper use of the unit.

It is strongly recommended to have the system checked on an annual basis by our technical service centre.

The packing material must be disposed of in compliance with current law and in such a way as not to be a source of hazard to third parties.

3.1. Dimensions and weight of packaging

Table 3.1 shows the measurements and dimensions of the packaging of the modules of EURAD radiant tubes

Table 3.1
Dimensions and weight of packaging

Burner Packaging		
Model	Maximum Measurement (Width X Height X Length) (mm)	Weight (kg)
MSM	510 x 340 x 240	12.25
MSU	510 x 340 x 240	12.25
MSC	510 x 340 x 240	12.25

Radiant Tubes & Reflectors Packaging		
Model	Maximum Measurements (Width X Height X Length) (mm)	Weight (kg)
MSM ALLU	385 x 285 x 3040	31.3
MSM INOX	385 x 285 x 3040	38.3
MSU ALLU	385 x 285 x 3040	29.6
MSU INOX	385 x 285 x 3040	37.5
MSC ALLU	600 x 210 x 3040	32,0
MSC INOX	600 x 210 x 3040	43.2

Ventilator Packaging		
Model	Maximum Measurements (Width X Height X Length) (mm)	Weight (kg)
180 W	240 x 250 x 350	4.00
65 W	250 x 290 x 275	3.45

Start Tubes Packaging		
Model	Maximum Measurements (Width X Height X Length) (mm)	Weight (kg)
MSM ALLU	385 x 285 x 3040	33.95
MSM INOX	385 x 285 x 3040	40.95
MSU ALLU	385 x 285 x 3040	32.25
MSU INOX	385 x 285 x 3040	40.15
MSC ALLU	600 x 210 x 3040	34.1
MSC INOX	600 x 210 x 3040	45.3

The elbows for MSU/MSM models (2.7 kg) and MSC models (2.2 kg) are supplied with a separate packaging.

3.2. Places of installation

The EURAD modules are designed to heat industrial buildings and workshops in general, warehouses, external loading bays, areas for animal raising and/or agricultural purposes, areas for sports activities and for industrial cycles (kilns).

Thermal radiance makes it possible to heat either single areas, using single modules, or entire rooms by using several modules so as to provide adequate coverage of the entire area. The intake of combustion air and the expulsion of fumes must take place based on the type of unit requested (see previous explanations). The installation of more than one unit in the same room or in directly connected rooms means that the units will be considered as a single system, with power equal to the sum of the thermal output of the single units.

- in underground rooms
- in rooms for public entertainment or in any room where density of individual persons exceeds 0.4 persons/m^2 (1 person every 2.5 $m^{2)}$
- in workshops or industrial areas where the processing and storage of materials lead to the formation of gases, vapours or dusts which may cause fires or explosions.

N.B.
The radiant tube modules may nonetheless be installed in the environments described above if, after an inspection of the environment (micro-climate), it is determined that the amount of hazardous substances does not reach levels that create a hazardous situation.

3.3. Safety distances

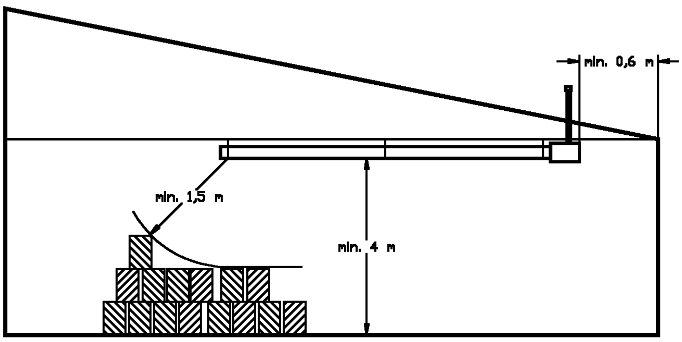
The height of installation of the modules from the floor (ground level) must not be **less than 4 meters.**
Horizontal and/or vertical structures where the burners of the radiant tube modules are placed must have fire resistance characteristics of at least R/REI 30 and fire reaction of class 0.
If incombustibility or fire resistance requirements of the structures are not met, installation must be carried out in observance of the following distances:

0.60 m between the shell of the burners and the wall;

1.00 m between the shell of the burners and the ceiling.

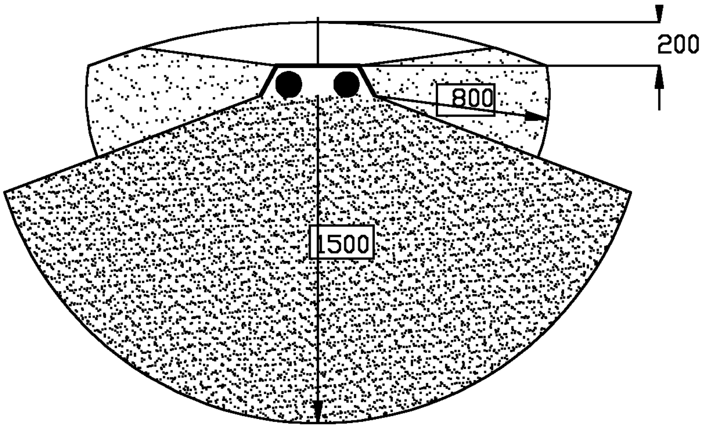
If these distances are not observed, a structure must be placed with characteristics not less than REI 120 with linear dimensions 0.50 m greater than the right angle projection of the burner on the side, and 1.0 m of those of the right angle projection of the burner on the top. Also, structures which the ducts for the discharge of flue gases pass through must be suitably protected.
The radiant circuit must be installed so as to ensure, based on specific technical instructions provided by the manufacturer, that the temperature of the vertical and horizontal structures that the circuit rest on does not exceed 50° C. As required, place suitable protection shields.
The modules may be fastened directly to the wall, as long as they are positioned with an inclination that is sufficient to direct the radiance towards the interior of the room.

Figure 3.1
Safety distances



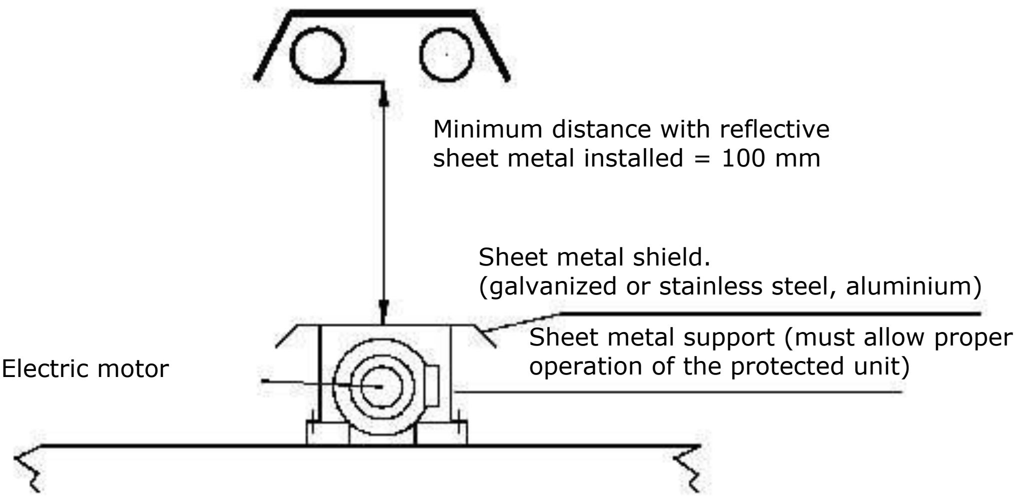
A safety distance must be maintained of 1.5 m between the external surface of the radiant ducts and any combustible material in storage (wood, cardboard and plastics) so that the surface of the materials does not reach hazardous temperatures, thus preventing a fire from breaking out.

Figure 3.2
Safety distances from combustible materials



If these safety distances cannot be maintained (due to motors of carriages on bridge cranes, electrical cable ducts, or light fixtures) it is necessary to provide suitable shields.

Figure 3.3
Safety distances from bridge cra and sheet metal shield.



PLACE ALUMINIUM OR POLISHED STEEL SHEET METAL WITH THE REFLECTIVE PART FACING UP!

3.4. Ventilation openings

It is obligatory to create ventilation openings in rooms where gas equipment is installed. These openings must be of a size which is properly suited for the installed thermal output and the location of the room.

The dimension can be calculated as shown hereunder:

For rooms above ground:

$$S \geq Q \times 10$$

S = Aperture surface in cm^2

Q = Thermal output in kW

For semi-underground down to -5 metres from the reference level:

$$S \geq Q \times 15$$

S = Aperture surface in cm^2

Q = Thermal output in kW

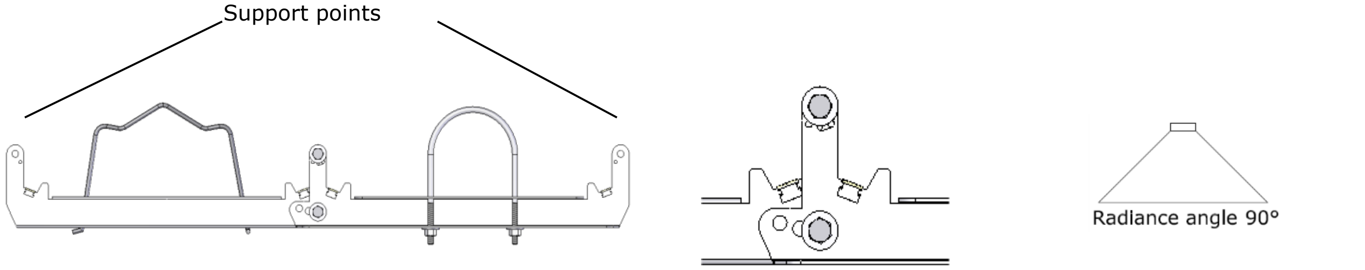
These values are not applied to greenhouses. In any case, each opening must not have a net surface of less than 100 cm^2.
The openings must be realized and located in such a way as to avoid the formation of gas bubbles, regardless of the conformation of the covering.
It is permissible to protect the ventilation openings with metallic grids, nets and/or awnings as long as the net ventilation surface is not reduced.

ATTENTION!!
For gases with a density of great than 0.8, two-thirds of the openings must be placed flush with ground level, with a minimum height of 20 cm. Furthermore, the openings must be not less than 2 m for capacities of less than 116 kW and not less than 4.5 m for capacities greater than 116 kW from cavities, depressions or openings connected to rooms located below ground level or from drainage ducts. The installation of modules fuelled by gas with a density greater than 0.8 is permissible only in rooms located above ground.

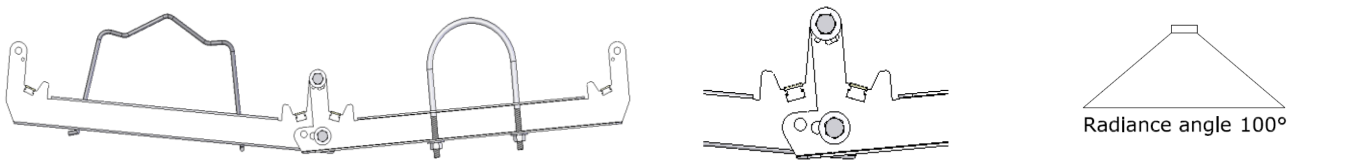
3.5. Position and fastening of support brackets

The brackets do not have any special requirements for where they should be placed other than those imposed by the structure of the building. As far as the radiant module is concerned, the brackets may be applied along its entire length. To optimize installation of the single module, the following is a list of bracket positions that we recommend. As a rule of thumb, each reflector should if possible be supported by two brackets.
Figures 3.7 ÷ 3.11 show the ideal positions.
The angle of the brackets of the MSU model must be adjusted as indicated on the final drawing of the design. The radiance cones are shown in figure 3.4. The radiance cones for the MSC and MSM models are shown in figures 3.5, 3.6.

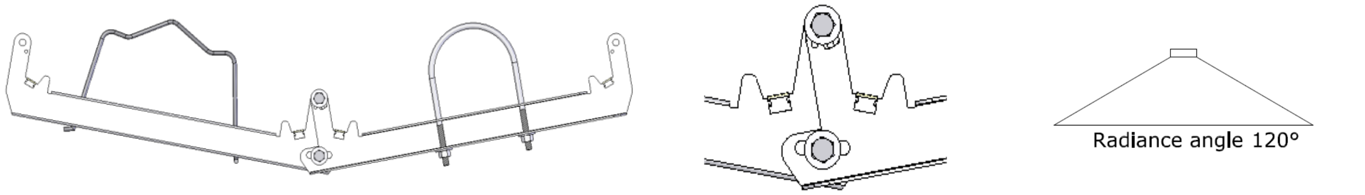
Figure 3.4
Brackets for EURAD MSU model



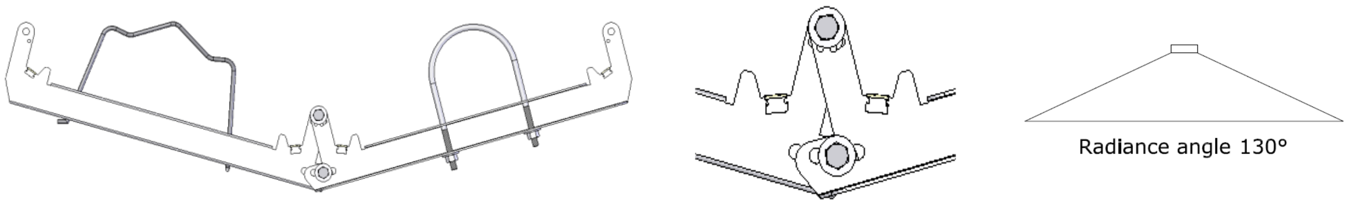
Aperture of 180° for a radiance cone of 90°



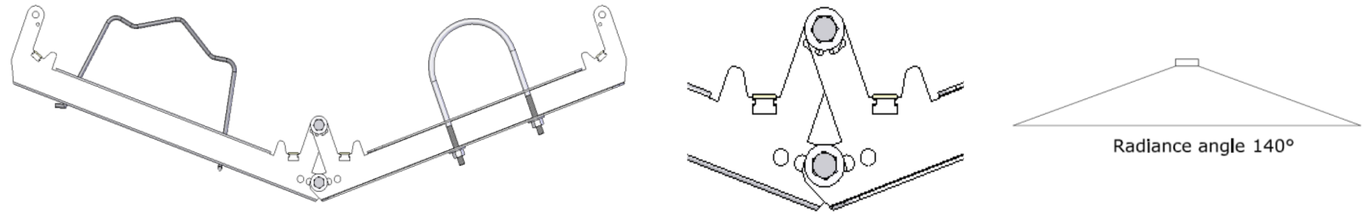
Aperture of approx. 190° for a radiance cone of 100°



Aperture of approx. 200° for a radiance cone of 120°



Aperture of approx. 210° for a radiance cone of 130°



Aperture of approx. 220° for a radiance cone of 140°

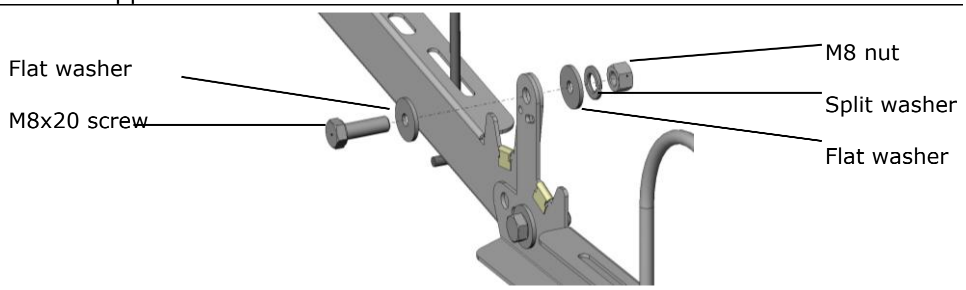


Figure 3.5
Brackets for EURAD MSC model

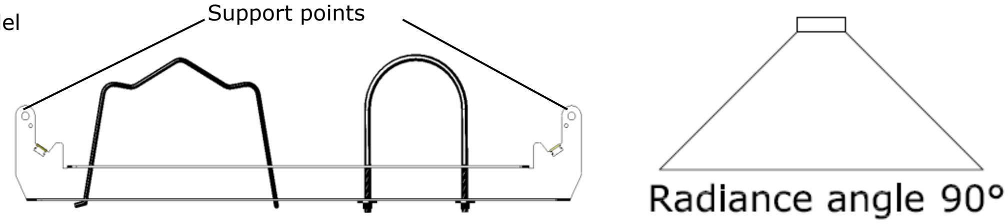
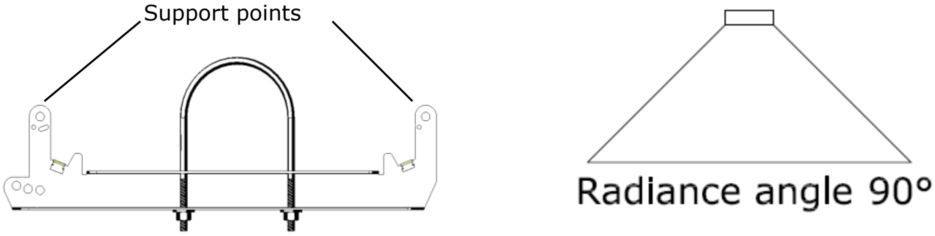


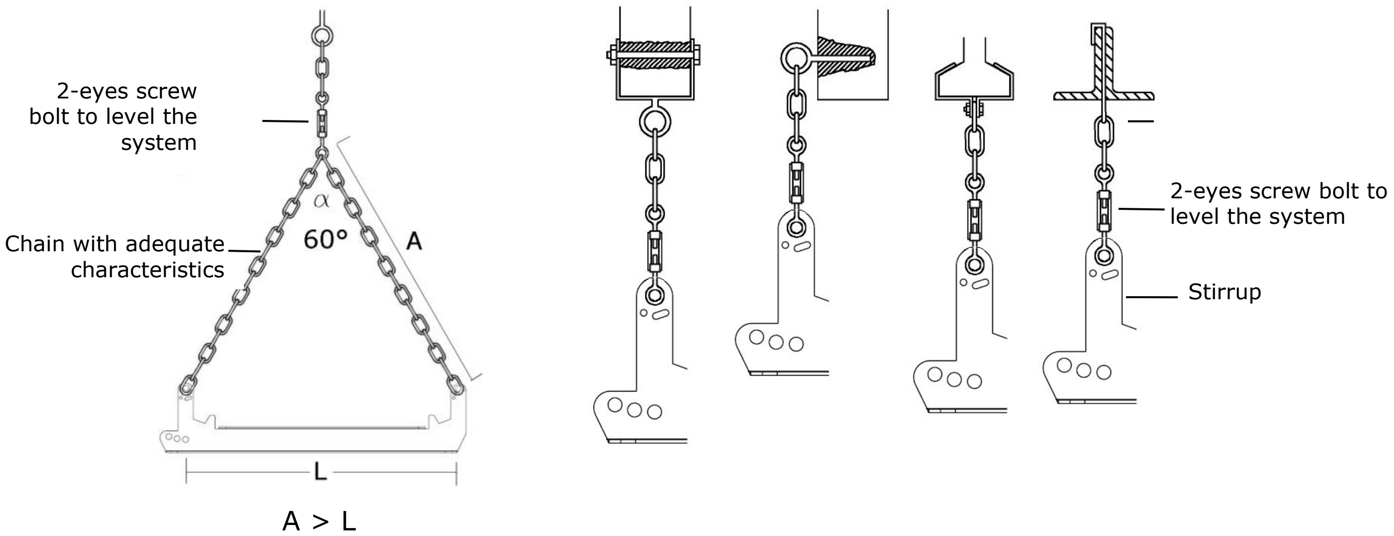
Figure 3.6
Brackets for EURAD MSM model



ATTENTION:

Before positioning the stirrups, see the executive drawing of the system to verify the distance between centres and the correct positioning of the single radiant tubes.

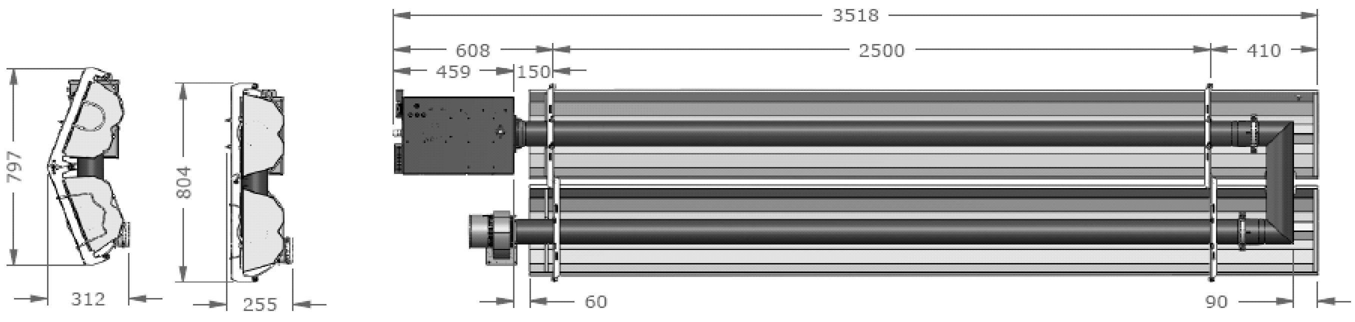
Examples of support and stirrup fastenings



The following figures show the suggested longitudinal positions of the brackets in the various EURAD models.

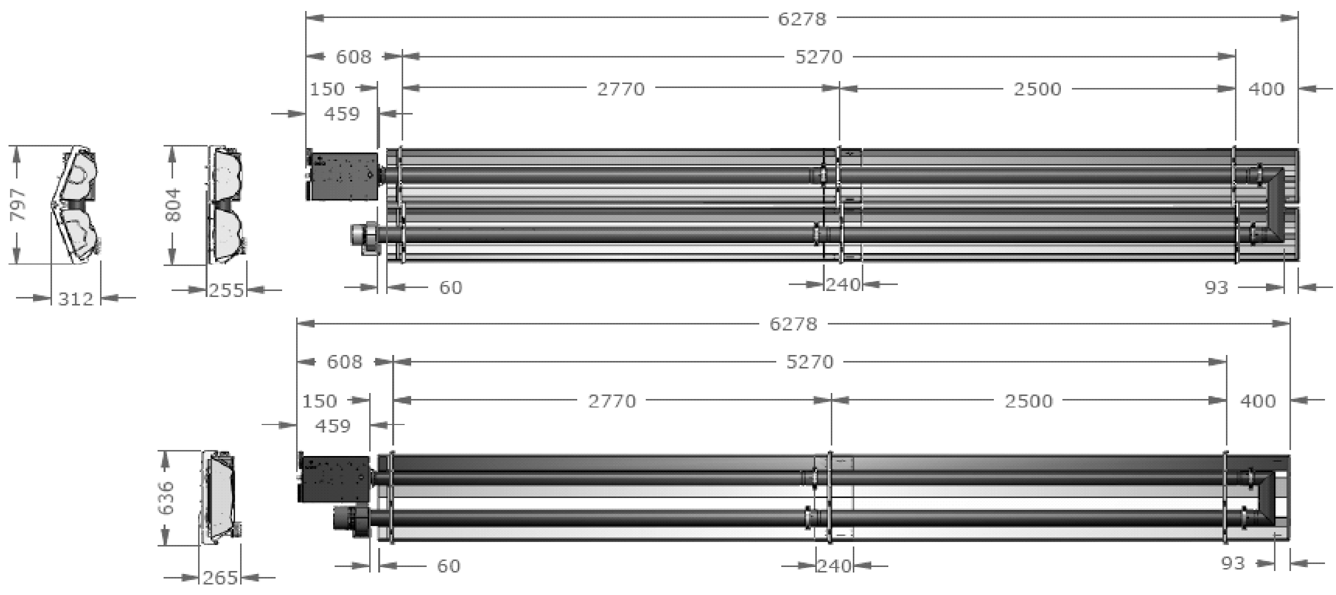
For the 3 meters model, are recommended the measures in figure 3.7.:

Figure 3.7
Position of brackets for the MSU module



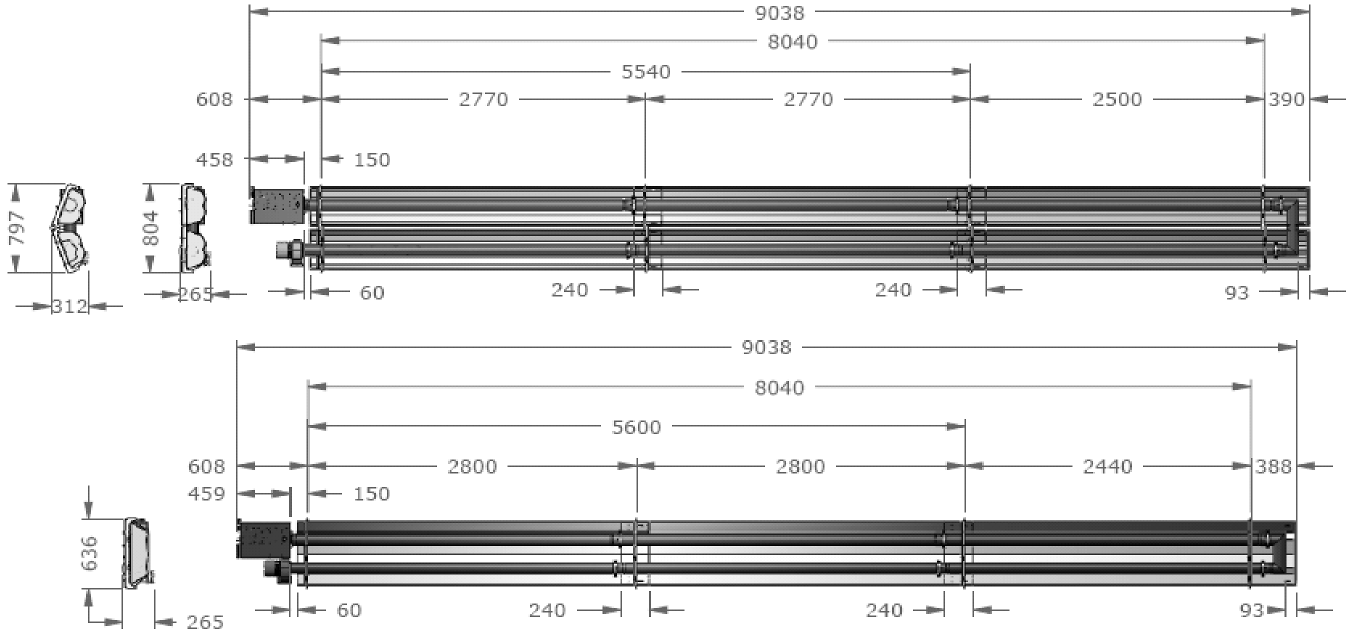
For the 6 meters models, are recommended the measures in figure 3.8.:

Figure 3.8
Position of brackets for models MSU 6 and MSC 6



For the 9 meters models, are recommended the measures in figure 3.9.:

Figure 3.9
Position of brackets for
models MSU 9 and MSC 9



For the 12 meters models, are recommended the measures in figure 3.10 and 3.10a.:

Figure 3.10
Positioning of the stirrups
for models MSC 12

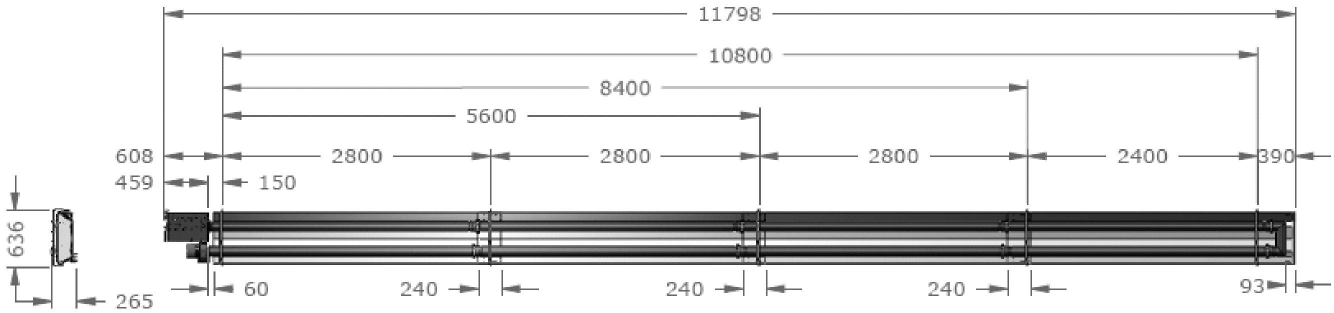
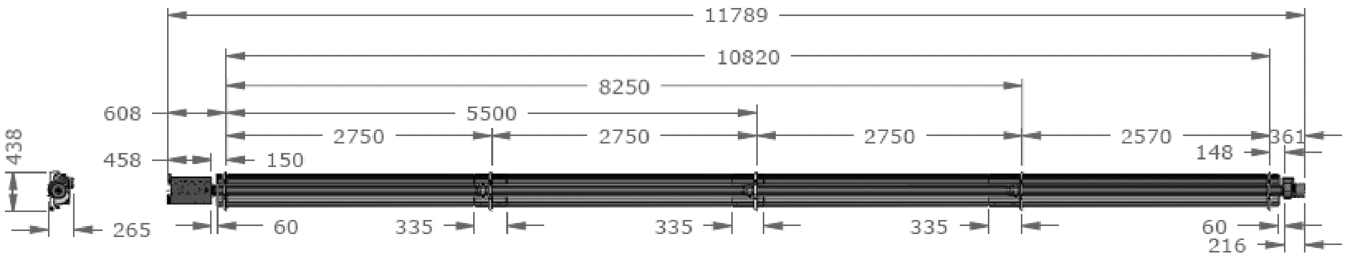
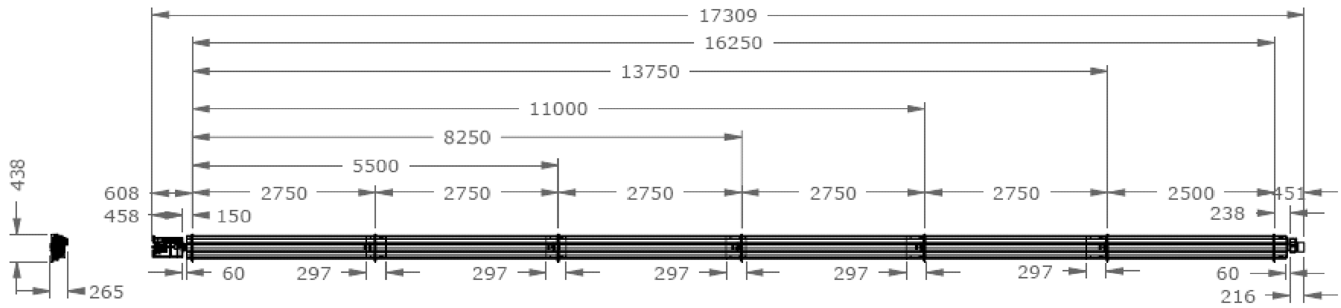


Figure 3.10a
Positioning of the stirrups
for models MSM 12



For the 18 meters models, are recommended the measures in figure 3.11.:

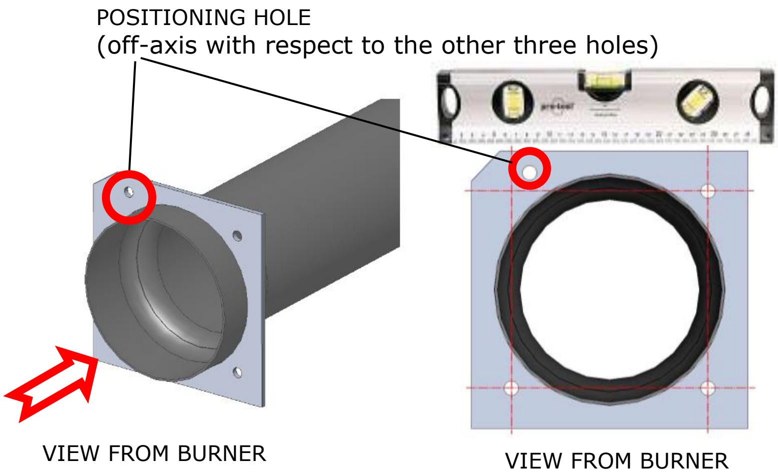
Figure 3.11
Position of brackets for
model MSM 18



3.6. Assembly of pipes and elbow

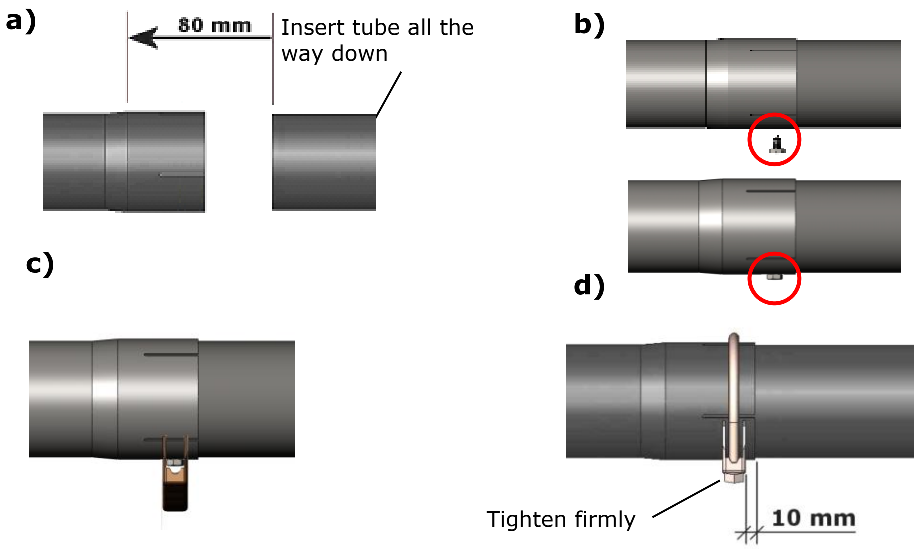
Installation proceeds with the positioning of tubes, to be carried out as described below. We suggest starting from the delivery tube (recognizable by the flange with socket with an external diameter of 126.5 mm).
Attention: the burner side flanged tube must be positioned on the right respect to the fan side flanged tube (see fig. 3.16-3.17)
The flange of the delivery tube must be positioned so that the positioning hole (hole off-axis with respect to the other three holes) is at upper left when looking from the position of the burner (fig. 3.12).
Attention: this provision is important for proper positioning of the burner.

Figure 3.12
Positioning of delivery tube



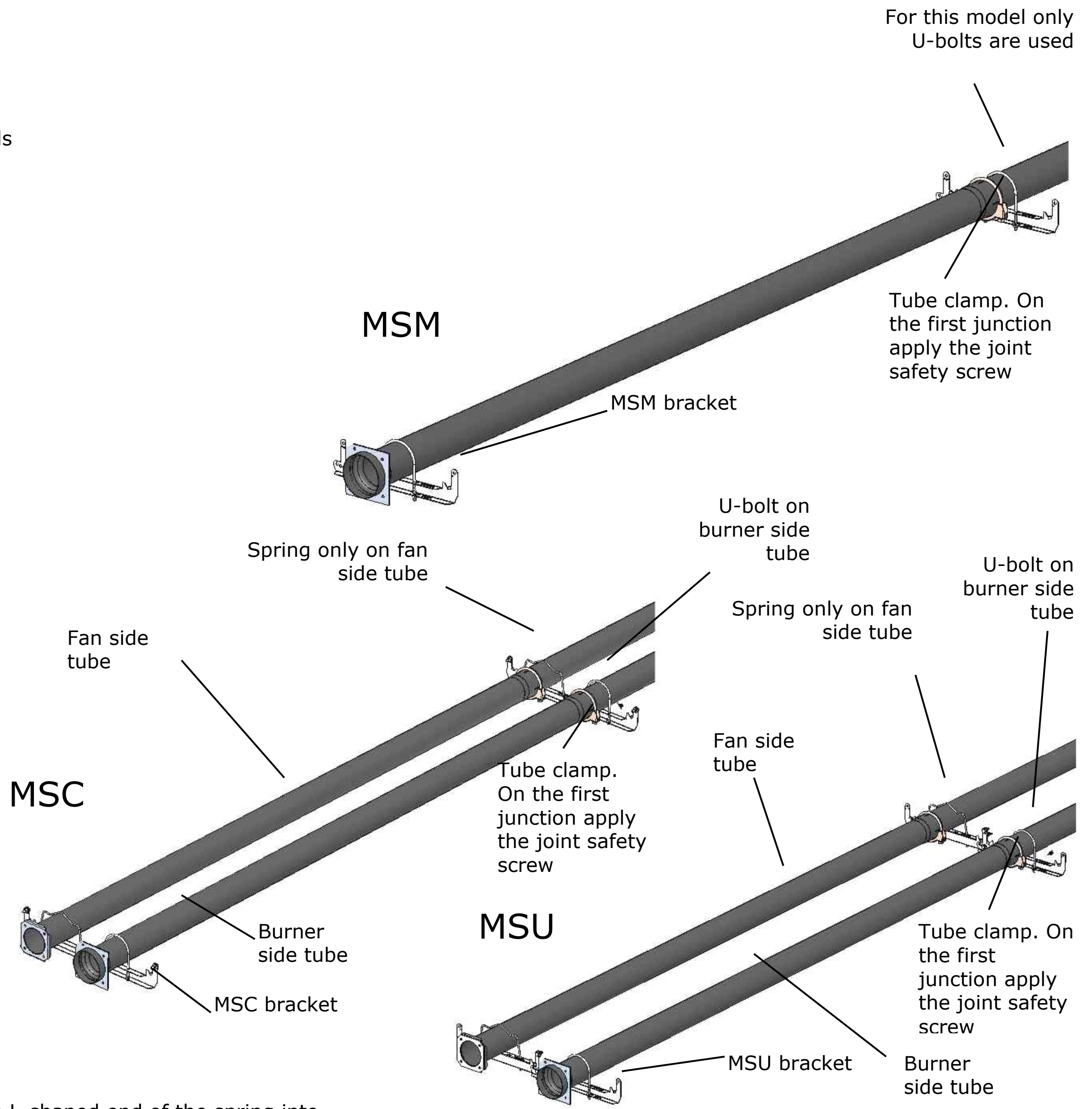
Assembly of tubes is carried out using a tube clamp. The radiant tubes must have about 80 mm of one inserted into the other. The tube clamp should be placed about 10 mm from the end of the socket tube. Secure the tube clamp so that it ensures appropriate closure.

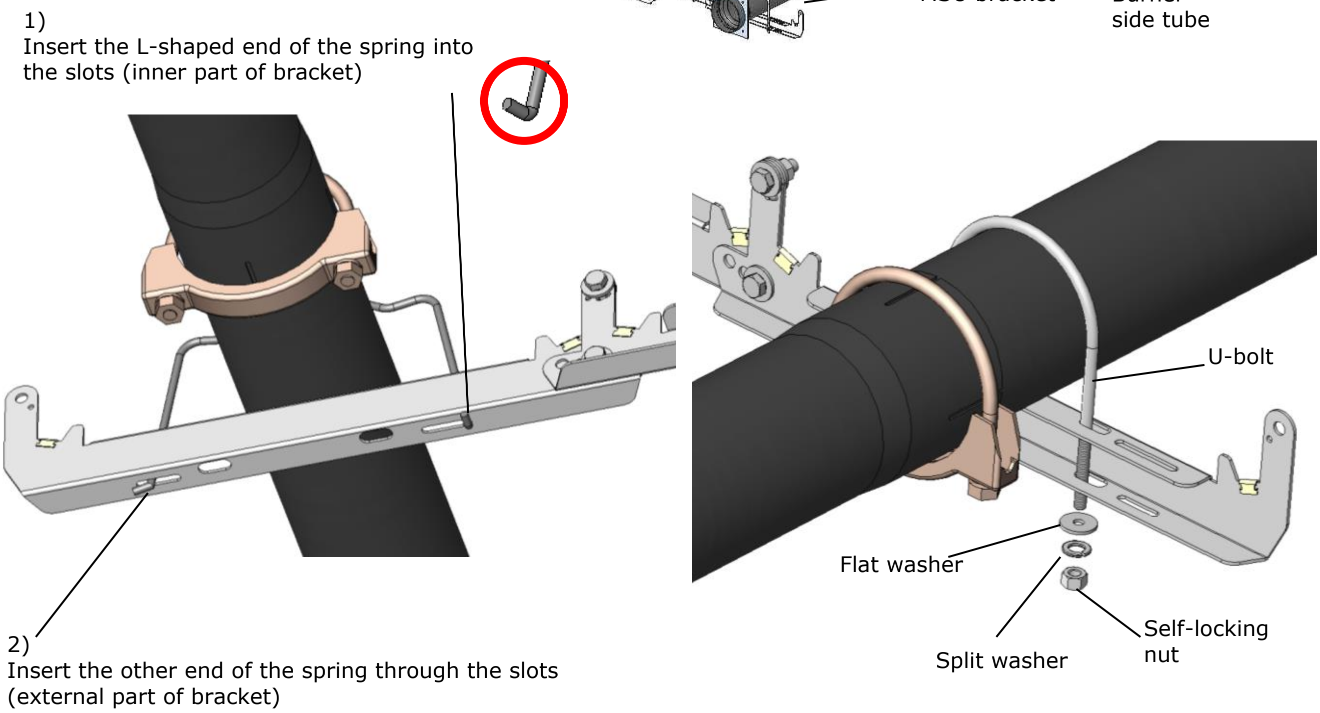
Figure 3.13
Assembly and fastening of tubes for all models



a) Insert the tube until the stop. **b)** The junction between the flanged start tube (burner side) and the following tube has to be reinforced with a self-drilling screw. Use the screw supplied together with the start tube. This operation has to be performed Only on the first junction of the burner. **c)** Cover the screw with the tube clamp base. **d)** Tighten firmly the tube clamp

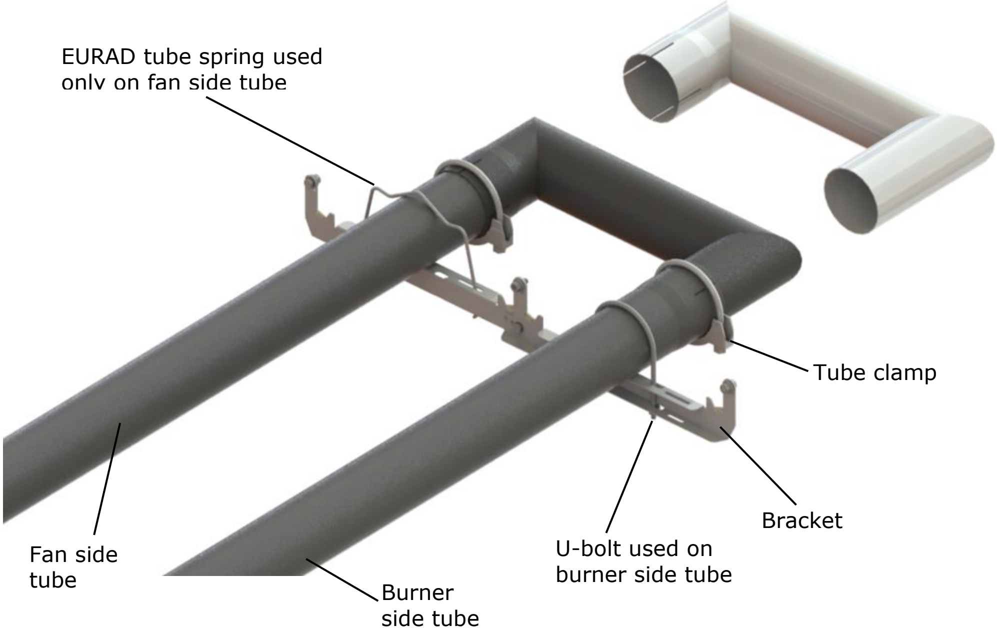
Figure 3.14
Fastening
of tubes for
various models





Fasten the elbow (in the MSC and MSU models) to the tubes. Assemble the curve by inserting about 80 mm of the ends into the socket pipes. Place the tube clamp about 10 mm from the end of the socket tube. Secure the tube clamp so that it ensures appropriate closure. (Figure 3.15).

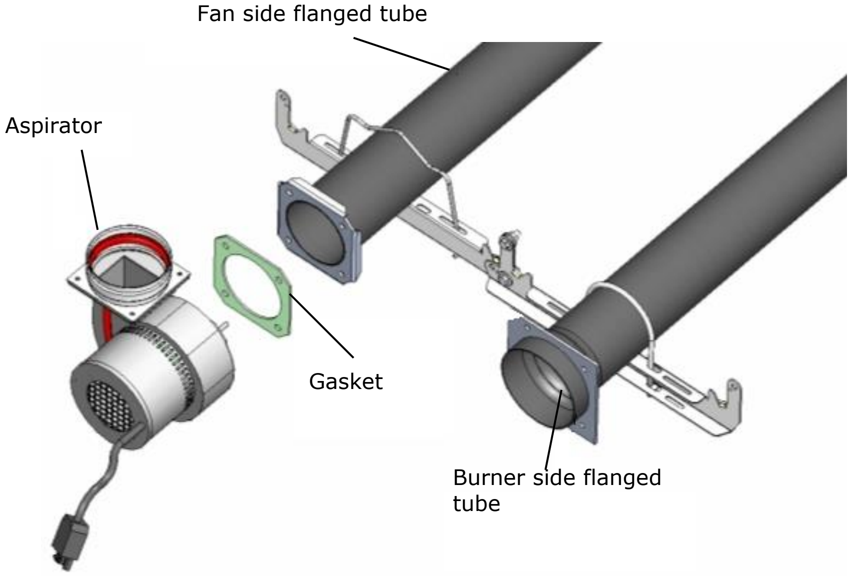
Figure 3.15
Installation of the new elbow for models MSU and MSC from 01/10/2012



3.7. Fastening of aspirator and burner

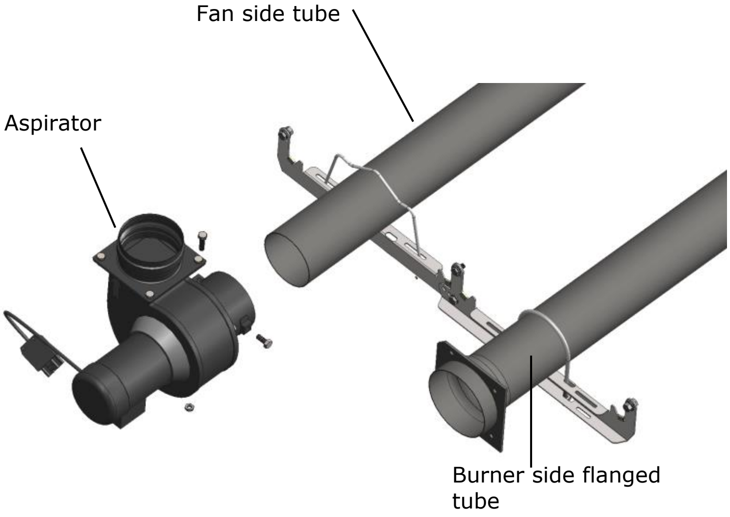
The ventilator and the gasket must be fixed to the flanged tube by means of the special bench screw (Fig. 3.16 and 3.17). For MSM models the ventilator must be mounted at the end of the radiant tube; for its connection the client must create a proper extension with the 4 pins connectors supplied separately (Ph+N+earth, 3x1.5 mm^2).

Figure 3.16
Assembly of aspirator without turbolator for models MSU and MSC.



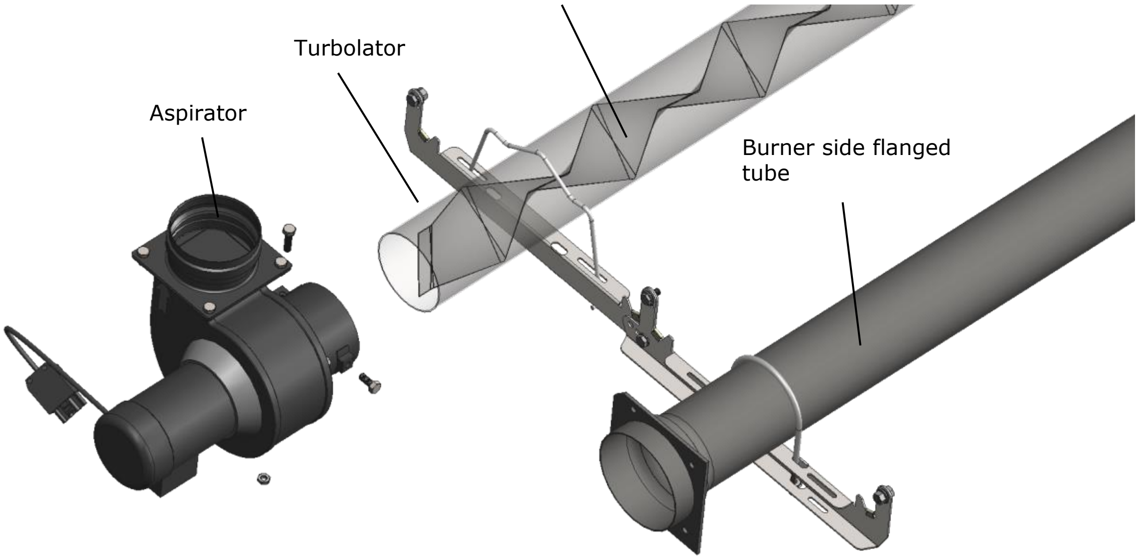
The fan **CS**, instead, is inserted in a smooth tube and fixed by means of proper screws (Fig. 3.16b).

Figure 3.16b
Assembly of aspirator without turbolator for models MSU and MSC.



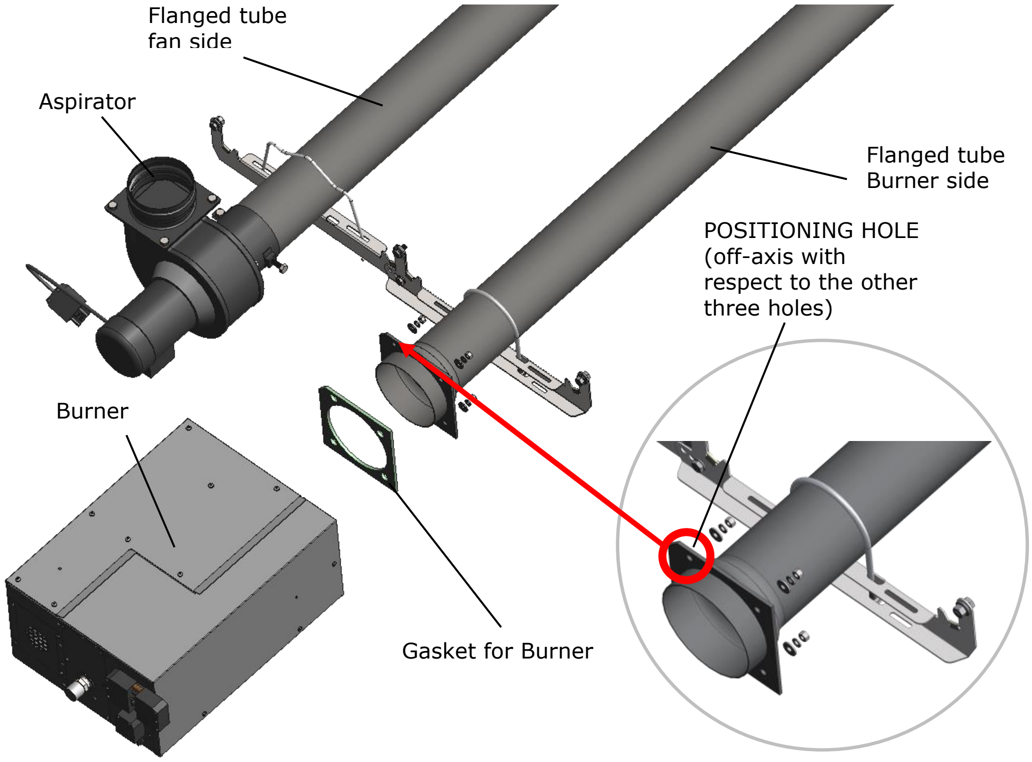
Also in case of tubes with turbolator, fans **CA** and **CS** are assembled according to the instructions previously given.

Figure 3.17
Assembly of aspirator with turbolator for models MSU and MSC.



N.B.:
Fastening of the aspirator for the MSM model is performed in the same way on the opposite side of the burner. An extension must be provided for electrical connection of the fan.

Figure 3.18
Assembly of the burner



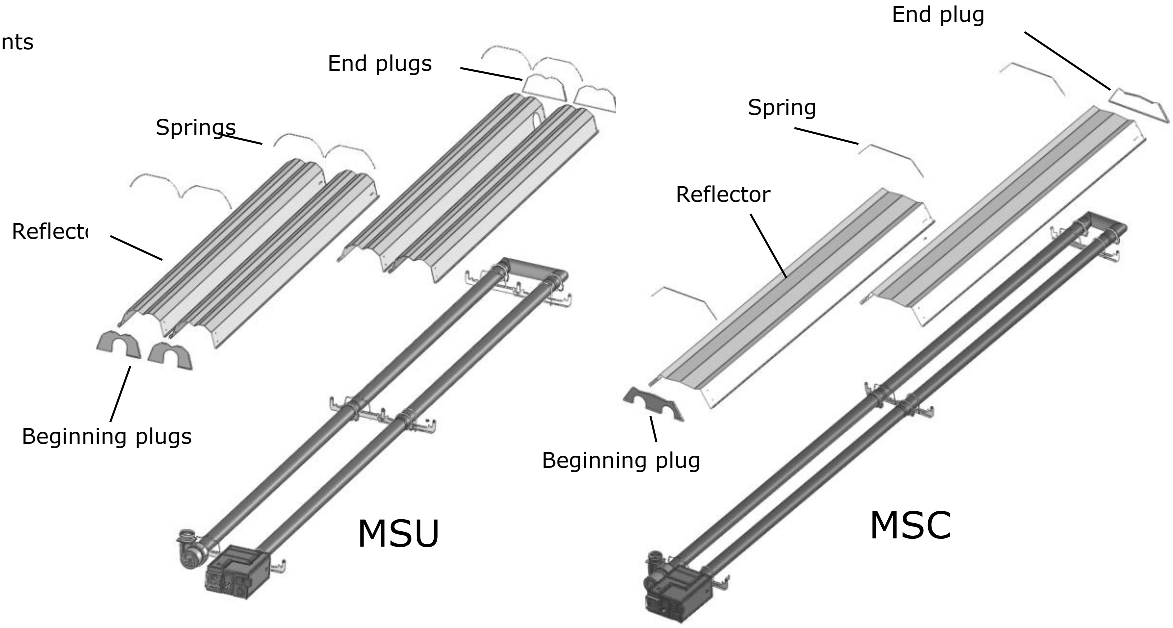
Fasten the burner to the dedicated flanged tube using the gasket and screws provided with the burner (Figure 3.18)

3.8. Placement and fastening of reflectors

Before assembling the reflectors, remove the protection film applied on the internal part of the reflectors!

Cover the upper part of the tubes by resting the reflectors on the brackets.

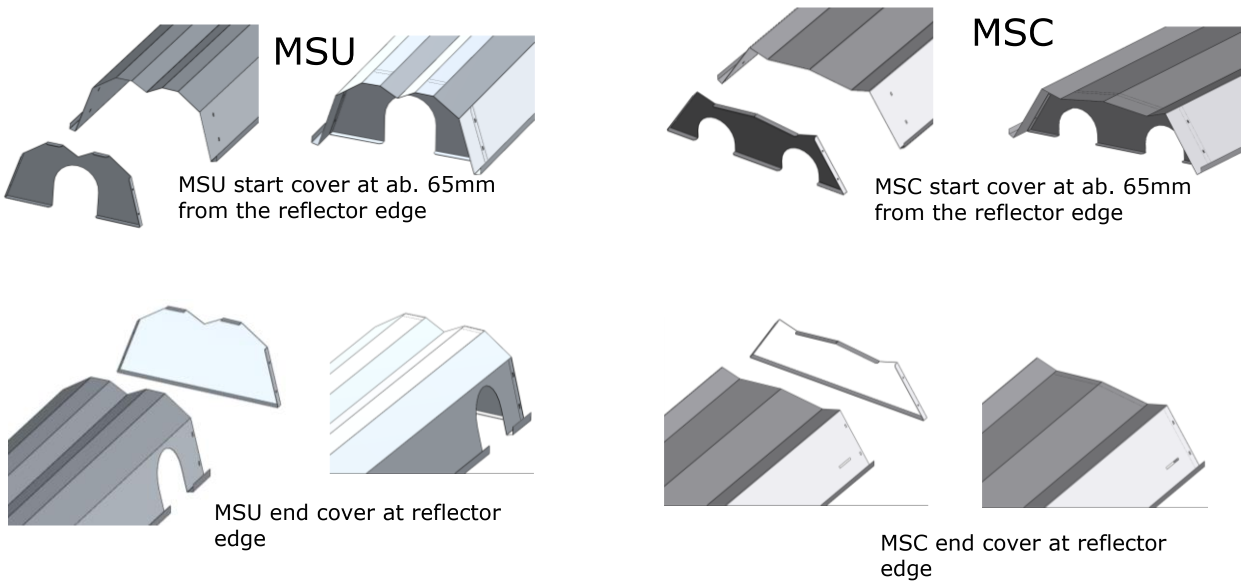
Figure 3.19
Reflector components



Attention!!
For the model MSM the instructions are the same.

1. The plugs have to be mounted in the inner part of the reflectors and fixed with the special rivets (supplied with the screw set for stirrups).
In the MSU and MSC versions, the beginning plug ha sto be assembled from the slotted part of the reflector, at ab. 65mm from the edge and using the special slotted holes.
The MSM version will be supplied with both shaped plugs (beginning).

Figure 3.20
Position of plugs for beginning and end



The fixing of the beginning and final plugs is made by using the special openings already made on the reflectors and using the rivets supplied with the screw set for stirrups.

2. Begin the assembling of the reflectors with the positioning of the **reflectors on elbow side**, so that it remains a space of ab. **90 mm** between the elbow and the final plug. The reflector has to be positioned on the dedicated housing of the bracket and fastened with the special spring.

Figure 3.21
Fastening plugs

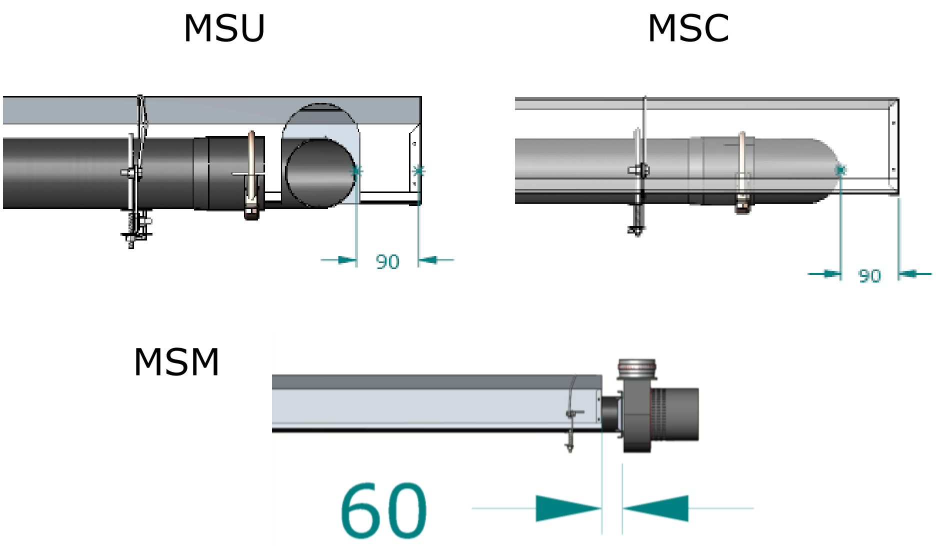
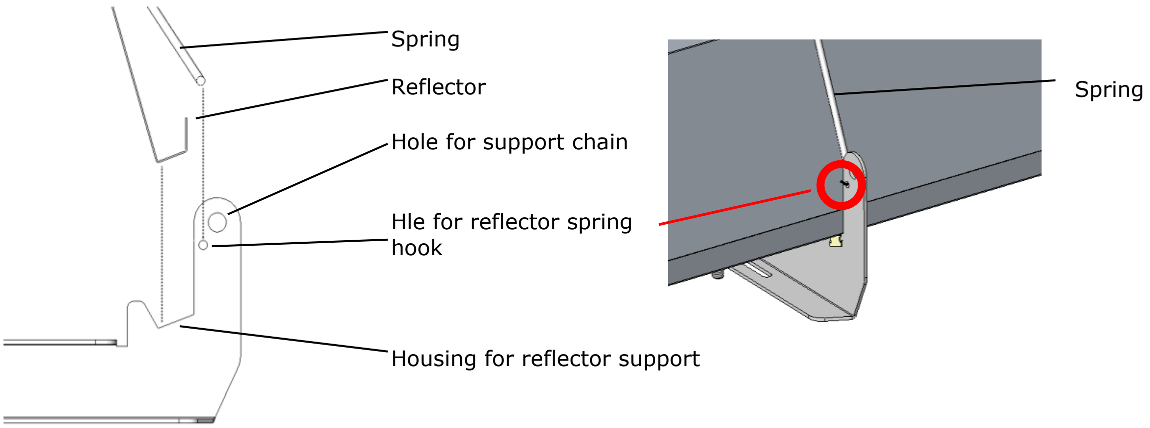


Figure 3.22
Housing for reflectors



3. Continue with the positioning of the next reflector, that has to be overlapped of 15-20 cm to the preceding one (see figures 3.7 – 3.11). Continue with this operation of positioning of the reflectors till reach the start reflectors.

Figure 3.23
Mounting sequence
of reflectors

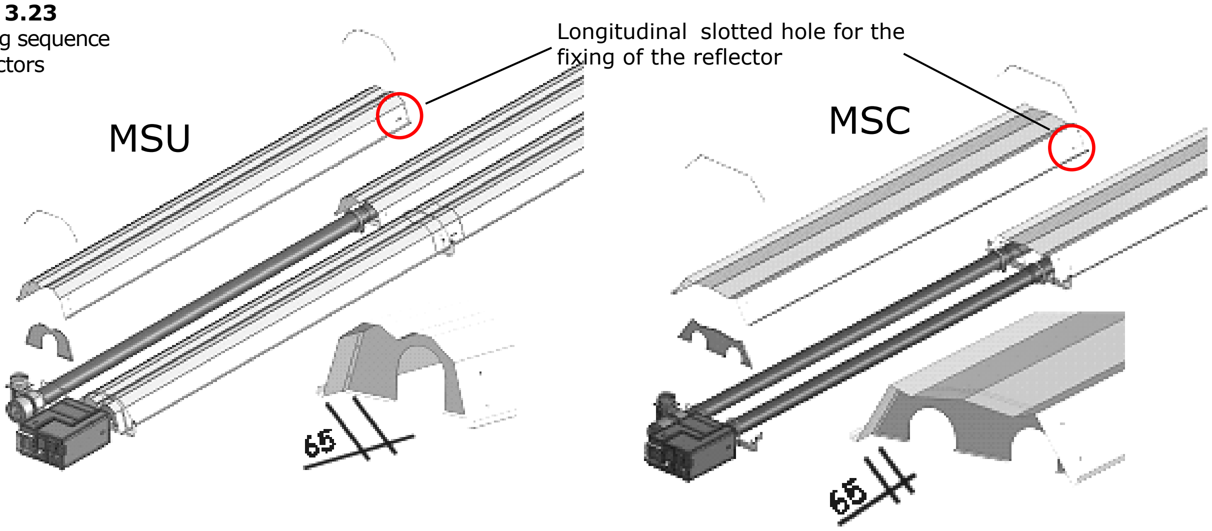
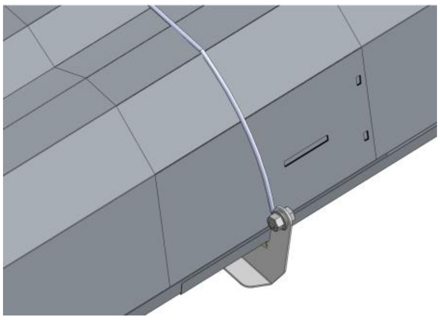


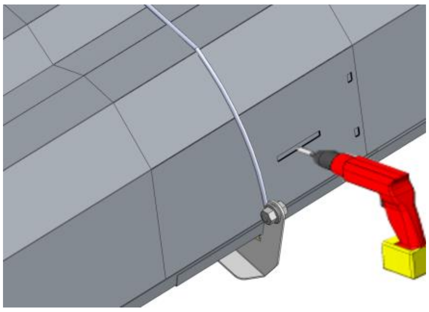
Figure 3.24
Indication of fixing
of reflectors

- **In the MSU and MSC models the slotted end of the reflector must always be placed in the direction of the elbow.**
- **If you are assembling an MSM model, the slotted end of the reflectors must always be placed in the direction of the fan.**

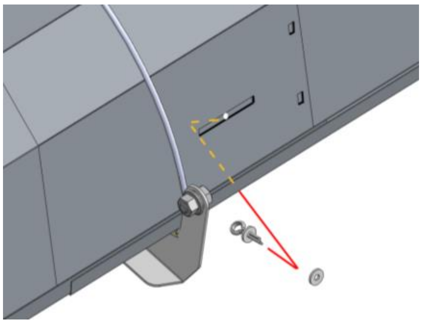
The reflectors are to be attached to one another using a split pin and two washers. Fastening is to be performed as follows:



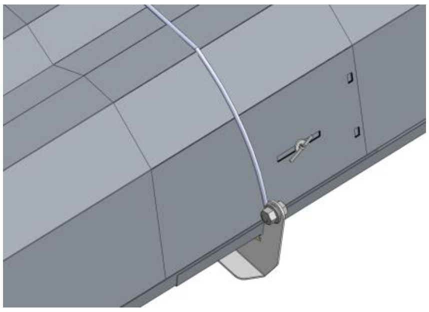
1) Overlay next reflector



2) Use a 4.5 mm bit to bore the lower reflector in the centre of the slot



3) Prepare split pin with a washer and insert it, from the inside towards the outside, through the hole and slot of the reflectors



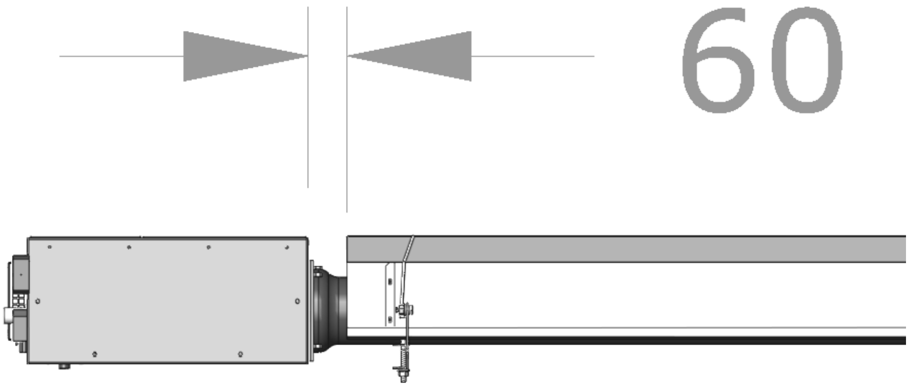
4) Apply the second washer and bend the ends of the split pin as shown in the drawing.

MSU: place a split pin on the outer side of each overlapping reflector (on the reflectors on both the burner side and the fan side).

MSC /MSM: apply a split pin on each side of the overlapping reflector.

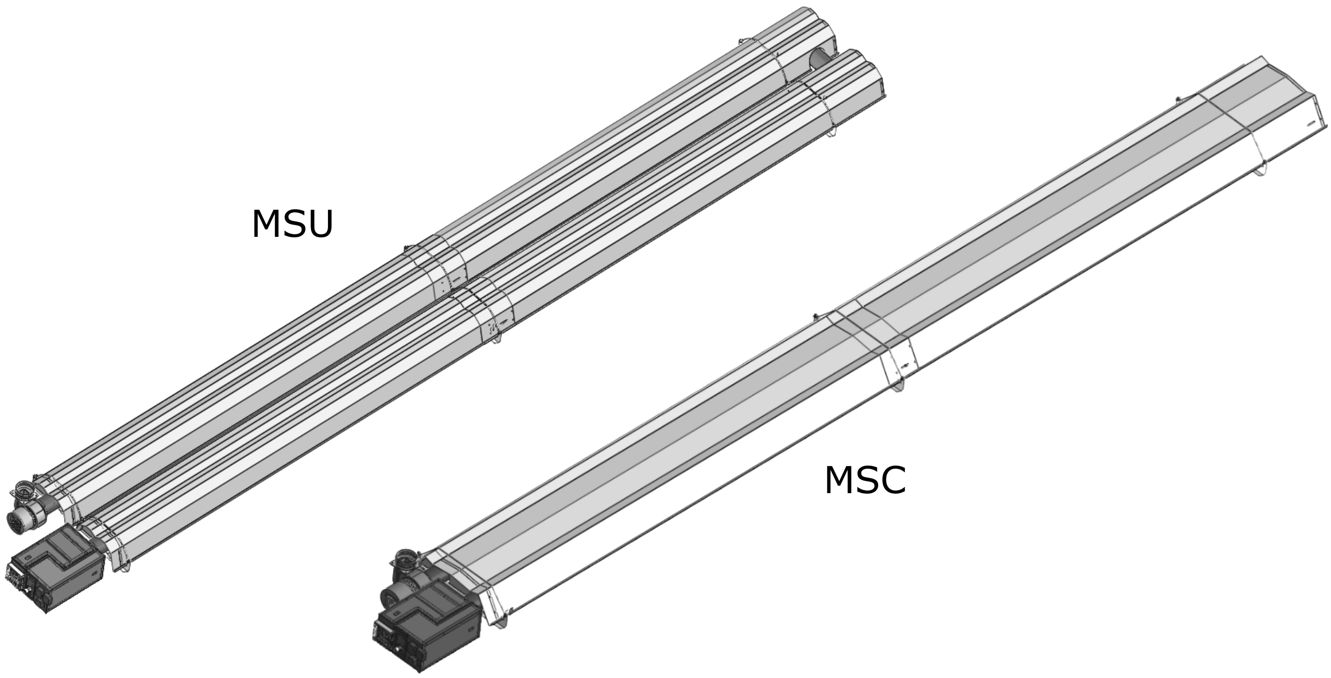
4. Positioning of the reflector on burner and/or fan side

Figure 3.25
Positioning of the reflector on burner and/or fan side



After securing all reflectors to one another with the split pins and after attaching the fastening springs, reflector positioning is complete.

Figure 3.26
Examples of complete modules



3.9. Mounting of the chimney

Particular attention must be paid at the fumes section

Flue pipes and/or any external air inlet ducts must be made only with CE homologated tubes and, in any case, in accordance with the UE 305/201 regulations, which have fixed harmonized conditions for the commercialization of construction products and abrogated the directive 89/106/CEE.

Install the installation of the fume expulsion flue for type B and C units (Figure 3.27), and the air intake tube for type C units (Figure 3.28, 3.29, 3.30).

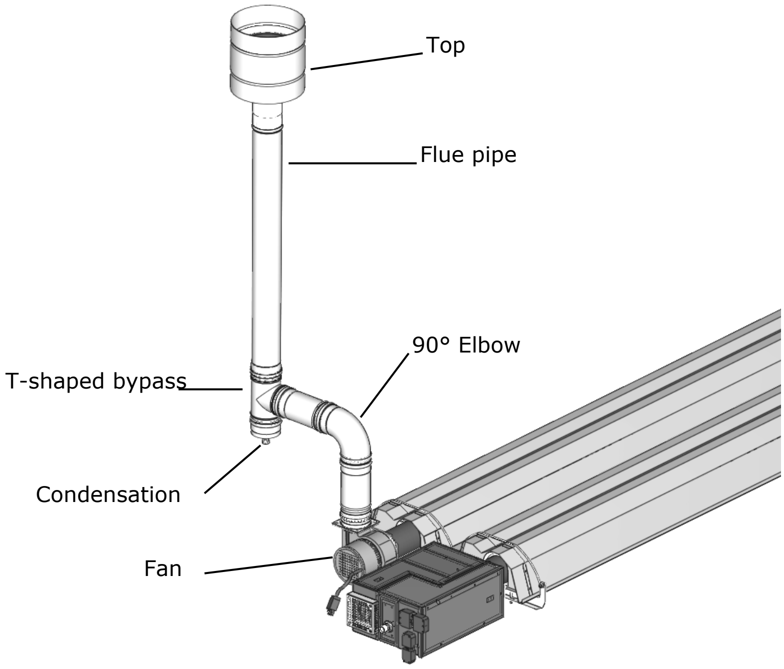


Figure 3.27
Fastening of flue pipe for expulsion of fumes complete with condensation collection

To execute the installation of the air intake tube, it is necessary to use a specific flange, which must be applied over the opening of the combustion air intake. If the system is ordered with external air intake, the burner will be provided with the intake valve. Otherwise, the following modifications will be required.

Figure 3.28

- In case the burner is supplied with air intake plate (present only in some models), just remove the screws that fix this plate, put the specific gasket, the external air intake flange and screw again.

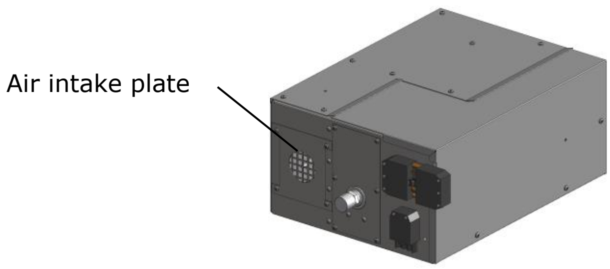


Figure 3.29

- Install the intake flange for external air and the gasket

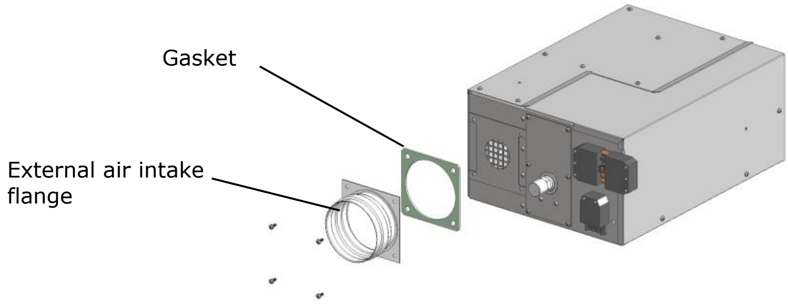
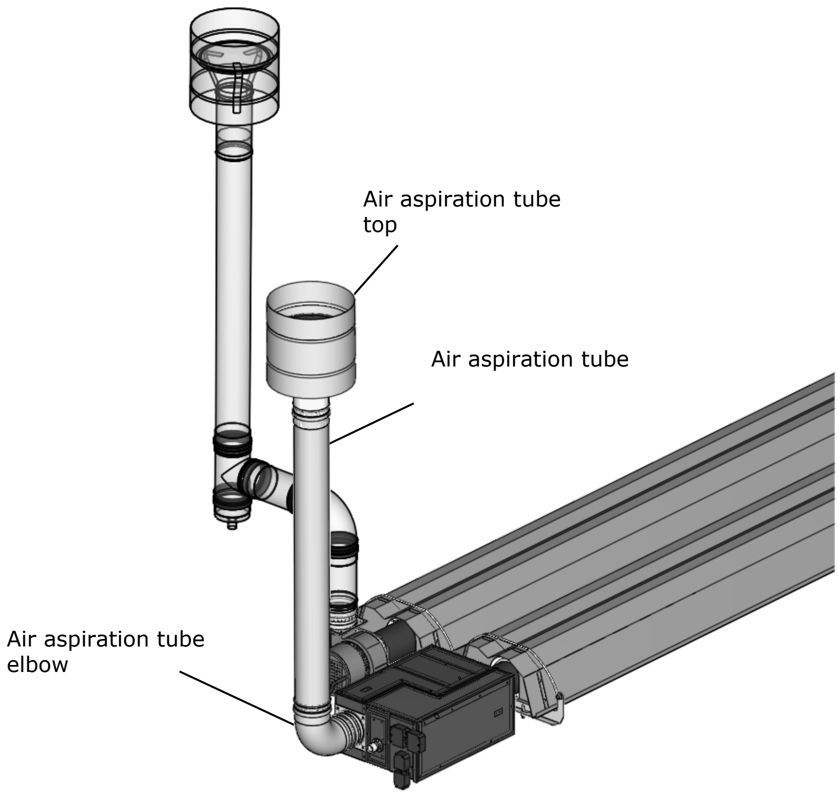


Figure 3.30
Flue pipe positioning
External air intake



Size the length of the flue pipe so that the discharge and intake tubes protrude from the roof or side walls. Observe the minimum distances set forth by standards for gas systems (Figures 3.31-3.37) and in any case do not exceed the total length as set forth in Table 3.3.

Tables 3.3
Maximum length of flue pipes for expulsion and intake

Model	Power* (kW)	Maximum length including expulsion and intake tubes (m)	Unit type
MSU 3 M	15.1	20.0	B22 - C12 - C32 - C42
MSU 6 L	27	15.0	B22 - C12 - C32 - C42
MSU 6 H	37.8	15.0	B22 - C12 - C32 - C42
MSU 9 L	42.2	10.0	B22
MSU 9 H	51.9	10.0	B22
MSC 6 L	20.5	15.0	B22 - C12 - C32 - C42
MSC 6 H	32.4	15.0	B22 - C12 - C32 - C42
MSC 9 L	27	10.0	B22 - C12 - C32 - C42
MSC 9 H	42.2	10.0	B22
MSC 12 M	37.8	6.0	B22 - C12 - C32 - C42
MSM 12 L	27	15.0	B22 - C12 - C32 - C42
MSM 12 H	37.8	15.0	B22 - C12 - C32 - C42
MSM 18 L	42.2	10.0	B22
MSM 18 H	51.9	10.0	B22

* Hs in compliance with EN 437

N.B.:
Each 90° elbow corresponds to a linear length of 0.9 m.

Use flue pipes as required by current standards.

The applicable standard requires an outlet height (where outlet height is interpreted as the summit of the flue pipe / smokestack, regardless of any chimney tops) which must be beyond the so-called reflux area, in order to avoid the creation of counter-pressure which would prevent the free discharge into the atmosphere of flue gases. Therefore, the minimum heights as indicated in Figures 3.38 must be adopted.

The ducts for the intake of combustion air and for the discharge of fumes must be metallic, made of materials which ensure long-term resistance to normal mechanical stress, heat and the action of flue gases and any condensation produced. Corrugated ducts may not be used.

It is possible to use either rigid aluminium tube (thickness 1.5 mm) or rigid stainless steel tube. To avoid problems due to dilation (especially between the fumes discharge and intake), it is permissible to use double wall flexible stainless steel tube with smooth inner wall (in accordance with EN 1856-1: 2005 and EN 1856-2: 2006) for the expulsion of flue gases.

Figure 3.31
Minimum distances of flue pipe for flat roof

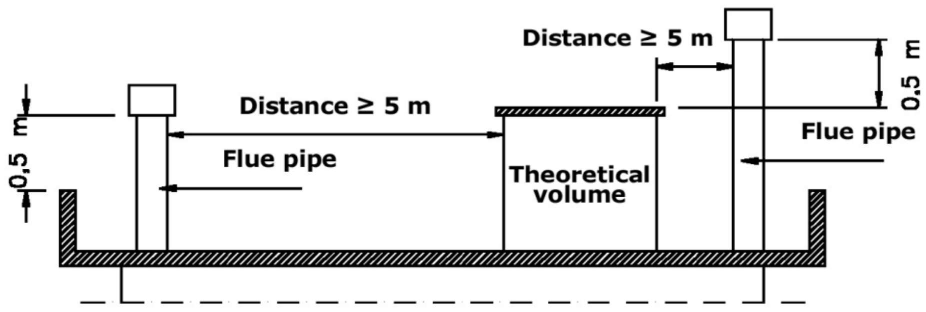


Figure 3.32
Minimum distances of flue pipe for roof at 15°

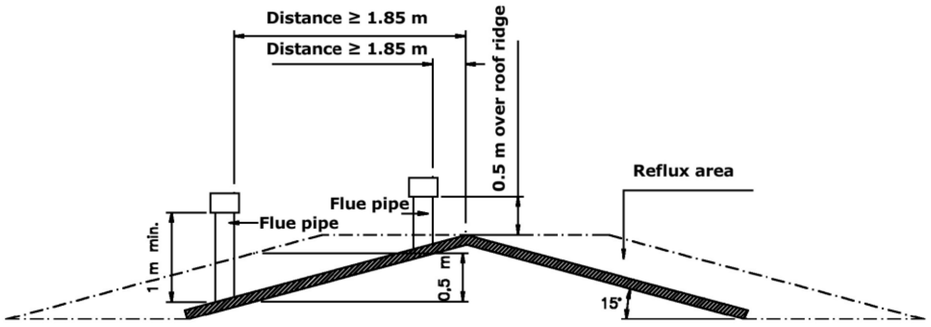


Figure 3.33
Minimum distances of flue pipe for roof at 30°

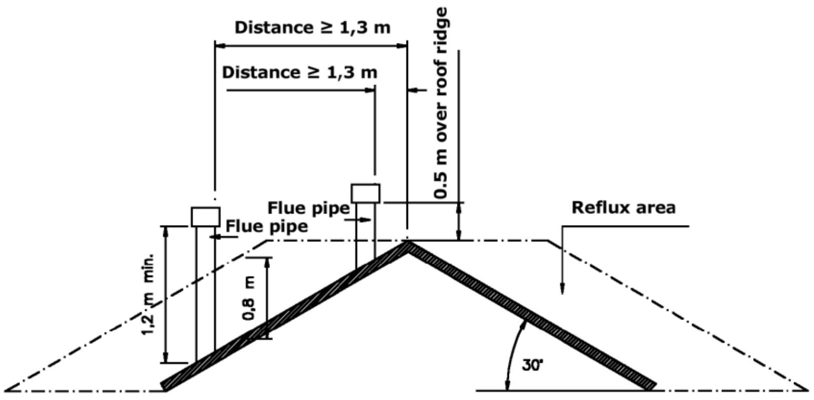


Figure 3.34
Minimum distances of flue pipe for roof at 45°

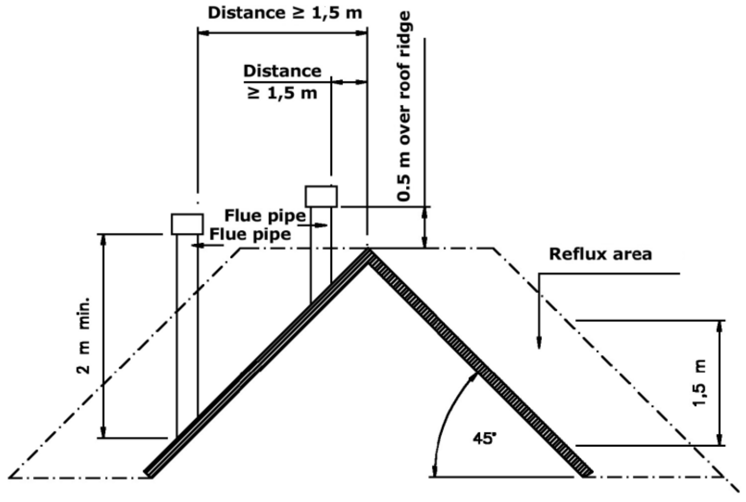


Figure 3.35
Minimum distances of flue pipe for roof at 60°

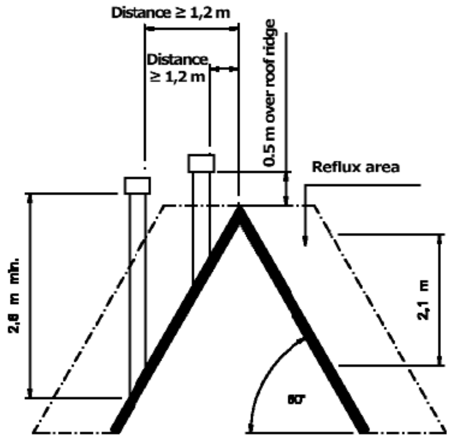


Figure 3.36
Side outlets

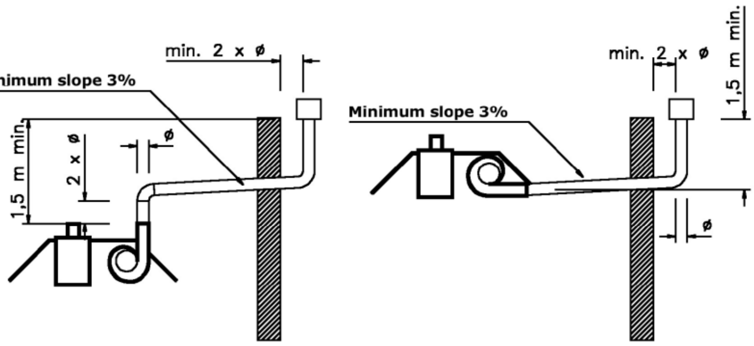


Figure 3.37
Side outlets

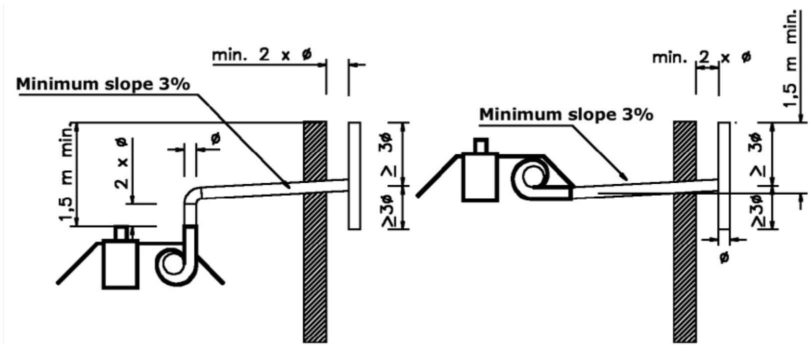
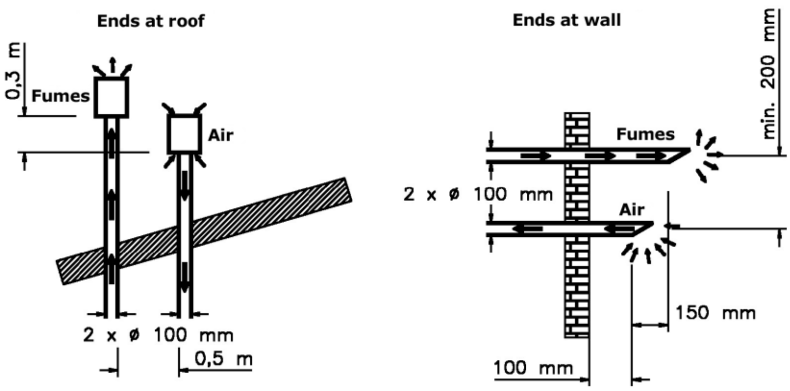


Figure 3.38
Minimum distances for expulsion and intake



The air intake must be placed below the fume discharge outlet. Use only approved end pieces for both combustible air intake and for fumes discharge.

3.10. Connection to gas mains

(Flexible tubes and ball cocks are not included in the supply)

Make the connection to the gas mains with a flexible stainless steel tube which meets the requirements of national standard (Figure 3.39).

This work must be carried out by **qualified personnel!**

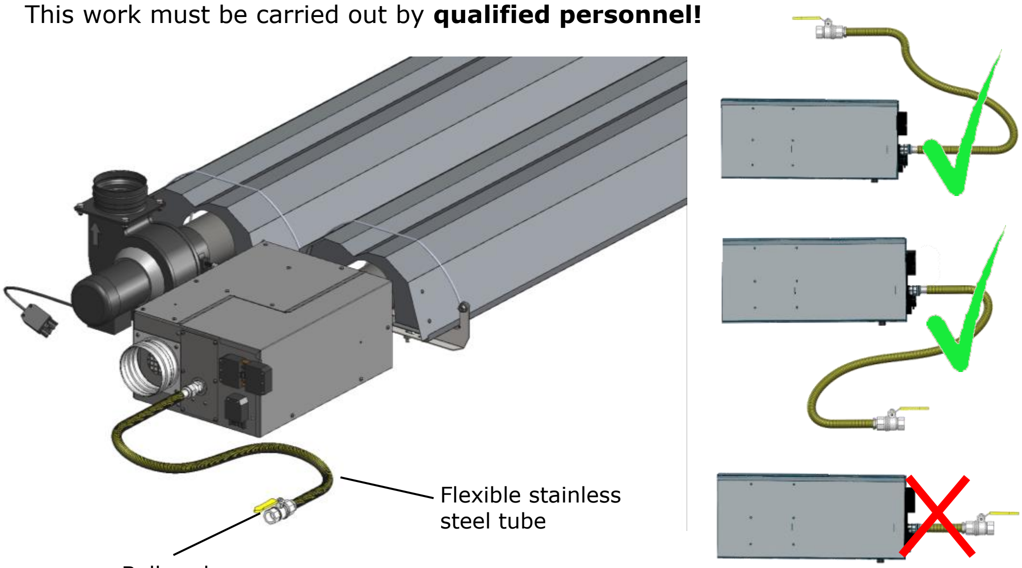
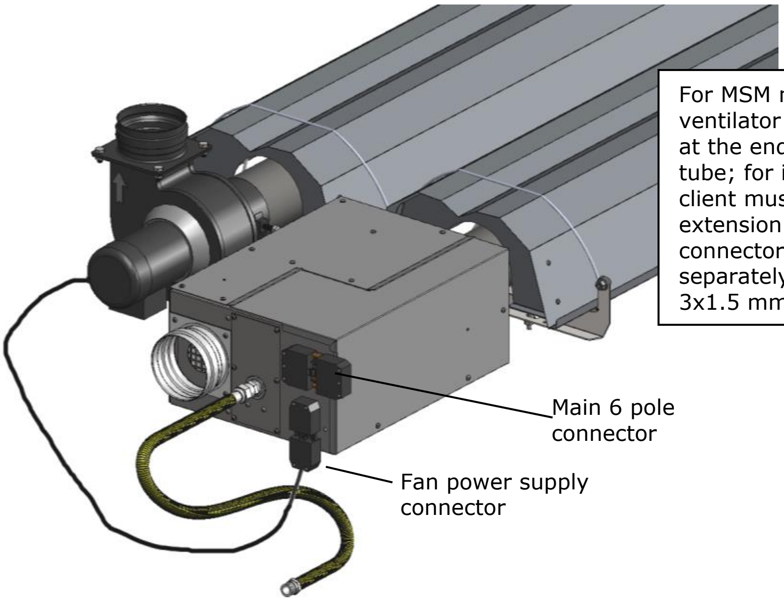


Figure 3.39
Connection to gas mains

N.B: The flex pipe in connection to the gas net must have an adequate length, so that it can guarantee a free movement of the burner during its operation and compensate the dilatation of the radiant tubes (see figure).

3.11. Connection to electrical mains

Make the electrical connection of the fan motor by connecting the special 4-pole plug to the socket (Figure 3.40).
Check that the connection to the electrical mains is made with an earth ground wire that is a couple of centimetres longer than the other wires.
A working earth ground system is indispensable.
Depending on the system type, it will be necessary a proper dimensioning of the power supply cable, to be done by a qualified technician.
Make the electrical connection as shown in the diagram in Figure 3.41.
This work must be carried out by **qualified personnel!**



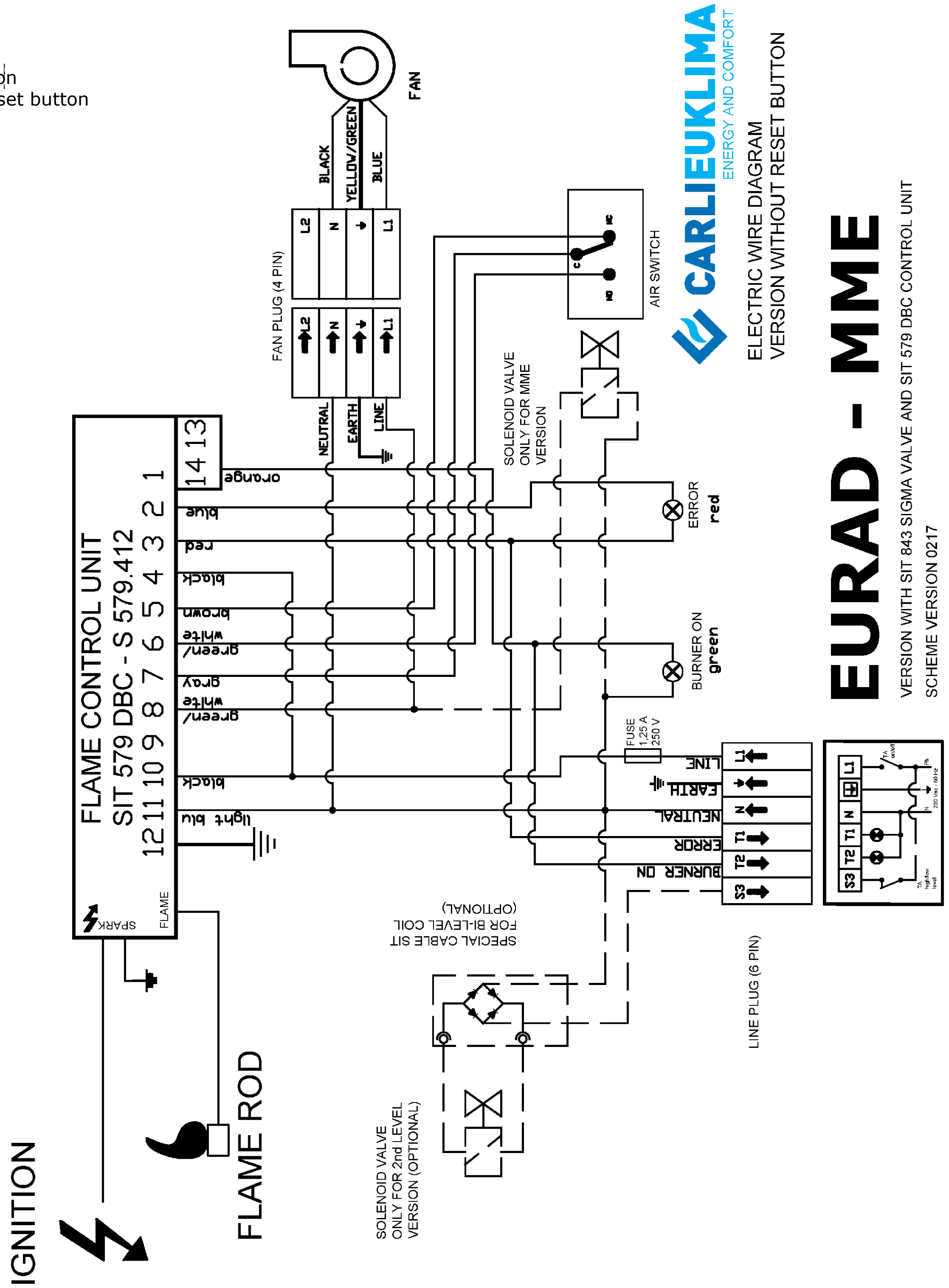
For MSM models the ventilator must be mounted at the end of the radiant tube; for its connection the client must create a proper extension with the 4 pins connectors supplied separately (Ph+N+earth, 3x1.5 mm^2)

Figure 3.40
Position of plugs

Make the connection with a 6-pole WIELAND connector

L1	=	Phase 220 V AC
Earth	=	Earth ground
N	=	Neutral 220 V AC
T1	=	Remote signalling Burner Block
T2	=	Remote signalling Operating Burner
S3	=	$1^{st}/2^{nd}$ stage (optional)

Figure 3.41
Electrical connection
version without reset button



ELECTRICAL INSTALLATION MUST BE CARRIED OUT IN COMPLIANCE WITH CURRENT NATIONAL AND/OR EUROPEAN STANDARDS.

INSTALLATION OF THE RADIANT TUBE IS NOW COMPLETE

4. STARTING THE SYSTEM, USE AND MAINTENANCE

The start-up and all installation, modification or maintenance work on a gas system located either indoors or outdoors must be performed by a qualified company that is authorized to perform this kind of work. The company that performs installation must inform competent authorities and the gas company upon starting work.

The company that performs installation must also issue a certificate of conformity along with a declaration of materials used.

(As required by current law)

4.1. Starting the system

System start-up is performed by following these steps:

- Ask the local gas company for the following information:

- type of gas
- calorific value in kWh / m^3

Maximum CO_2 content in fumes

- gas pressure

Commissioning of the system must be performed by a **qualified technician.**

It is obligatory to issue a document stating that the work has been properly performed.

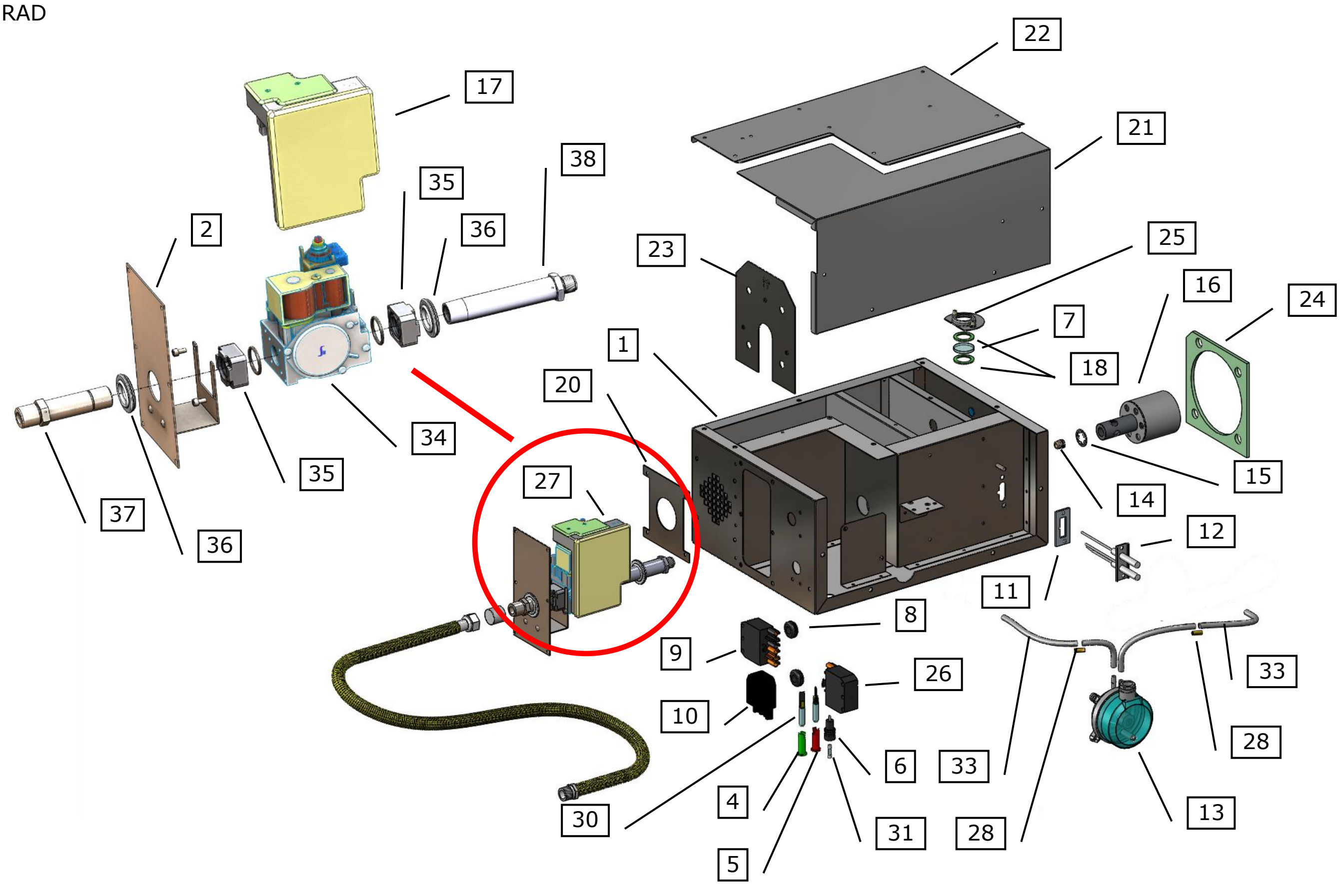
- Visual check of module installation and electrical connections (check the proper PHASE - NEUTRAL - EARTH GROUND connection) and check of gas connection seal.

EURAD burners are pre-calibrated in the factory based on the power requested by the client, and which can be found on the identification plate.

This pre-calibration takes place during the product realization process with a given gas pressure upstream from the valve set at 20 mbar for the methane versions and 37 mbar for the LPG versions.
Therefore, at the moment of installation, EURAD burners do not require any further adjustment.
Please remember what is stated by National standard.

Figure 4.1 shows all the components of the EURAD burner.

Figure 4.1
Burner components
EURAD



N°	DESCRIPTION	N°	DESCRIPTION
1	EURAD BURNER BOX	22	TORCH SIDE COVER
2	VALVE FLANGE	23	AIR ADJUSTMENT PLATE
4	GREEN GEM	24	DELIVERY TUBE FLANGE GASKET
5	RED GEM	25	GLASS HOLDER FLANGE
6	FUSE HOLDER	26	6-POLE MALE CONNECTOR
7	THERMAL GLASS	27	VALVE GROUP SIT 843
8	CABLE PASSAGE RUBBER	28	CAPILLARY
9	6-POLE FEMALE CONNECTOR	30	NEON SIGNAL LAMPS
10	4-POLE FEMALE CONNECTOR	31	FUSE
11	ELECTRODE GASKET	32	ADHESIVE BAR
12	ELECTRODE	33	SILICON TUBE
13	PRESSURE SWITCH	34	GAS VALVE SIT 843
14	NOZZLE	35	STRAIGHT CONNECTION ½" WITH OR GASKET
15	TOOTHED WASHER	36	TUBE PASSAGE GASKET
16	TORCH	37	COUPLING ½" M-M
17	FLAME CONTROL CARD SIT 579.402	38	NOZZLE HOLDER EURAD-06
18	GASKET FOR THERMAL GLASS		
20	AIR INTAKE PLATE		
21	ELECTRIC COMPONENTS COVER		

■ Check the version of the burner (Methane / LPG) and the power to install based on the model and the length of the radiant tubes, referring to the machine's identification plate. Calibration of the burner is carried out in the factory, based on the model and type of gas requested. It is however advisable to check the calibration prior to commissioning. Tables 4.1, 4.2, and 4.3 show the approximate calibration values for each model and for each type of gas.

Table 4.1
Calibration values for
EURAD MSU

ATTENTION

The **two-stage** version requires a **double calibration**!!

The pressure listed in the column **Gas pressure to nozzle** indicates the calibration pressure for the **maximum load (HI –level)**, whereas the pressure listed for the **partial load (LOW – level)** is about equal to the **40%** of the **Gas pressure to nozzle**.

With the calibration of the gas pressure to nozzle at 40%, the thermal power id reduced to the 30%.

The **single - stage** version has to be calibrated only with the pressure indicated in the **Gas pressure to nozzle** column.

Model	Thermal output* Hs (kW)	Thermal output Hi (kW)	Length Tubes (m)	Type of gas	Calorific value PCI (kwh/m3)	Gas consumption (m3/h)	Gas consumption kg/h	Ø Nozzle (mm)	Gas pressure at nozzle (mbar)	Ø Air adjustment plate (mm)	Ø Air intake regulation plate (mm)	Pressure switch (mbar)	Mixer YES/ NO	Mixer Length (m)
MSU 3 M				G 20	9.45	1.44		3.1	9.2	10				
MSU 3 M	15.1	14	6	G 30	32.25		1.11	1.9	28.2	11	65	1.4	YES	1
MSU 3 M				G 31	24.45		1.06	1.9	36	11				
MSU 6 L				G 20	9.45	2.57		4.2	9	15				
MSU 6 L	27	24	12	G 30	32.25		1.98	2.5	28	15	50	1.6	YES	1
MSU 6 L				G 31	24.45		1.9	2.5	35.7	15				
MSU 6 H				G 20	9.45	3.6		5	9	25				
MSU 6 H	37.8	34	12	G 30	32.25		2.77	2.9	27.8	22	50	1.4	YES	1
MSU 6 H				G 31	24.45		2.66	2.9	35.5	22				
MSU 9 L				G 20	9.45	4.02		5.3	9	25				
MSU 9 L	42.2	39	18	G 30	32.25		3.09	3.1	28	25	50	1.1	NO	
MSU 9 L				G 31	24.45		2.97	3..1	35.7	25				
MSU 9 H				G 20	9.45	4.95		6	9.4	35				
MSU 9 H	51.9	48	18	G 30	32.25		3.8	3.5	27.5	28	65	0.95	YES	1
MSU 9 H				G 31	24.45		3.65	3.5	35.3	28				

* Hs in compliance with EN 437

Supply dynamic pressure for **methane** (**G 20**) **20 mbar**

Supply dynamic pressure for **butane (G 30)** **28-30 mbar**

Supply dynamic pressure for **propane (G 31)** **37 mbar**

Table 4.2
Calibration values for
EURAD MSM

ATTENTION

The **two-stage** version requires a **double calibration**!!

The pressure listed in the column **Gas pressure to nozzle** indicates the calibration pressure for the **maximum load (HI –level)**, whereas the pressure listed for the **partial load (LOW – level)** is about equal to the **40%** of the **Gas pressure to nozzle**.

With the calibration of the gas pressure to nozzle at 40%, the thermal power id reduced to the 30%.

The **single - stage** version has to be calibrated only with the pressure indicated in the **Gas pressure to nozzle** column.

Model	Thermal output* Hs	Thermal output Hi	Length Tubes	Type of gas	Calorific value PCI	Gas consumption		Ø Nozzle	Gas pressure at nozzle	Ø Air adjustment plate	Ø Air intake regulation plate	Pressure switch	Mixer	
	(kW)	(kW)	(m)		(kwh/m3)	(m3/h)	(kg/h)	(mm)	(mbar)	(mm)	(mm)	(mbar)	YES/ NO	Length (m)
MSM 12 L				G 20	9.45	2.57		4.2	9	20				
MSM 12 L	27	24	12	G 30	32.25		1.98	2.5	27.8	20	50	0.95	NO	
MSM 12 L				G 31	24.45		1.9	2.5	35.6	20				
MSM 12 H				G 20	9.45	3.6		5	9	28				
MSM 12 H	37.8	34	12	G 30	32.25		2.77	2.9	27.8	28	50	0.8	YES	2
MSM 12 H				G 31	24.45		2.66	2.9	35.6	28				
MSM 18 L				G 20	9.45	4.02		5.3	9	25				
MSM 18 L	42.2	39	18	G 30	32.25		3.09	3.1	27.8	25	50	1.1	NO	
MSM 18 L				G 31	24.45		2.97	3.1	35.6	25				
MSM 18 H				G 20	9.45	4.95		6	9.4	35				
MSM 18 H	51.9	48	18	G 30	32.25		3.8	3.5	27.8	31	65	0.8	YES	1
MSM 18 H				G 31	24.45		3.65	3.5	35.6	31				

*Hs in compliance with EN 437

Supply dynamic pressure for **methane** (**G 20**) **20 mbar**

Supply dynamic pressure for **butane (G 30) 28-30 mbar**

Supply dynamic pressure for **propane (G 31) 37 mbar**

Table 4.3
Calibration values for
EURAD MSC

ATTENTION

The **two-stage** version requires a **double calibration**!!

The pressure listed in the column **Gas pressure to nozzle** indicates the calibration pressure for the **maximum load (HI –level)**, whereas the pressure listed for the **partial load (LOW – level)** is about equal to the **<u>40%</u>** of the **Gas pressure to nozzle**.

With the calibration of the gas pressure to nozzle at 40%, the thermal power id reduced to the 30%.

The **single - stage** version has to be calibrated only with the pressure indicated in the **Gas pressure to nozzle** column.

Model	Thermal output* Hs	Thermal output Hi	Length Tubes	Type of gas	Calorific value PCI	Gas consumption		Ø Nozzle	Gas pressure at nozzle	Ø Air adjustment plate	Ø Air intake regulation plate	Pressure switch	Mixer	
	(kW)	(kW)	(m)		(kwh/m3)	(m3/h)	(kg/h)	(mm)	(mbar)	(mm)	(mm)	(mbar)	YES/ NO	Length (m)
MSC 6 L				G 20	9.45	1.95		3.8	9	15				
MSC 6 L	20.5	19	12	G 30	32.25		1.5	2.2	27.8	15	50	0.95	NO	
MSC 6 L				G 31	24.45		1.44	2.2	35.6	15				
MSC 6 H				G 20	9.45	3.09		4.6	9.1	19				
MSC 6 H	32.4	30	12	G 30	32.25		2.37	2.7	28	18	50	1.4	YES	1
MSC 6 H				G 31	24.45		2.28	2.7	36	18				
MSC 9 L				G 20	9.45	2.57		4.2	9	15				
MSC 9 L	27	25	18	G 30	32.25		1.98	2.5	27.8	15	50	1.4	NO	
MSC 9 L				G 31	24.45		1.9	2.5	35.6	15				
MSC 9 H				G 20	9.45	4.02		5.3	9	28				
MSC 9 H	42.2	39	18	G 30	32.25		3.09	3.1	27.9	25	50	0.95	NO	
MSC 9 H				G 31	24.45		2.97	3.1	35.8	25				
MSC 12 M				G 20	9.45	3.6		5	9	20				
MSC 12 M	37.8	35	24	G 30	32.25		2.77	2.9	27.6	18	65	1.6	YES	1
MSC 12 M				G 31	24.45		2.66	2.9	35.4	18				

* Hs in compliance with EN 437

Supply dynamic pressure for **methane (G 20) 20 mbar**
Supply dynamic pressure for **butane (G 30) 28-30 mbar**
Supply dynamic pressure for **propane (G 31) 37 mbar**

■ Check that gas is supplied by measuring the pressure at the inlet of the valve assembly after checking that the burner is off.

MAXIMUM INLET PRESSURE 50 mbar

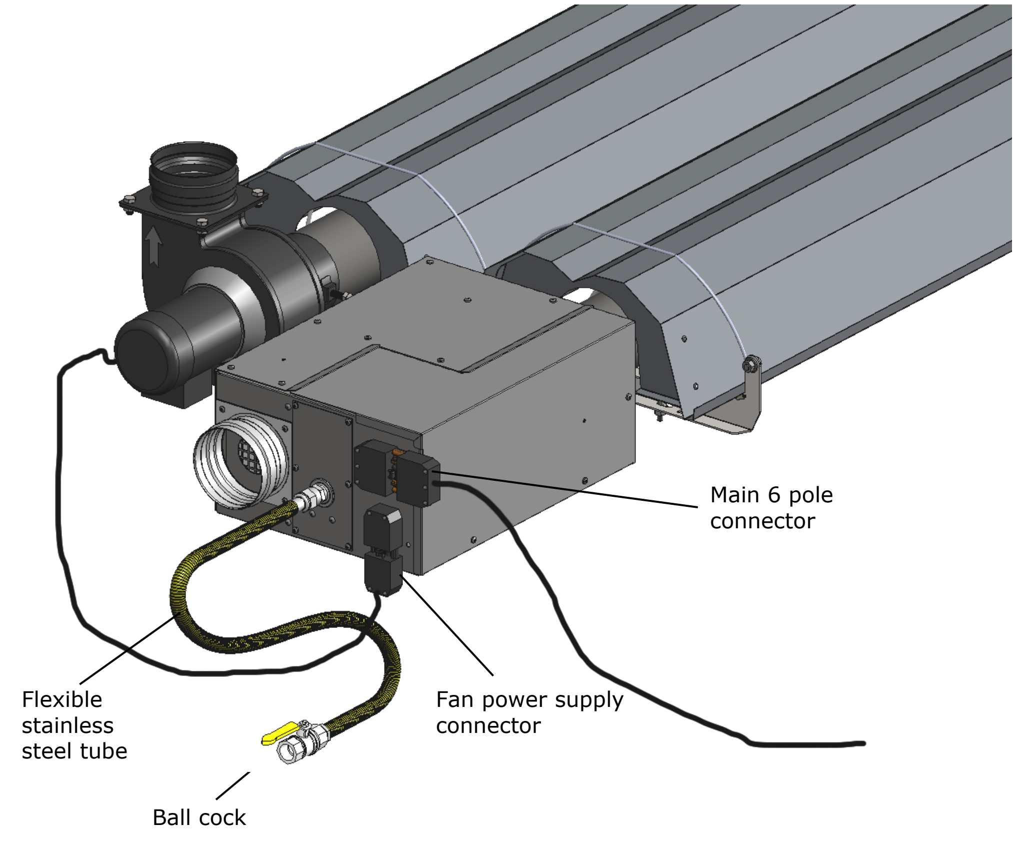
■ Check that there is electrical current (6 poles connector) Be careful of the polarity! (See electrical diagram in Figure 3.41)

■ Power up the unit by connecting the power plug to the socket of the burner as shown in Figure 4.2 (6-pole connector). Give the activation signal to the burner by means of the room thermostat

■ The supply must be of the same potential as the one used for the room thermostat.

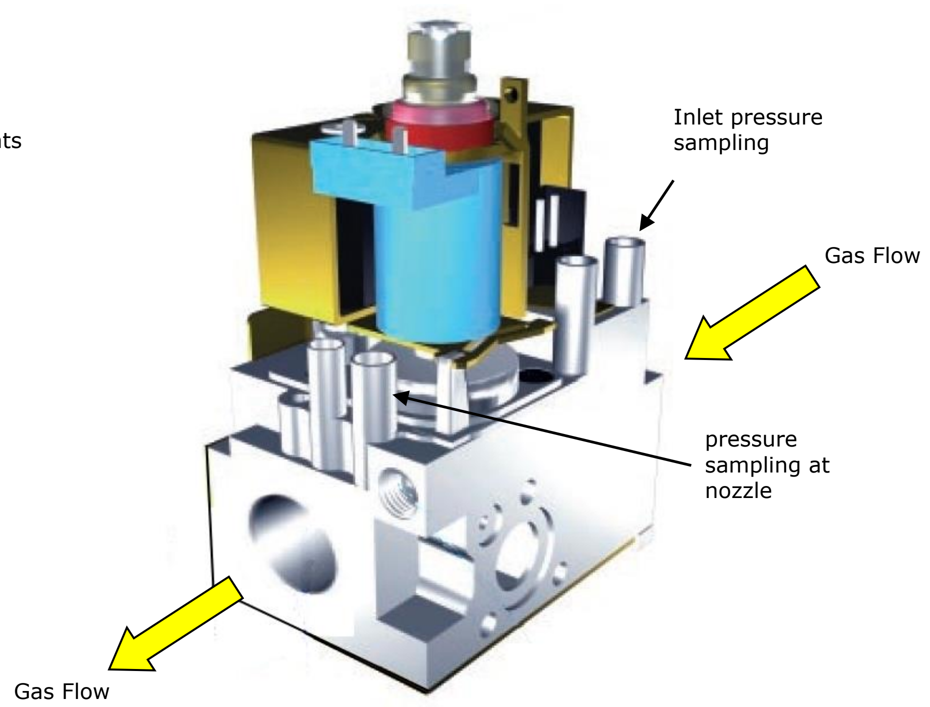
■ Check the wiring between the burner and the control panel, especially Phase, Neutral, Earth, T1 (Operation and block signalling) and S3 only for the two-stage version. An incorrect wiring can damage the flame control card.

Figure 4.2
Unit connection



■ While the burner is on, check the inlet pressure of the valve group as indicated in Figure 4.3 and calibrate the pressure according to the power of the burner installed (see Table 4.4).

Figure 4.3
Calibration and detection points of the gas valve SIT 843



CALIBRATION PROCEDURE

One-stage version

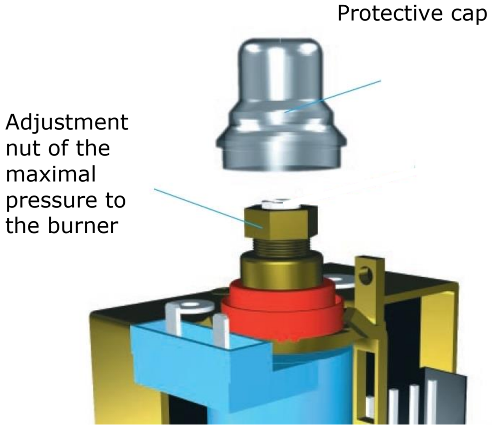
The **one-stage** version must be calibrated following the values shown in the "**Pressure at nozzle**" column, by acting exclusively on the regulation nut of the maximal pressure at burner.

Attention:
In the **one-stage** version**,** we recommend NOT to use the plastic screw, reserved to the regulation of the minimum pressure at burner, as it modifies the exit pressure!

To obtain a correct regulation of the pressure on the **one-stage** versions we recommend to follow the following procedure:

- Connect a manometer at the point for inlet pressure sampling and a manometer at the point for outlet pressure sampling.
- Remove the protective cap.
- Turn the regulation nut of the maximal pressure (by using a key 10) until is reached the pressure indicated in the column "**Pressure at nozzle**" in the Table 4.4 below.
- **Pay attention to the comburent type used.**

Figure 4.4
Pressure regulation one-stage version



Two-stage version

Two-stage version requires a specific cable with integrated detection circuit and IP40 degree of protection.

Figure 4.5
Cable with rectifier
for Two-stage version.

Furthermore, **Two-stage** version requires a double calibration of the pressure.

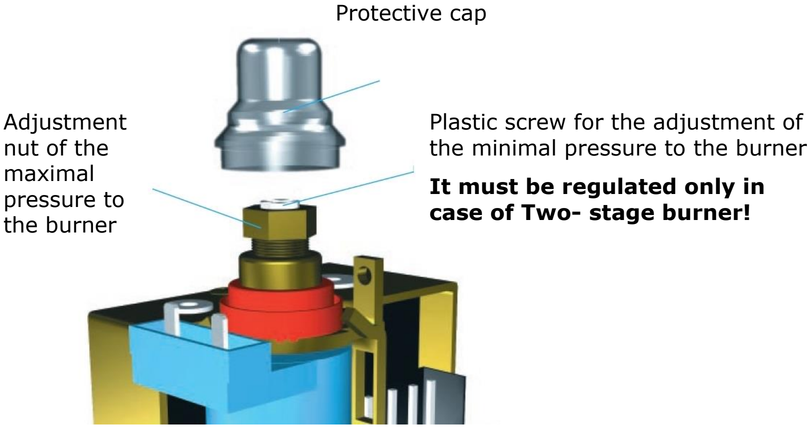
Regulation of the maximal pressure at the nozzle (High-Level) and regulation of the minimum pressure at nozzle (Low-level).

To obtain a correct adjustment of the pressure on the **Two-stage** versions, we recommend to follow the procedure below:

- Connect a manometer at the point for inlet pressure sampling and a manometer at the point for outlet pressure sampling.
- Remove the protective cap
- Ensure that the modulating coil is powered**.**
- Turn the regulation nut of the maximal pressure (by using a key 10) until is reached the pressure indicated in the column "**Pressure at nozzle**" indicated in the Table 4.4 below.

  Pay attention to the type of comburent used.

Figure 4.6
Pressure regulation
Two-stage version



- Adjust with a slotted screwdriver the minimum pressure for the low level, as indicated in the column "**Pressure at nozzle** in Table 4.4 below.

Table 4.4
Pressure values
for calibration

Methane G20				
Model	Power* (kW)	Nozzle Ø (mm)	Max pressure at nozzle One and two stages (High-level) (mbar)	Min. pressure at nozzle Two-stages only (Low-level) (mbar)
MSU 3 M	15,1	3,1	9,2	3,7
MSU 6 L	27	4,2	9,0	3,6
MSU 6 H	37,8	5,0	9,0	3,6
MSU 9 L	42,2	5,3	9,0	3,6
MSU 9 H	51,9	6,0	9,4	3,8
MSC 6 L	20,5	3,8	9,0	3,6
MSC 6 H	32,4	4,6	9,1	3,6
MSC 9 L	27	4,2	9,0	3,6
MSC 9 H	42,2	5,3	9,0	3,6
MSC 12 M	37,8	5,0	9,0	3,6
MSM 12 L	27	4,2	9,0	3,6
MSM 12 H	37,8	5,0	9,0	3,6
MSM 18 L	42,2	5,3	9,0	3,6
MSM 18 H	51,9	6,0	9,1	3,6

*Hs according to EN 437

Butane G30				Propane G31		
Model	Power* (kW)	Nozzle Ø (mm)	Max G30 pressure at nozzle One and two stages (High-level) (mbar)	Min. pressure at nozzle Two-stages only (Low-Level) (mbar)	Max. G31 pressurwe at nozzle One and two stages (High-level) (mbar)	Min. G31 pressure at nozzle Two-stages only (Low-Level) (mbar)
MSU 3 M	15,1	1,9	28,2	11,3	36,0	14,4
MSU 6 L	27	2,5	28,0	11,2	35,7	14,3
MSU 6 H	37,8	2,9	27,8	11,1	35,5	14,2
MSU 9 L	42,2	3,1	28,0	11,2	35,7	14,3
MSU 9 H	51,9	3,5	27,5	11,0	35,3	14,1
MSC 6 L	20,5	2,2	27,8	11,1	35,6	14,2
MSC 6 H	32,4	2,7	28,0	11,2	36,0	14,4
MSC 9 L	27	2,5	27,8	11,1	35,6	14,2
MSC 9 H	42,2	3,1	27,9	11,2	35,8	14,3
MSC 12 M	37,8	2,9	27,6	11,0	35,4	14,2
MSM 12 L	27	2,5	27,8	11,1	35,6	14,2
MSM 12 H	37,8	2,9	27,8	11,1	35,6	14,2
MSM 18 L	42,2	3,1	27,8	11,1	35,6	14,2
MSM 18 H	51,9	3,5	27,8	11,1	35,6	14,2

*Hs according to EN 437

Supply dynamic pressure for **methane (G 20)** **20 mbar**
Supply dynamic pressure for **butane (G 30)** **28-30 mbar**
Supply dynamic pressure for **propane (G 31)** **37 mbar**

A combustion test certifies the correct regulation of the burner. The results of the fume combustion measurement must be recorded in the system or plant booklet.

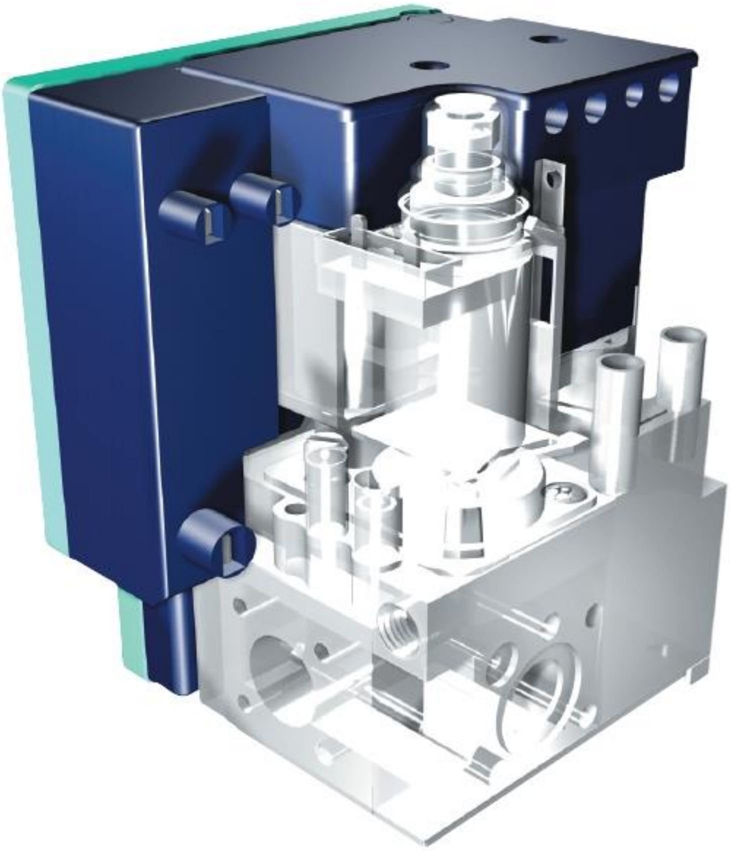
In Table 4.5 are shown the approximate calibration values for each type of model.

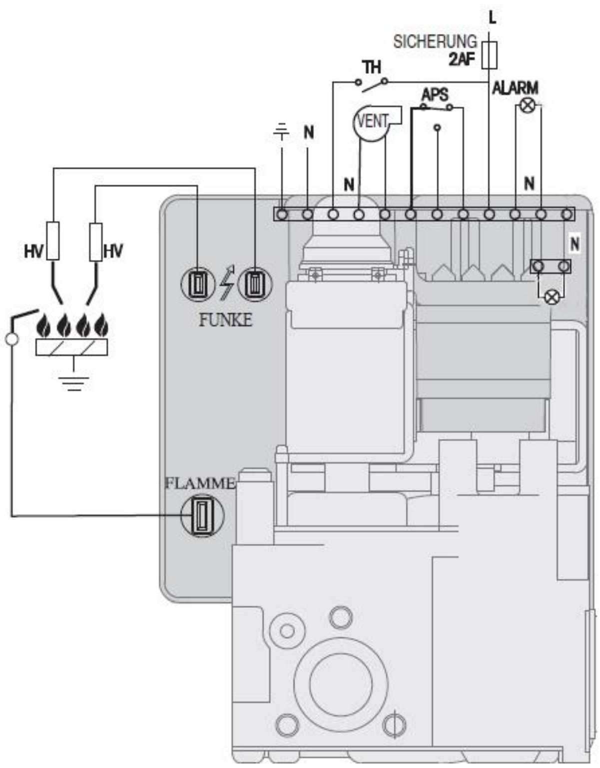
Table 4.5
Approximate values of CO_2 for EURAD models

Model	Power* (kW)	Methane G 20 CO_2 (%)	Butane G 30 CO_2 (%)	Propane G 31 CO_2 (%)
MSU 3 M	15,1	7,1	8,2	8,0
MSU 6 L	27	7,0	7,8	8,0
MSU 6 H	37,8	7,1	9,1	8,8
MSU 9 L	42,2	7,2	7,9	8,7
MSU 9 H	51,9	7,2	8,6	9,0
MSC 6 L	20,5	6,8	7,7	7,8
MSC 6 H	32,4	7,0	8,4	8,4
MSC 9 L	27	7,8	7,5	7,7
MSC 9 H	42,2	6,8	8,5	8,6
MSC 12 M	37,8	6,9	8,8	8,2
MSM 12 L	27	6,4	7,7	8,1
MSM 12 H	37,8	6,7	7,8	7,5
MSM 18 L	42,2	7,0	8,1	8,3
MSM 18 H	51,9	7,2	8,8	8,1

*Hs in accordo con EN 437

Figure 4.7
Flame control card
SIT 579DBC version
EURAD 579.402





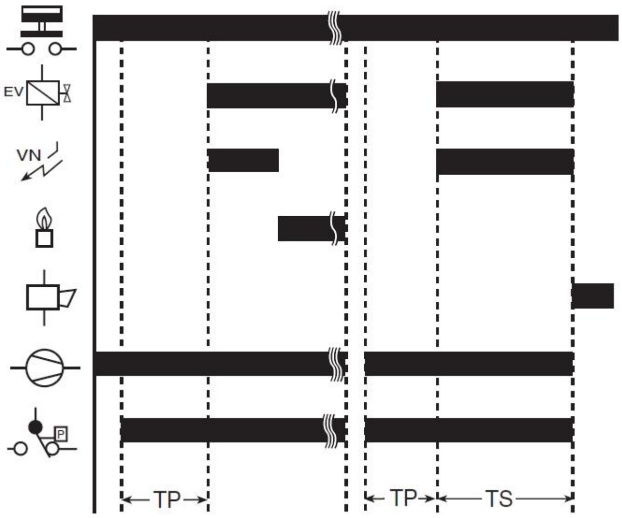
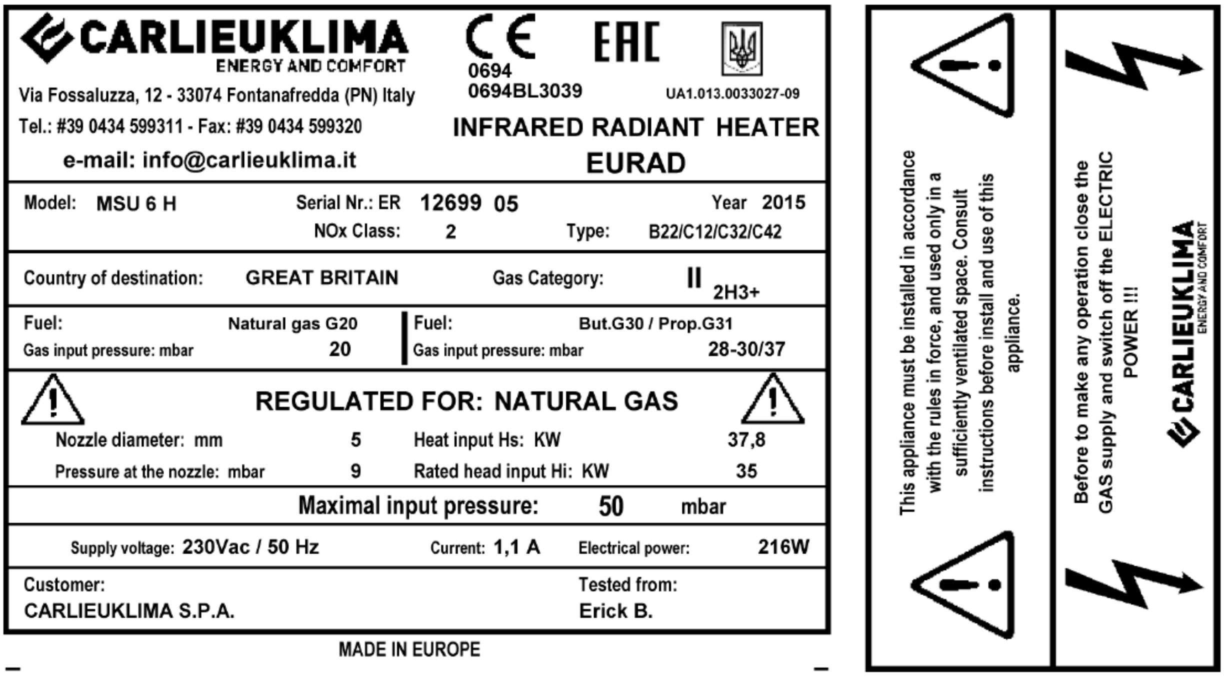


Figure 4.8
Identification plate



4.2. Maintenance of the EURAD system

All users are advised to provide regularly for periodic maintenance of their system (annual maintenance suggested).
This work is to be carried out by an authorized firm.

All work performed during the warranty period must be carried out by qualified technicians.

Failure to notify of any sort of work carried out on the system during the warranty period will be cause for voidance of said warranty.

After each new calibration, all of the parts for adjustment must be sealed.

The annual check with relative measurement of actual system output is required by National standard

4.2.1. TROUBLESHOOTING

The following points are a troubleshooting guide for problems which may occur during start-up and maintenance of the EURAD system. For further information, contact the CARLIEUKLIMA technical service centre.

BURNER DOES NOT WORK

No current arriving to the burner
Check the line with a tester
(220 V AC at terminals L1 - N)

Possible errors:
- Power supply fuse up the line from burner interrupted
- Power supply fuse on burner interrupted
- Room thermostat does not give permission (contact still open)
- The room thermostat is operating in automatic mode and has not been properly programmed.
- Room thermostat does not measure temperature (probe not connected or defective)
- The difference between the room temperature and the set temperature is not large enough for activation (Δt programmed too high)
- Check electrical operation of the room thermostat (output contact).

Burner is shut down
(red shutdown indicator light for burner is on)

- Check Phase – Neutral
- Release by switching power to the burner off and then back on again
- Check the cause for the burner shutdown

Possible causes:
- Ignition does not occur
- Flame detection does not occur
- Lack of fuel

Check the burner wiring

- Use a tester to check the voltage between L1 and N of the power supply connector (230 V AC)
- Use a tester to check the voltage at contacts 4 (phase) and 11 (neutral) of the ignition device (230 V AC); if this voltage is not detected, check the fuse on the burner.
- Check the connector - flame control card wiring
- Check the burner wiring (ignition electronics)

Possible errors:
- Power supply fuse up the line from burner interrupted
- Power supply fuse on burner interrupted
- Wiring error
- Defective equipment

Check the fan motor

- Use a tester to check the voltage between L1 and N of the 4-pole motor power supply connector (220 V AC)

Possible errors:
Fan blocked
Burner-fan connection interrupted
Wiring error
Motor winding interrupted
Starting condenser defective

THE MOTOR-FAN TURNS ONLY FOR FEW SECONDS

The differential pressure switch does not exchange

- Check the connection of the measuring tubes
- Measure the pressure at the pressure switch using a differential gauge and a T-shaped hose connection

Insufficient space between ignition electrode and ground electrode

- Increase the space between the two electrodes

Table 4.6
Approximate depressions at burner prior to ignition

Model	Power* (kW)	Air intake chamber pressure (mbar)	Burner head depression (mbar)	Differential depression between burner head and intake chamber (mbar)
MSU 3 M	15.1	0.0	2.8	2.8
MSU 6 L	27	0.0	3.7	3.7
MSU 6 H	37.8	0.0	3.6	3.6
MSU 9 L	42.2	0.0	3.6	3.6
MSU 9 H	51.9	0.0	G20 = 1,7 / G30-G31 = 3,0	G20 = 1,7 / G30-G31 = 3,0
MSC 6 L	20.5	0.0	2.7	2.7
MSC 6 H	32.4	0.0	3.7	3.7
MSC 9 L	27	0.0	3.9	3.9
MSC 9 H	42.2	0.0	3.6	3.6
MSC 12 M	37.8	0.0	3.6	3.6
MSM 12 L	27	0.0	2.4	2.4
MSM 12 H	37.8	0.0	3.7	3.7
MSM 18 L	42.2	0.0	3.9	3.9
MSM 18 H	51.9	0.0	3.2	3.2

* Hs in compliance with EN 437

Possible defects:

- Leaks in pipes (loose seals)
- Air intake tube (if present) clogged
- Flue pipe clogged
- Defective pressure switch

- Check the concerned electrical part
  (exchange control unit contacts pressure switch 5 (C), 6 (NO), 7 (NC)

Possible defects:

- Pressure switch defective

BURNER SHUTS DOWN

Phase and neutral are inverted

- Check the voltage and the polarity at the 6-pole connector (L1 - N 230 VAC) and at the electronic equipment (connector contacts: phase 4 and 10, neutral 11).

Gas does not get to the burner

- Check the gas pressure at the inlet of the SIT valve assembly **maximum 50 mbar !!!**

- Check if mains pressure is stable

Supply pressure values for all **EURAD** models

Type of gas:	**Methane**	Supply pressure:	**G20:**	**20 mbar**
Type of gas:	**LPG**	Supply pressure:	**G30:**	**28 - 30 mbar**
			G31:	**37 mbar**

Check the pressure at the nozzle as per the table previously shown in this manual (Tab. 4.4).

The valve assembly does not switch

- Check the ohmic continuity of the coils.

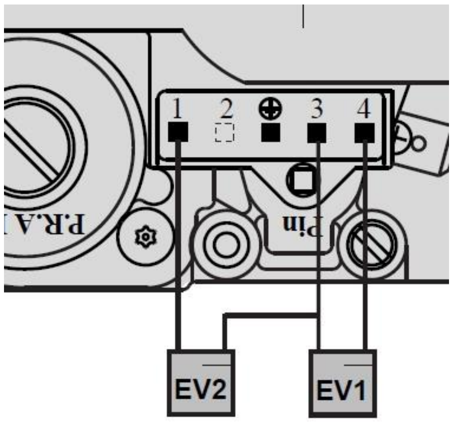
  Use a tester to check the continuity of the coil windings following the next instructions:

  Check with a tester the continuity of the coil windings, as follows:

  Coil EV1 = 880 Ω ±10%

  Coil EV2 = 6,7 kΩ ±10%

Figure 4.9
Coils of the gas valve
SIT 843 Sigma



Modulating Coil= 19,0 kΩ ±10%

Possible defects
- Defective equipment
- Defective valve assembly

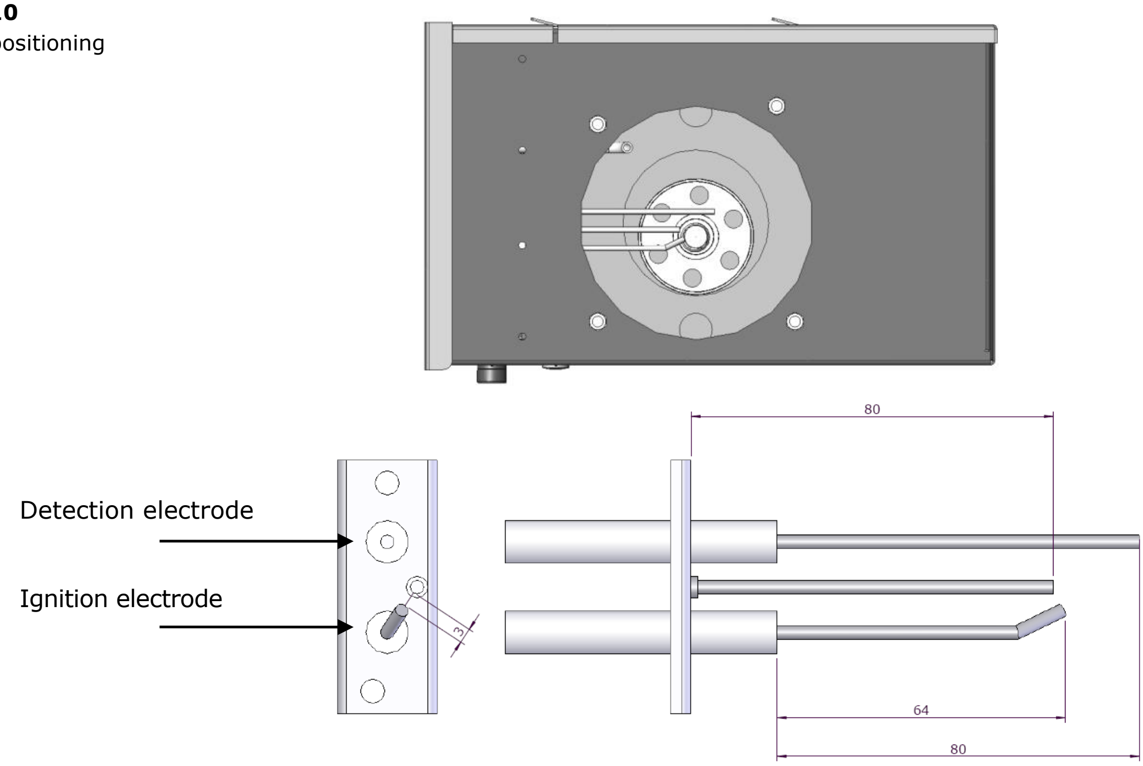
Electrical ignition problems

- Check the involved electrical part (flame detection and/or ignition electrodes). Position of the electrodes is very important.

- Check if discharge to earth occurs
- Check whether the detection electrode is in the exact position. See figure 4.8.

Possible defects
- Incorrect electrode connection
- Ignition electrode does not properly discharge because it is in the wrong position
- Detection electrode does not work because it is located in the wrong position.
- Defective equipment

Figure 4.10
Electrode positioning



ATTENTION:
in order to work properly, the SIT flame control card must be used with ignition electrodes of 1 k Ω resistance only.

4.2.2. MODIFICATIONS REQUIRED TO MAKE A FUEL CHANGEOVER

To change the type of fuel, the EURAD burner requires special actions which are specified hereunder. It is in any case advisable to replace the burner completely.

Parts to be replaced:

- **Nozzle**
- **Air regulation plate**

Replace based on power, type of gas used and according to the instructions published in this manual (see tables 4.1 ÷ 4.4).

Calibrations that must be carried out anew:

- **Adjustment of pressure at the nozzle**

Adjust the pressure at the nozzle based on the power to be installed and in accordance with the instructions provided by this manual (see tables 4.1 ÷ 4.4).

Attention!!

After each new calibration, all of the parts for adjustment (gas pressure adjustment screws on the valve assembly) must be sealed.

After a change of gas type, the label provided with the changeover kit must be applied. This label is issued exclusively by CARLIEUKLIMA Srl.

4.2.3. ANNUAL CHECK-UP AND MEASUREMENT OF EFFICIENCY

The annual check with relative measurement of actual system output is required by National standard

a) The sampling of the flue gases and the measurement of their temperature must take place taking a sample in the duct for the evacuation of flue gases
The sample must be taken on the fumes duct, preferably at a distance equal to twice the diameter from the outlet point of the flue gases of the unit. Sampling must be performed by the person responsible for operation and maintenance of the system, or by a skilled technician.
Upon completion of measurements, the operator must permanently close the hole, so as to ensure the seal of the flue gas evacuation duct during normal operation of the system.

b) Upon completion of work, the operator must complete the **plant or system log** as required by the regulation.

4.3. General warranty conditions

1 CARLIEUKLIMA Srl guarantees the EURAD system installed by qualified personnel authorized by the company for a period of:

12 (twelve) months for the electrical and electronic parts from the date of first ignition.

The validity of the warranty is contingent upon an annual check-up by an authorized technical service centre and subsequent completion of the machine form.

2 The warranty period of CARLIEUKLIMA Srl does not include material supplied by third parties.
Said material is covered by the warranty provided by the supplier.

3 The warranty consists exclusively in the supply, free of charge, of those parts which show defects in manufacturing or workmanship.

4 The warranty is immediately void if the system has been tampered with, disassembled or modified without prior authorization by CARLIEUKLIMA Srl.
If the invoice is not paid by the agreed due date, from that date the warranty will no longer in any way be in effect.

5 Not covered by the warranty are problems due to carelessness, improper calibration, poor system use or accidents which are unforeseen and in any case not attributable to imperfect manufacturing or defective material.

4.4. Disposal of packaging, storage, disposal.

DISPOSAL OF PACKAGING

The packaging of all EURAD components is compliant with legal standards and may be disposed of in accordance with current standards.
The packaging is composed of the following materials: cardboard, expanded polystyrene, nylon.

STORAGE

If it should become necessary to place the machine in storage for a long period of time, please do the following:

- Disconnect the unit from the electrical mains
- Close the gas supply ball valve
- Disconnect the unit from the electrical mains
- Disassemble the unit and store the disassembled module in a dry place.

DISPOSAL

If you should decide not to use this unit any longer it is advisable to:

- Remove all of the electrical parts and dispose of them in accordance with current laws
- Dispose of the mirror-polished aluminium reflectors in specialised collection centres.
- Dispose of the stainless steel reflectors in specialised collection centres.
- The remaining material can be disposed of as scrap iron in appropriate collection centres.

CARLIEUKLIMA Srl

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