HEATVIS

Performance Evaluation and Competitive Analysis of Radiant Heaters

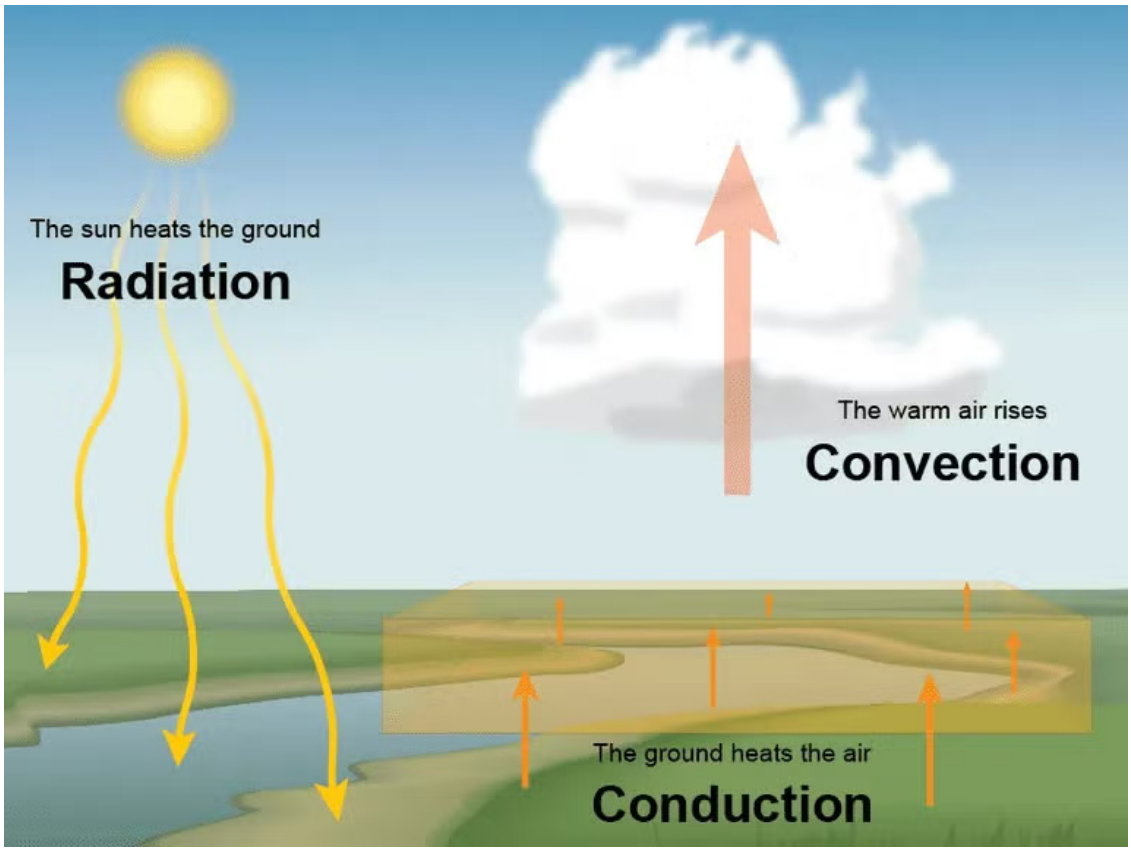
Table of Contents

1. Technical Overview of Radiant Heaters
2. Key Features and Technological Capabilities
3. Comparative Analysis : Our Product vs Competitors
4. Comparison of Major Components
5. Heating Load Calculation Method
6. Performance Metrics and Evaluation
7. Conclusion

1. Technical Overview of Radiant Heaters

(1) Heat Transfer Methods

There are three main ways in which heat is transferred



Conduction

Energy is transferred through a material without the movement of the material itself. Heat is conveyed via the vibration or collision of particles.

Convection

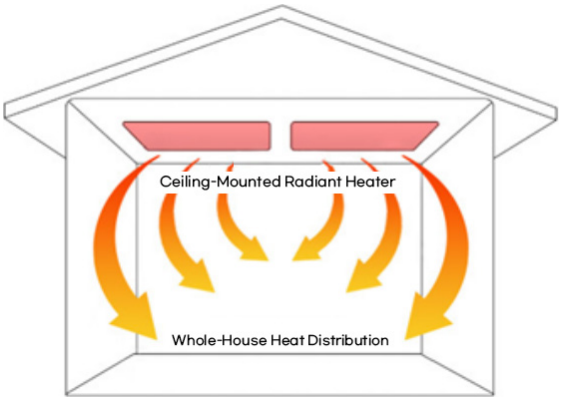
Both material and energy move together. Warm air rises while cooler air sinks, creating a circulating flow.

Radiation

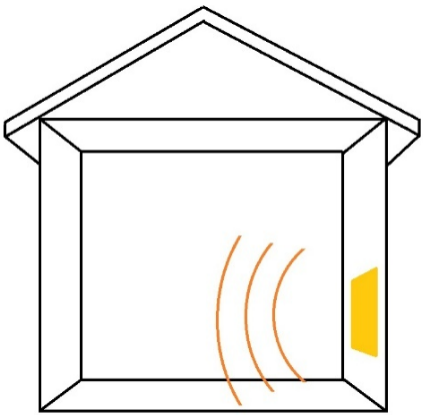
Heat is transferred through electromagnetic waves without the need for a medium. This is the same principle by which solar energy travels through the vacuum of space to reach the Earth.

(2) Principle of Radiant Heating

Utilizing radiant heat : The surface temperature of embedded hot water pipes or electric heating elements in floors, walls, or ceilings is raised, allowing heat to radiate into the space and warm the interior.



Ceiling-Mounted Radiant Heater



Wall-Mounted Radiant Heater

Direct Heating

Instead of heating the air, heat is transferred from the surface of objects throughout the space, resulting in minimal vertical temperature differences and enhanced comfort.

Installation Flexibility

Can be installed on floors, walls, or ceilings, maintaining heating efficiency even in areas exposed to outside air.

(3) Features and Benefits

Comfort

Ensures uniform indoor temperature distribution, with consistent heating performance even in spaces with external air infiltration.

Efficiency

Minimizes heat loss and maximizes energy efficiency, potentially reducing heating costs.

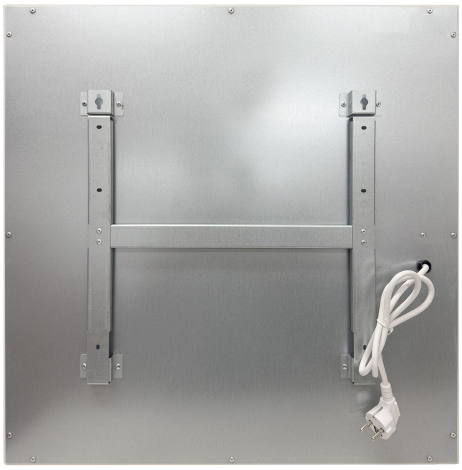
Safety

Some products include safety systems to prevent burns and other hazards.

2. Key Features and Technological Capabilities

Front

Back



Inner

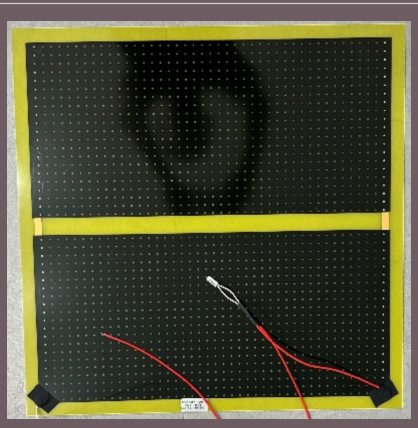
Item	HV-HP-350
Product Dimensions(mm)	t21 x 600 x 600
Rated Voltage (V) / Frequency (Hz)	230/50
Rated Power Consumption (W)	350
Weight (kg)	Approx. 5.4
Heating Element	Carbon crystal
Surface Temperature (°C)	Max. 95°C (±5°C)
Insulation Material	Ultra-Lightweight Foamed Material Based on Melamine Resin
Insulation Fire Rating	V-0 UL94
Heating Area (㎡)	~2 ~ 4 (depending on insulation)
Safety Features	Thermal cut out bimetal 125℃
Front Panel Material	Power coated GI(Galvanized Iron)
Rear Panel Material	EGI(Electro Galvanized Iron)
Installation Method	Wall-Mounted
Ingress Protecction Rating	IP44
Product Lifespan	Over 100,000 Hr

3. Comparative Analysis: Our Product vs. Competitors

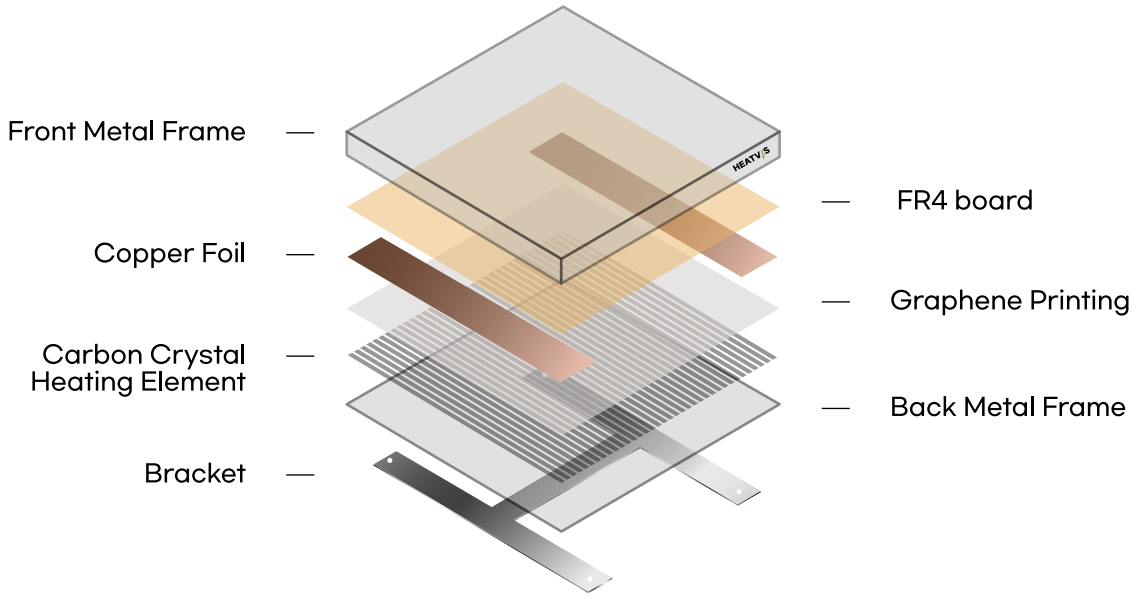
Item	HV-HP-350	ECOSUN 300	Remarks
Manufacturer	South Korea	Czech Republic	
Product Dimensions (mm)	t21 x 600 x 600	t30 x 592 592	Achieved Thin Profile
Rated Voltage (V)	230V	230V	
IP grade	IP44	IP44	
Weight(kg)	5.4	5.7	Lightweight Design
Rated Power Consumption(W)	350	300	
Maximum Surface Temperature(℃)	95℃(±5)	82℃	
Surface Coating	Thermosetting powder coating Grainy surface	Quartz crystal Grainy surface	
Operational Temperature	-20℃ ~ 30℃ (Recommended -10℃ ~ 20℃)	Unknown	
Insulation Material	Melamine Resin Based Lightweight Foam(V-0, UL94)	Ceramic Fiber (Non-Combustible)	Improved Working Environment Easy Waste Disposal
Insulation Thermal Conductivity K(W/mK)	0.033	0.033	
Safety Device	SEKI 125℃ (South Korea)	No Brand T113	High Reliability UL
Heating Element	Carbon Crystal	Carbon Fiber Type	High Reliability and Durability
Durability	Over 100,000 Hours	Unknown	
Time to Reach Maximum Temperature (min)	Approximately 24 minutes	Approximately 25 minutes	
Heat Distribution (Radiation/Convection)	Radiation 68%, Convection 32%	Radiation 74.2%, Convection 25.8%	
Ease of Installation	Excellent due to Lightweight Design	Average	

4. Comparison of Major Components

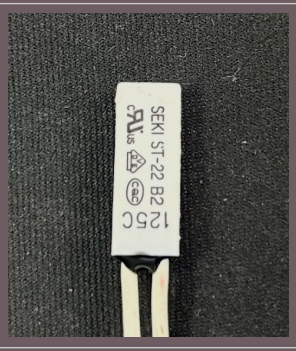
(1) Heating Element Comparison

Item	HV-HP-350 Carbon Crystal	Ecosun 300 Carbon Fiber Type
Heating Element Shape		
Durability	Heating element thickness of 1 mm ensures long-term performance	Durability may decrease with thin carbon fiber design
Insulation	Uses FR4 board with excellent insulation and durability	Use of vinyl-based insulation can reduce insulation performance
Foreign Matter Ingress	Maintains a clean, contaminant-free condition	Potential for foreign matter ingress when produced in fiber form
Power Connection	Secure connection of lead wires	Possible poor contact at lead wire connections
Carbon Heating Element Adhesion	Firm adhesion ensured with FR4 board	Reduced adhesion when covered with vinyl material
Copper Foil for Power Supply	Strong compression using FR4 board	Stitched seams in sewn design may cause leakage or degradationt
Certification Status	CE, CB and others	

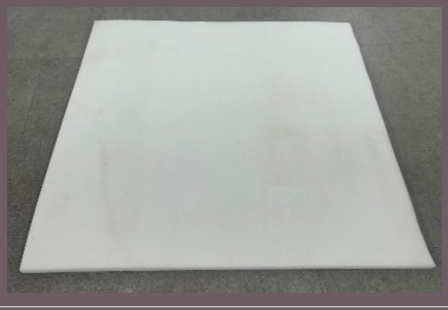
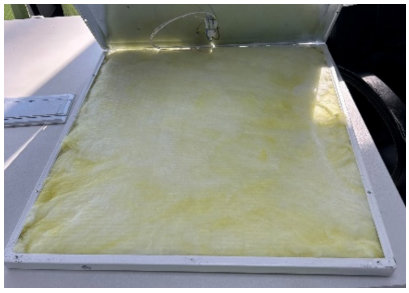
(2) Hierarchical Structure of Our Carbon Crystal



(3) Comparison of Safety Devices (Overload Protection Bimetal)

Item	HV-HP-350	Ecosun 300
Bimetal Shape		
Manufacturer	South Korea	Unknown
Bimetal Operating Temperature (℃)	125	113
Temperature Tolerance (℃)	±5	Unknown
Dielectric Strength / Withstand Voltage	1 min. at AC1500V	Unknown
Rated Current (A)	7 at AC250V	Unknown
Reset Method	Automatic Reset	Unknown
Lead wire	W-type : UL3266 AWG22	Unknown
Certification Status	UL, VDE, CQC, KC	Unknown

(4) Insulation Material Comparison

Item	HV-HP-350	Ecosun 300
Insulation Shape		
Material	Ultra-Lightweight Open Cell Foam Based on Thermosetting Melamine Resin	Fiber glass
Thermal Conductivity (W/m·K)	Max ≤ 0.035	Max ≤ 0.035 (Expected)
Fire Rating / Flammability	UI 94 V test : V-0	Non-Combustible
Thickness(mm)	18	Approximately 30

(5) Drawbacks of fiber glass insulation.

1. Health Risks

Inhalation of fiberglass fibers or contact with skin can cause irritation and may trigger allergic reactions.

2. Vulnerability to Moisture

It can absorb moisture, reducing insulation effectiveness and potentially leading to mold growth.

3. Structural Instability

It can easily be damaged by physical impact or pressure, and over time, its insulation performance can decrease.

4. Environmental Issues

It is difficult to recycle and can have a negative environmental impact when disposed of.

5. Heating Load Calculation Method

Heat Load refers to the amount of heat (W) required to maintain a space at the target temperature.

General Formula : $Q = U \times A \times \Delta T$

A. Q : Required heat (W)

B. U : Thermal transmittance ($W/m^2 \cdot K$)

- varies by component such as walls, windows, etc.

C. A : Area (m^2)

D. ΔT : Indoor-outdoor temperature difference (K)

Correction Factors : Additional considerations for infiltration (external air ingress), internal heat sources (occupants, lighting), and ventilation requirements.

Example : For a typical residential space with average insulation performance (U-value: 0.8 $W/m^2 \cdot K$), an area of 10 m^2, indoor temperature of 22°C, and outdoor temperature of -5°C:

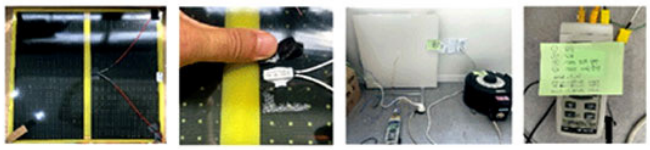
$Q = 0.8 \times 10 \times (22 - (-5)) = 0.8 \times 10 \times 27 =$ **216 W**

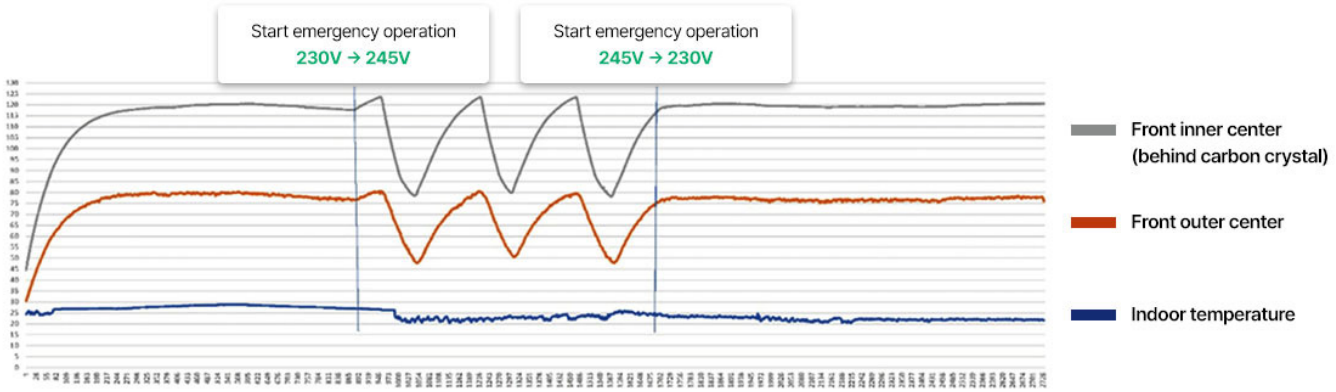
→ In this case, a single 350 W radiant heating panel is sufficient.

6. Performance Metrics and Evaluation

(1) Results of Normal and Emergency Operation Tests for Our Product

- **Bimetal** : 125 °C
- **Test voltage** : 230 V → 245 V → 230 V
- **Bimetal location** : Center (carbon section)
- **Purpose** : To verify bimetal operation during emergency operation





Experimental process

- During normal operation (230V), the bimetal does not operate
- During emergency operation (245V), the bimetal operates, cutting off the power
- When voltage is adjusted back to normal operation (230V), the bimetal does not operate

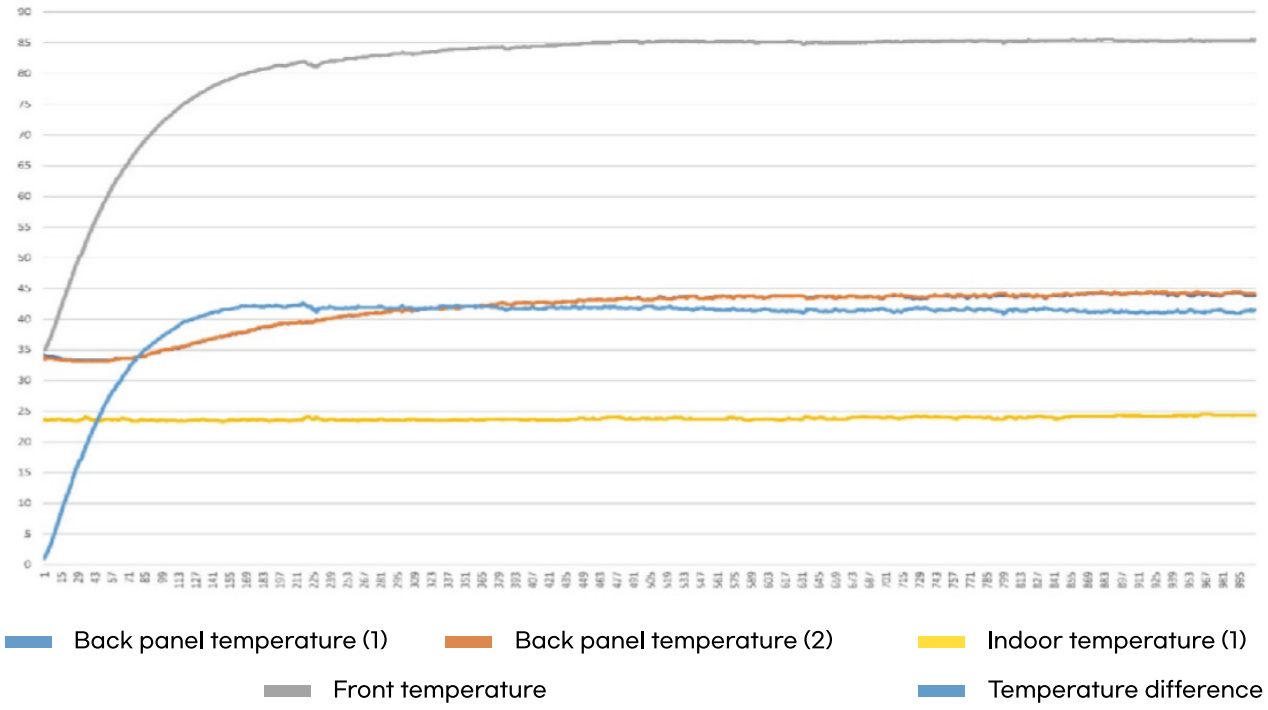
Conclusion

- In an emergency, the bimetal operates to protect the product and prevent user burns
- In an emergency, the bimetal operates every 25 minutes

(1) Temperature Rise Test of Fenix Product

Sample : Fenix Radiant Heater 300 W

(1) Heating Element : Carbon
(2) Insulation Material : Fiberglass
(3) Dimensions : 30t * 592 * 592 mm



Experimental process

- After approximately 45 minutes of operation,

  the target temperature was reached and subsequently maintained steadily

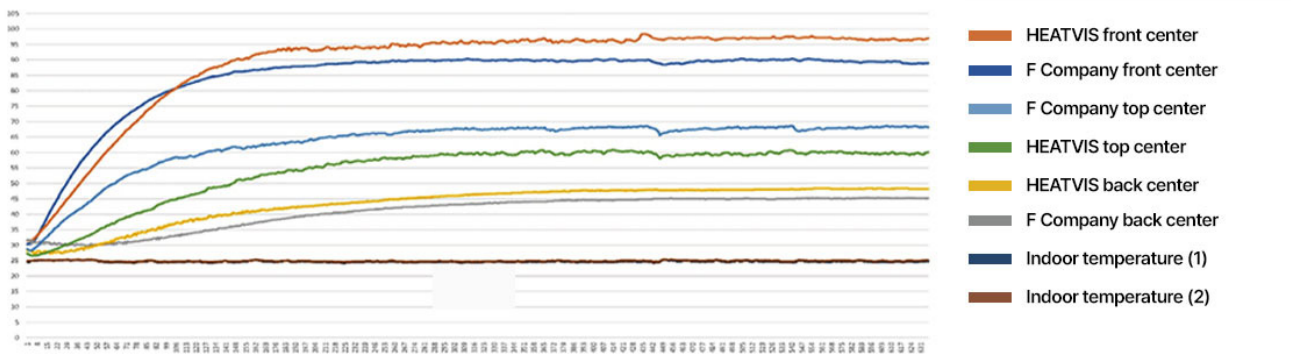
Conclusion

- During normal operation, it takes a considerable amount of time

  to reach the target temperature

(3) Comparison Test of Temperature Rise Between Our Product and Fenix Product

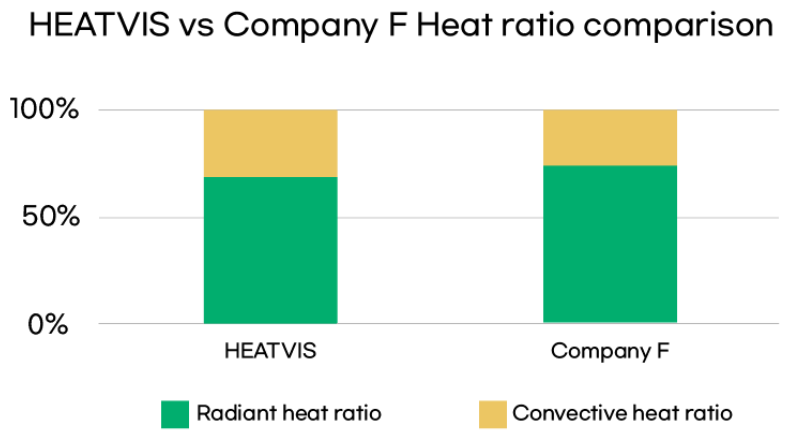
Test voltage : 230V



Experimental process

- Our product's central maximum temperature was measured to be approximately 7 degrees higher than that of competitors. The temperature at the top front was measured to be approximately 69 degrees, approximately 9 degrees higher than that of competitors.
- The maximum temperature at the center of the front panel was measured at approximately 97°C for our product, reaching it in about 24 minutes,₩ while Fenix's product reached around 90°C in a similar time of about 24 minutes

Conclusion



- Our product generates slightly more convective heat compared to Fenix.
- Convective heat also contributes to indoor heating, and the proportion in our product is considered appropriate
- In terms of total energy output, our product delivers sufficient heat compared to the competitor, aiding in energy savings
- Although the maximum temperature is higher for our product, the time to reach it is similarly around 24 minutes, indicating greater efficiency

7. Conclusion

1. Heating Performance

Fast heating and wide heating coverage ensure fundamental functionality as a heater while maximizing comfort

2. Safety

High reliability achieved through the use of internationally certified components

3. Environmental Friendliness

Use of high-quality, environmentally safe insulation materials

4. Durability

Extended service life due to the synergistic combination of reliable components