DAYGAS
Heating Systems

RADIUM TUBULAR RADIANT SERIES
TECHNICAL DOCUMENTATION

Radium Tubular Radiant Series

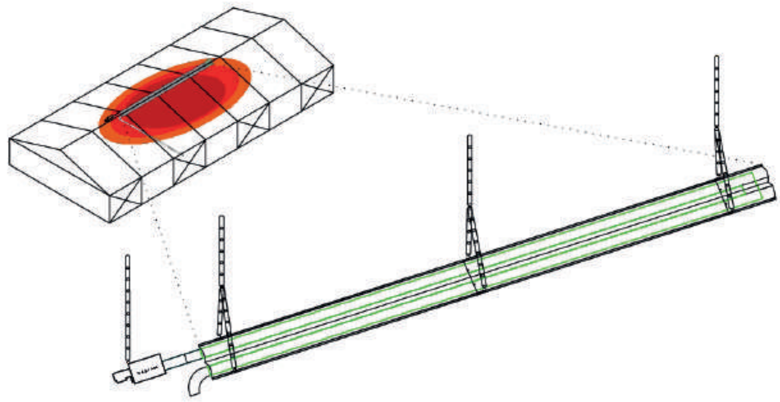
Radium Tubular Radiant Heater Series

Daygas Radium tubular radiant heaters are modern devices designed to heat spaces with high ceilings and large volumes. Radium heats the environment by reflecting the heat energy obtained by the combustion of the air-gas mixture in the radiant tubes to the desired environment, thanks to the parabolic designed aluminum reflectors. Radium tube type radiants heat people and objects without heating the air. In this way, warming provides optimum comfort.

Radium Tube Type Series Features

» Possibility to operate in 2 stages with remote control or with thermostat
» Display of step and fault notification on the display screen
» Heating by radiation without air rotation
» Two types are produced as I and U type
» High level of security
» Safe gas valve system
» Simple service and assembly
» Low energy consumption
» Short start up
» Low emission rate

Radium Series Radiant Pipes

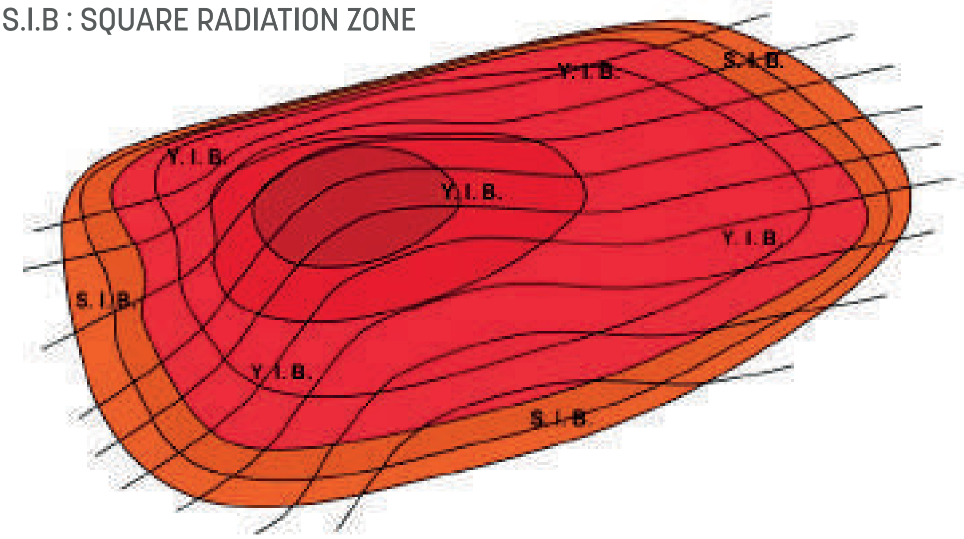


- In tubular radiant heaters, heat-treated aluminized steel radiant pipes are used.
- The production process from the raw material to the finished pipe is subject to special processes in order to show the highest radiation capability in the usage areas.
- Our radiant pipes are high performance aluminized tubes. These pipes are made of aluminized, caloric steel coils.
- With aluminized pipes, we provide end users with more efficient heating even at low capacities.

Why is calorized aluminum the best?	RADIATION EFFICIENCY	RADIATION EFFECT	WEAR RESISTANCE	PEEL RESISTANCE
Calorized Aluminum	● ● ◖	● ● ◖	● ● ●	● ● ●
Aluminum Steel	◖	●	● ●	● ●
Painted Aluminum Steel	● ●	● ● ◖	● ● ◖	●
Hot Rolled Steel	● ◖	● ◖	●	●
Hot Rolled Painted Steel	● ●	● ●	●	●
Stainless steel	◖	◖	● ● ●	● ● ●
Painted Stainless steel	● ◖	● ● ◖	● ● ●	●

Radium Series Heat Dissipation

Y.I.B : INTENSIVE RADIATIONZONE
S.I.B : SQUARE RADIATION ZONE



*Radium Tube Radiant Heat Dissipation Izohips Curve

The Radium Tubular radiant device Y.I.B. in the heat distribution isohips curve. The fact that (intense radiation region) can be addressed to a large area as in the curve is due to the high radiant efficiency of the radiant pipe material that will radiate.

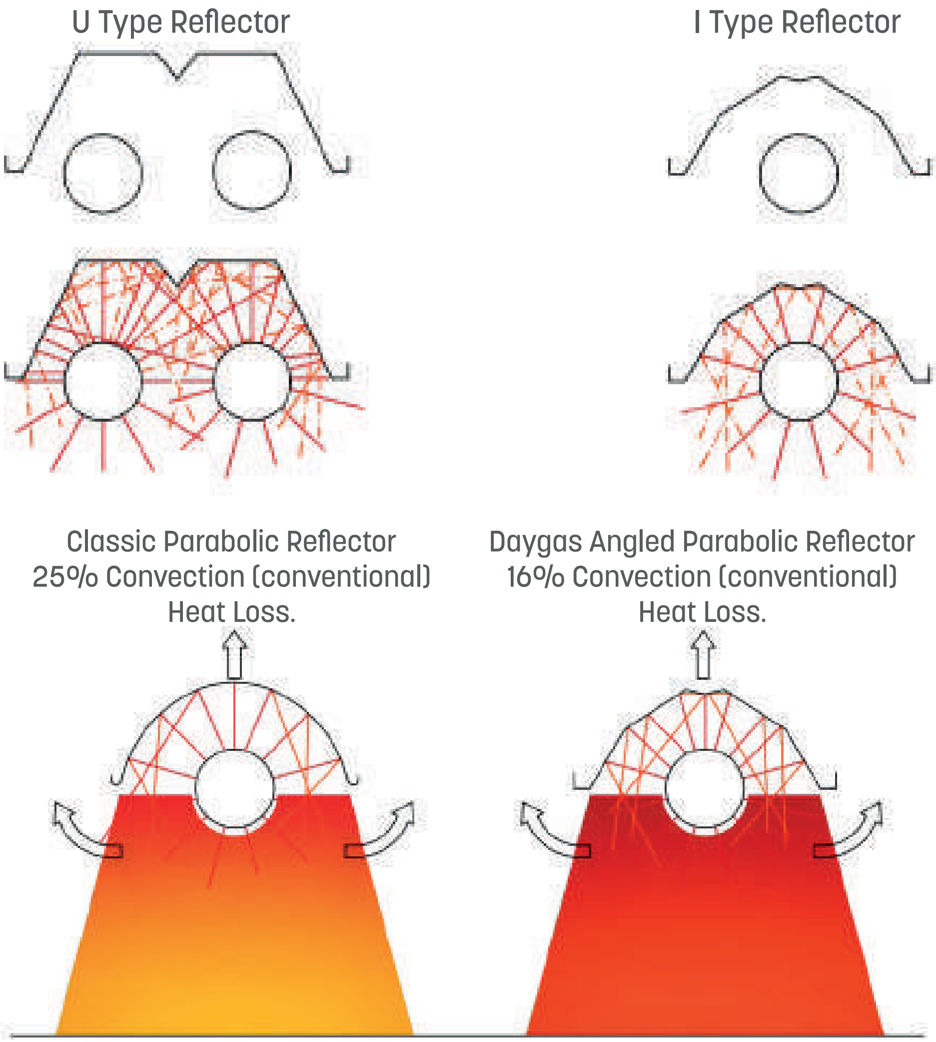
*Radiant Efficiency

We use aluminized steel special radiant pipes with 92% radiant efficiency (polished smooth surface). We achieve high efficiency by minimizing losses.

Importance of Pipe in Tubular Radiant Devices:

The flame, which is formed as a result of the ignition of the air-fuel mixture combined in the burner, moves through the pipe and turns into flue gas, and the waste gas is thrown out of the chimney. In this process, the energy released as a result of the combustion of gas in the pipe is transmitted to the pipe. Heating is provided by radiating the energy taken from the inner part of the pipe from the outer surface area to the environment where it is located. Therefore, the maximum level of heat transfer and radiation capability in all these processes is directly related to the quality and suitability of the radiant pipe.

Radium Series Reflectors



The beam emanating from the tubular surface area.

From the reflector reflected ray.

Beams of radiation emanating from the pipe surface area are indicated in red (solid line), beams reflected from the reflector are indicated in orange (dashed line). Normally, the radiation continues on its way, leaving some of its energy on every surface it hits. The material selection of the reflector (reflector) comes into play here, and it is desired to reflect the radiation coming on it as it is, without consuming the energy. Being aware of the importance of this, aluminum material reflectors with high reflectivity are used in our products.

In tubular radiants, radiation takes place on the surface of the pipe. Where the devices are hung, reflectors, in other words,reflectors are used in tubular radiant devices to take advantage of the energy of the radiation (usually the part facing the ceiling) that goes from the surface area to the dead spots. The use of reflectors not only reflects the radiation to the dead spots and sends it back to the desired environment, but also helps to increase the surface area as a result of the radiation that comes out of the pipe and strikes the pipe surface again, and thus increases the radiation capacity.

Radium Series Report

Emissivity

Emissivity is a dimensionless number that gives a measure of how well an object can emit energy compared to a black object. The emissivity may depend on factors such as body temperature, the wavelength range considered for the emitted energy, and the angle of propagation of the energy.

General		Subscripts	
ρ	Reflection (Ratio between reflected and incident radiation flow.)	λ	Rays Emitted by Matter (Depends on wavelength.)
α	Absorption / Absorption (Ratio between absorbed and incident radiant flux.)	h	Hemisphere
ε	Diffuse	θ	Direction
I	Radiation Intensity	n	Normal or Semi-Normal
E	Radiated Power	e	Spreading
		b	Blackbody

According to Kirchhoff's law, if the radiating power of a substance is 'E' and the absorption coefficient is 'α', they are equal in theory. In other words, the emission (or emission coefficient) of an object at any temperature is equal to its absorption coefficient. For real objects, ε depends largely on the structure of the surface, and also depends on the radiation wavelength, the arrival of the beam, and the surface temperature. The diffusion coefficient for real bodies ranges from 0 to 1.

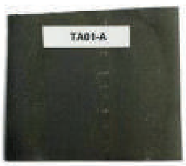
$$\varepsilon_{\lambda,\theta} = \frac{I_{\lambda,e}\,(\lambda,\theta,\rho,T)}{I_{\lambda,b}\,(\lambda,T)}$$

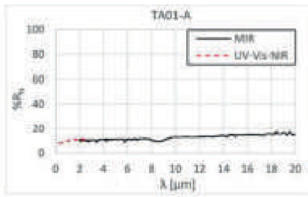
BURNISHED

TA01-A ''ALÜSİ RADYANT BORU DX54-AS120

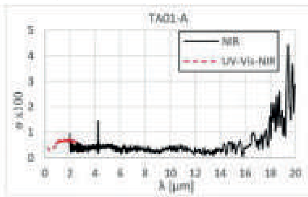
Radiation emitted from the tubular radiant can be measured with the same FT-IR spectrometer equipped with external input beam accessories.
As seen in the graphs on the right shows, it was created based on the spectral measurements of the emission at an ambient temperature of 700 °C (Tort 25 °C).

Radium alusi radiant pipes ε = 0.89 ε (emissivity coefficient) at 700 °C, up to 92% in alusi pipes. This value indicates the radiant efficiency.

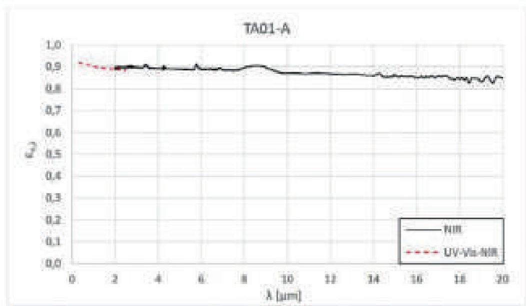




*Dalga boyu doğruluk kıyaslama

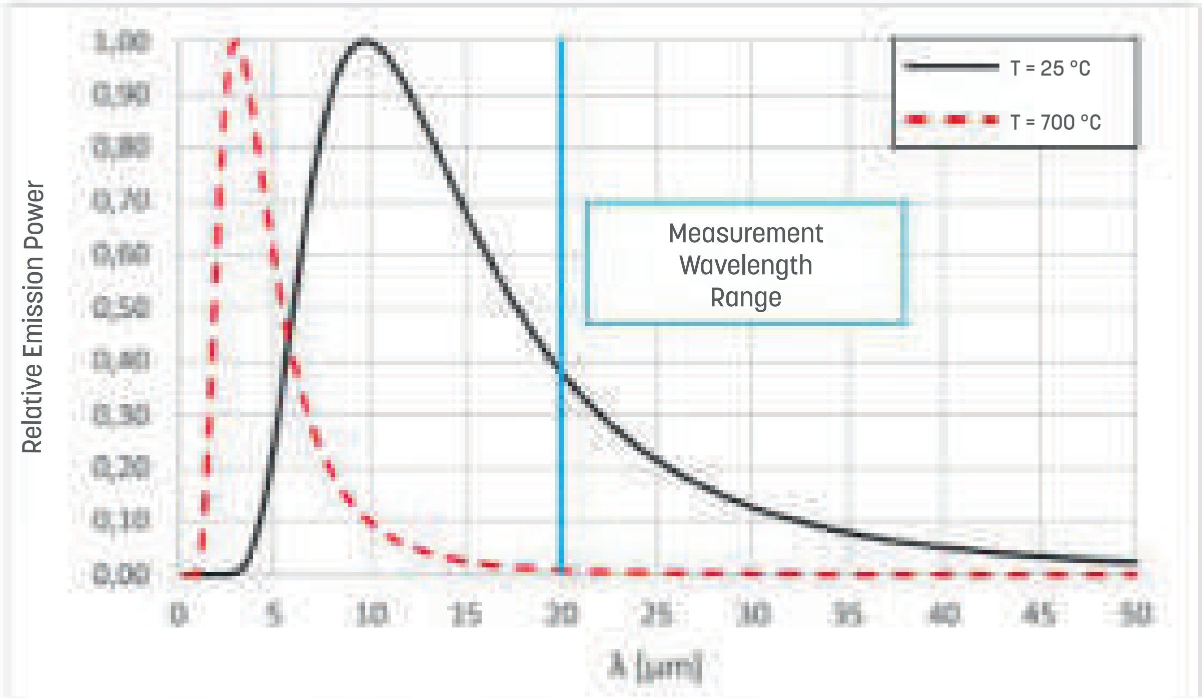


Standart Sapma

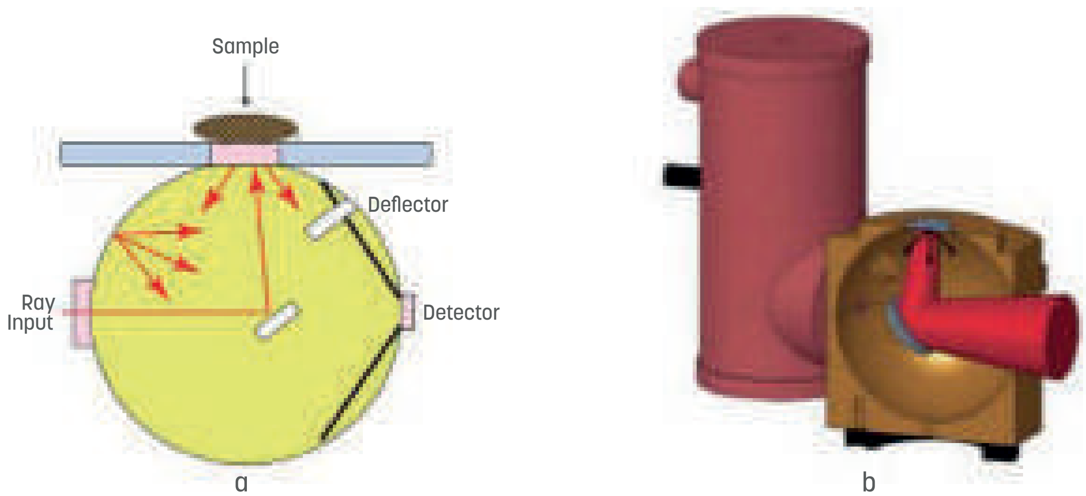


Spektral Yayılım

Radium Series Report

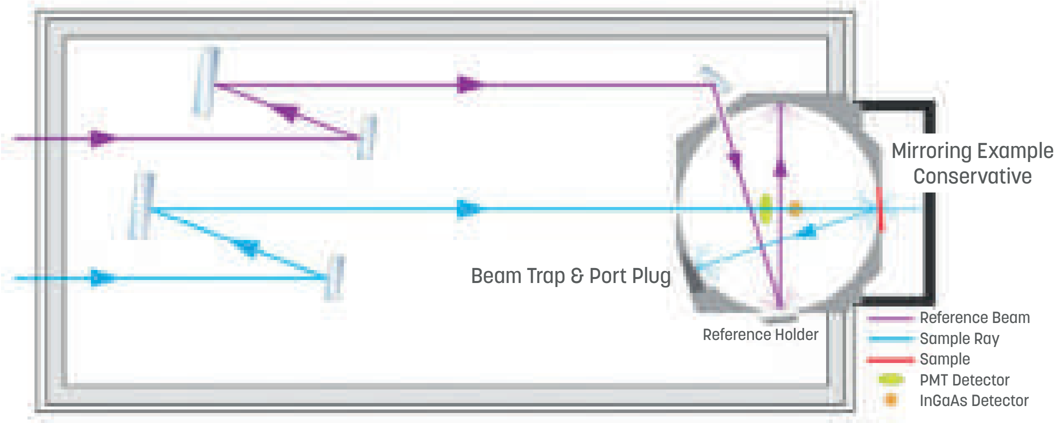


Relative Emission Power for Different Temperature

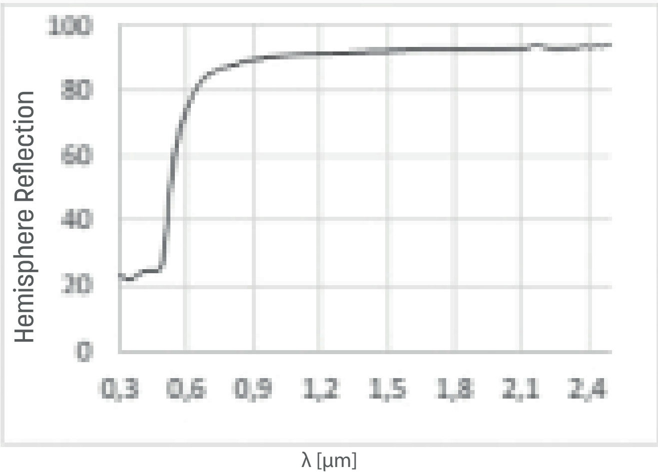


PIKE upward integrated IR gold integrated sphere diagram 5 and 3D drawing.

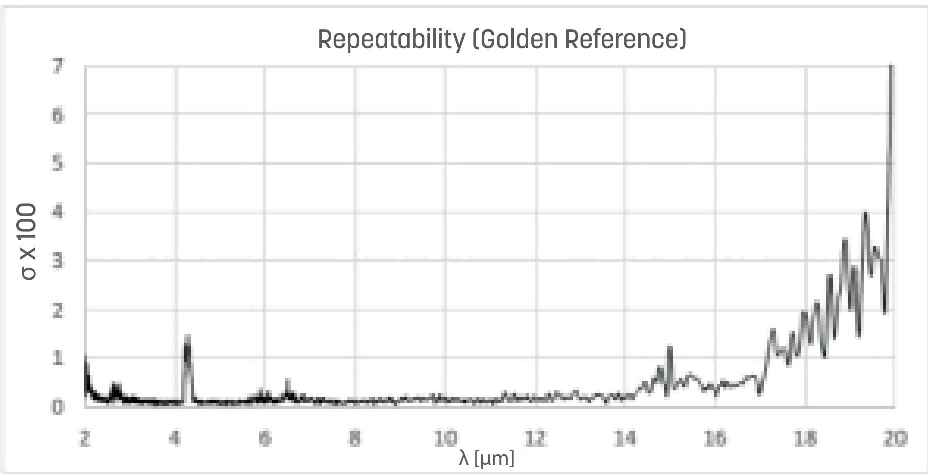
Radium Series Report



150 mm Spectralon Integrated Sphere Optical Diagram

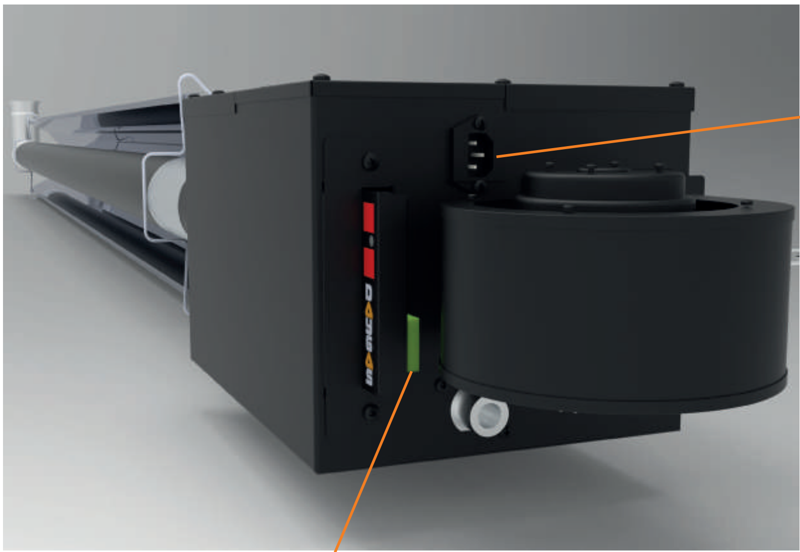


Typical Infragold MIR Reflection Spectrum, Measured Gold Reference UV-Vis-NIR Reflection Spectrum

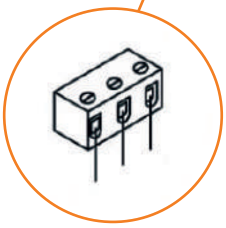


Gold reference standard deviation, ten measurements.

Electrical Signal Cables
Connection Details



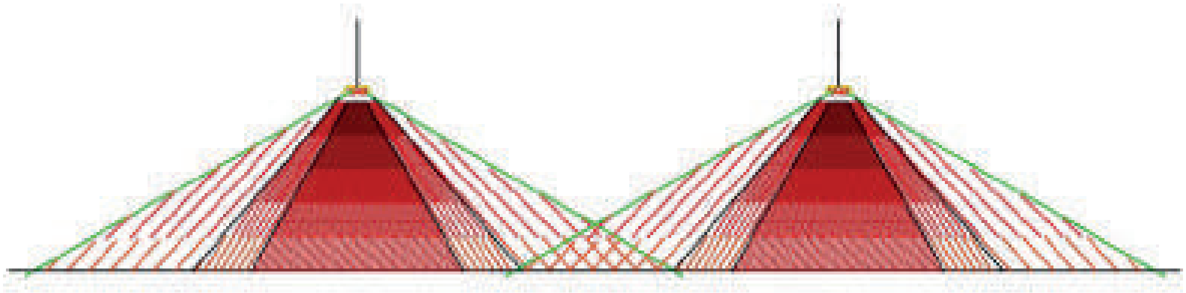
- **Radium Tubular Radiant**
- Electrical Connection: 230 V / 50 Hz
- Electrical Operating Power: ≤ 100 VA



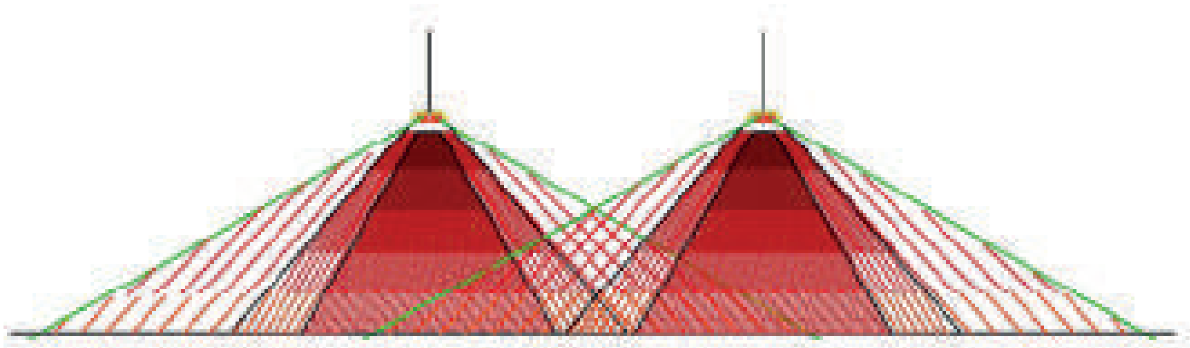
Automation Terminal: (RS485 Port)
Our devices have Modbus RTU communication protocol.

- When making automation signal cable end connections, the end points should not overlap between the devices. Modbus connections are serially (B-B, A-A,GND-GND) between devices, jumping over each other and gathered at the node.
- In tubular u radiant devices, as in other product groups, 1.5 m F type cable set for electrical connection is included in the box for each device.
- At the electrical connection point of the devices (in the C14 socket part), there is a 2A glass fuse to protect the device board.Therefore, the cards of the devices are protected against sudden electrical voltages on the power line.

Radium Series Radiation Area



When designing tubular radiant device placements, a layout is made in the place where the devices will be used - according to the heat loss in the environment. In places where the device layout design, insulation is sufficient and homogeneous heat distribution is not very important, optimal heating can be achieved by overlapping the standard impact areas.



In such a device layout plan, in case the heat loss is high, the insulation is weak, or the air flow is strong in the place where the devices will be used, optimal heating can be achieved by overlapping the intense radiation impact areas of the devices.

Radium Series Radiation Area

When intersecting the scanning angles, the intersection is made by taking into account not only the horizontal positioning of the devices, but also the hanging heights.

For example; Let's take the Daygas Radium 60kW U-tube radiant heater device;
From the catalog data, the min. hanging height: 425
max. hanging height 1350 cm

Selectable radiant pipe quantity within the capacity limits of the device: 9-15-18 meters.
When the design is made in such a way that 9 meters of radiant pipe and 6 meters of hanging height are made in the place where it will be used;

Standard scanning angle under one 60 kW U tube radiant device at the specified suspension height and pipe length; h: 6 meters Li: 9 meters

Standard glow length Lu : h*2
= 6*2
= 12 meters

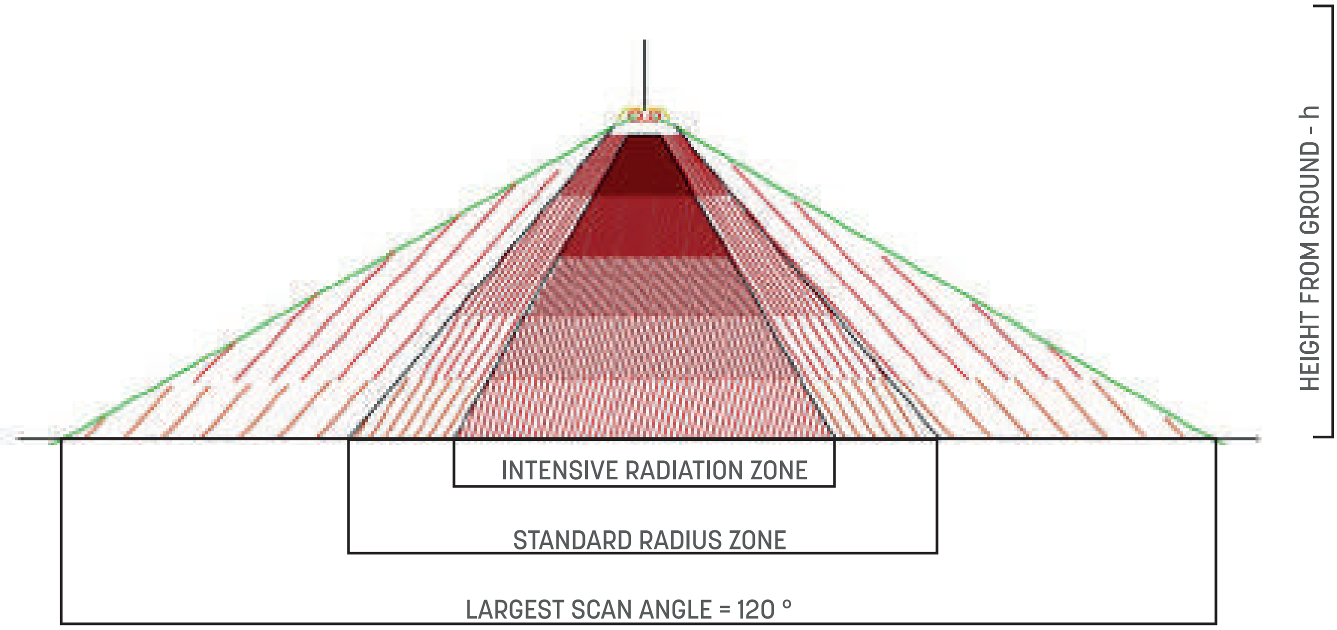
Standard radiation effect width Lux : Li + (Lu/2)
= 9 + (12/2)
= 15 meters

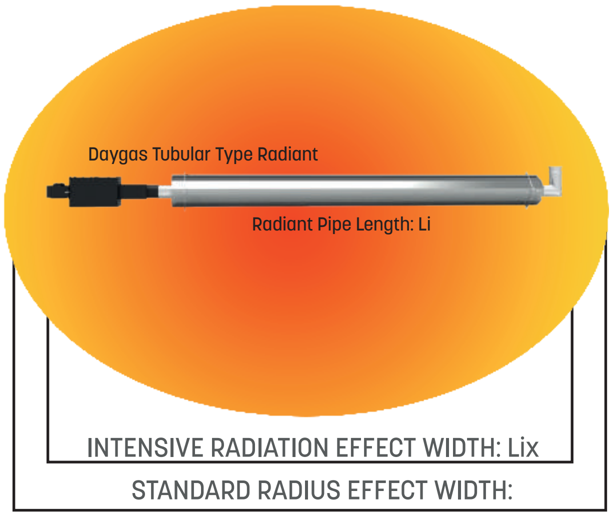
If the place where this device will be used will be heated by being under the intense radiation zone; the scanning area is reduced to ~ 90 m^2.

Scan area = Lu * Lux
= 9 + (12/2)
= 180 m^2 değerine ulaşırız.

By intersecting this drop with the scanning angle of another tubular radiant, we can increase the scanning area up to 150 m^2.

Radium Series Radiation Area





Lj = h*1.2
Lu = h*2

Ljx = Li+(Lj/2)
Lux = Li+(Lu/2)

r: Radiant hanging height.

Suspended height is the most important parameter in tubular radiant heater capacity selection. In addition, device capacity and type are selected as a result of providing comfort and safety conditions in the areas to be irradiated.

In the drawing above, you can see the heating data obtained from tubular radiants, in other words, the radiation effect areas. While making these calculations, the min. and max. hanging heights. Consideration should be given to the selection and number of heaters according to the area or environment where the heaters will be used.

Radium Series Device Capacity Selection

While selecting the tubular radiant device capacity, a number of values (device hanging height, openness to the outside environment and the outdoor winter average temperature of the place, etc.) are taken into consideration. The selection of radiant pipe length is as important as the selection of device capacity. Pipe size selection for tubular radiant devices is not limited to the device capacity, but is included in the calculation in the conditions where the devices will be hanged, so that the optimal pipe length and device capacity are matched.

DEVICE CAPACITY	RADIANT PIPE LENGTH					
	3 Meters	6 Meters	9 Meters	12 Meters	15 Meters	18 Meters
15 kW	✓	✓	✓	✓	✓	
20 kW		✓	✓	✓	✓	
30 kW		✓	✓	✓	✓	
35 kW			✓	✓	✓	
40 kW			✓	✓	✓	
45 kW			✓	✓	✓	
50 kW				✓	✓	
55 kW				✓	✓	
60 kW				✓	✓	✓
71 kW				✓	✓	✓

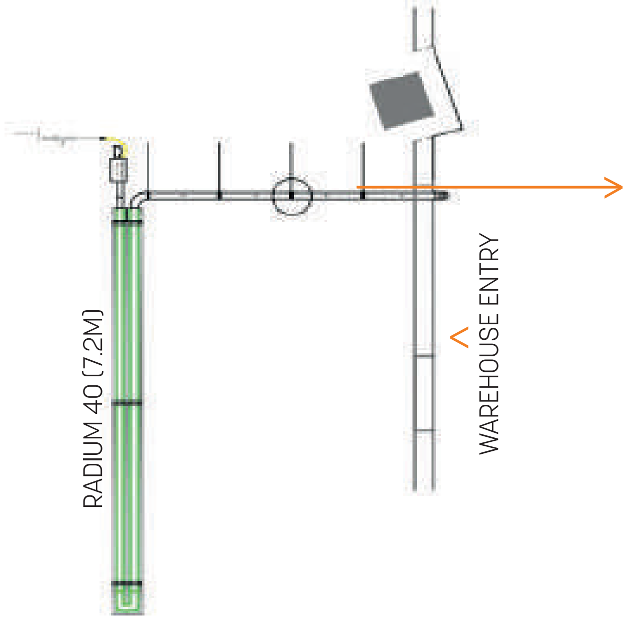
As can be seen from the table above, certain types of capacity devices are not limited to a single pipe size.
For example; For a 35 kW tube radiant device, the optimal radiant tube length is 6 meters. In addition, 3 and 9 meters pipe length can be selected.

Exhaust Flue Set Accessories

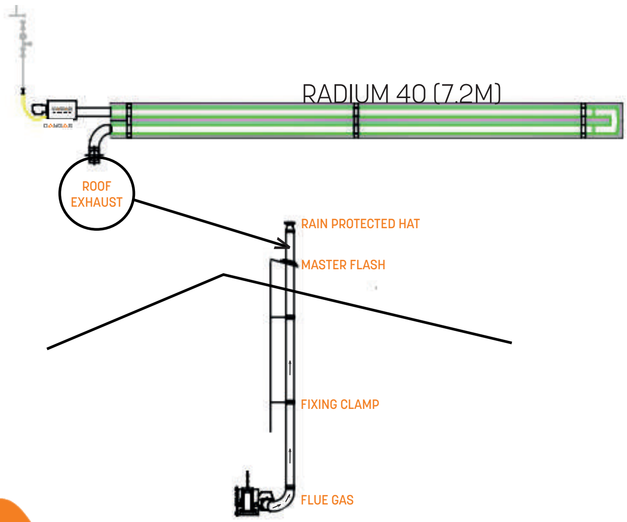
Tubular radiant devices are in the category of B type (B13) gas-burning devices. As a standard, they work as semi-hermetic (the way that the oxygen required for combustion is taken from the indoor environment and the waste gas released as a result of combustion is given to the external environment).

If requested, tubular radiant devices can also serve hermetically (the way the oxygen required for combustion is taken from the external environment and the waste gas released as a result of combustion is given to the external environment). Tubular radiant devices are semi-hermetic or hermetic, so they give the waste gas to the outside through the chimney.

Our chimney set accessories are made of 304 series stainless steel material and are highly resistant to corrosion and corrosion.Waste gas formed as a result of combustion is given to the outside through chimneys. Chimneys can discharge the flue gas in the horizontal or vertical plane, taking into account the place where the piped devices are hung, the distance to the outer wall and the roof.



While the flue gas flue pipes are positioned horizontally to exit from the outer wall, the flues must be fixed with hanger clamps at the nodal points. Otherwise, as a result of the chimneys sagging (angling) at the nodal points, the waste gas leaks into the environment and the combustion efficiency of the device is affected by the effect of differential pressure.



While the flue gas flue pipes are positioned vertically to exit from the roof, vertical mounting should be made with fixing clamps from the joint points of the chimneys. Rain protection cap with sealing element master flash and chimney termination element should be preferred at vertical roof outlets. Otherwise, water leakage to the environment and a decrease in combustion efficiency may occur.

ISO 9001 - 2015

ISO 10002 - 2018

CE EAC TSE TSE-HYB YERLİ ÜRETİM

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