



# OION

Sustainable Air Purification & Virus Removal  
with its Automatic Self-Cleaning Function

## V-Guard, Bipolar Plasma Ionizer Module

安全な室内空気のための空気清浄殺菌モジュール

V-Guard, プラズマイオン発生器

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# What is Ions? How it works...

## Mother Nature's Little Air Cleaners.

### How Plasma Ionization Works to Clean the Air of Pollutants

Much like sunlight does in the atmosphere, Plasma Air technology produces a natural bio-climate rich in positive and negative oxygen ions. The negative ions contain an extra electron while the positive ions are missing an electron resulting in an unstable condition. In an effort to restabilize, these polarized ions seek out atoms and molecules in the air to trade electrons with, effectively **neutralizing particulate matter, bacteria and virus cells, odorous gases and aerosols, and VOCs.**

The diagram illustrates the process of plasma ionization on a cell membrane and its effect on corona viruses. On the left, a circular inset shows a 'Healthy cell membrane' as a phospholipid bilayer with yellow heads and pink tails. The middle inset shows an 'Oxidized and destroyed membrane' where the structure is fragmented. To the right, under the heading '<Corona Virus Electron Microscope Image>', two images are shown: 'Damaged corona virus by being exposed to plasma' (two red circles around irregular, fragmented virus particles) and 'Normal State of Corona virus' (three red circles around intact, spherical virus particles). A scale bar in the normal state image indicates 100nm.

#### Viruses & Bacteria

It can reduce certain viruses and bacteria in indoor air, providing a cleaner environment for everyone.

#### Odors

It can help to remove unpleasant odors from your space.

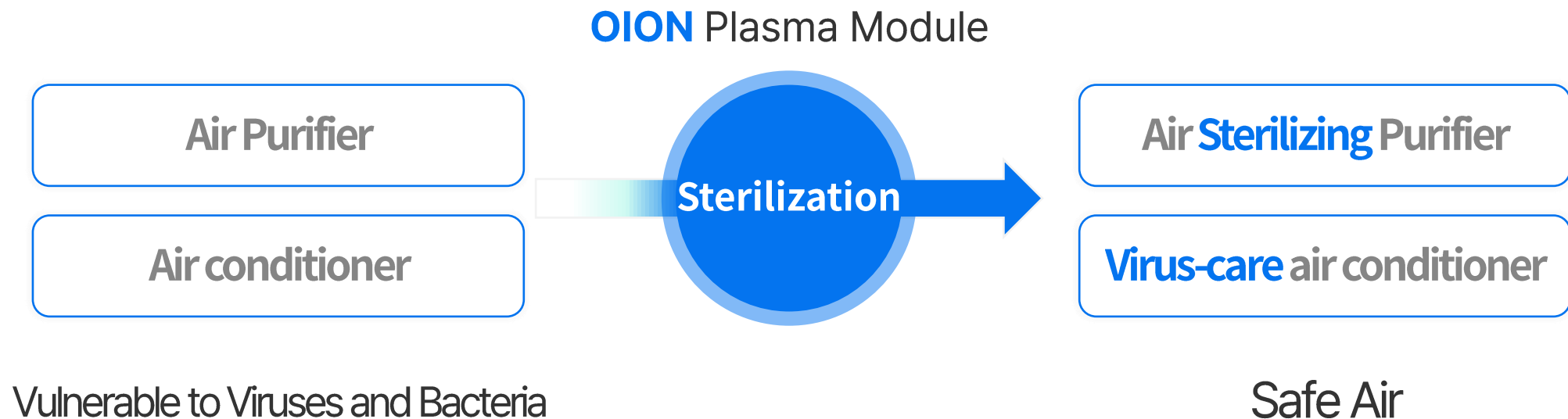
#### Particles in the Air

It can reduce the level of even the smallest particles that linger in the air or slip past filters.

#### VOCs, Mold, Pollens, etc.

# Adding Extraordinary Function into Ordinary Devices

It can upgrade a normal device into an "air sterilization" device



# ● Product Comparison

	HEPA filter	UV	PCO (Photocatalytic Oxidation)	Plasma
Saving Energy	X	X	X	Max 30%
Decrease in air pressure	High	None	None	None
Indoor Air Treatment	X	X	X	○
Intake Air Treatment	○	○	○	○
Exhaust Air Treatment	X	△	△	○
Installation Cost	Normal	Normal	High	Low
Maintenance Cost	Low/Normal	Normal	High	Low
Energy Consumption	High	Low	Normal	Low
Consumer Goods Cost	Proportional to the pollution	Normal	High	None
Purification Rate	0~80%	Low	Low	99%
Human Safety	○	△	○	△
Aerosol Sterilization	△	X	△	○



## ✔ Distinctions of V-Guard, OION

- ✔ Automatic cleaning function removes harmful substances from the air without restrictions on installation location.
- ✔ Excellent performance advantage in removing floating viruses and bacteria.
- ✔ Easy for installation and maintenance.
- ✔ Superior performance for large space

# Issues of Plasma Technology

- Impurities are gradually piled up in the discharge area

As time passes, impurities accumulate in the discharge area to prevent ions from forming



Example of plasma discharge part cleaning manual

Remove the unit cover and pull out the unit holder

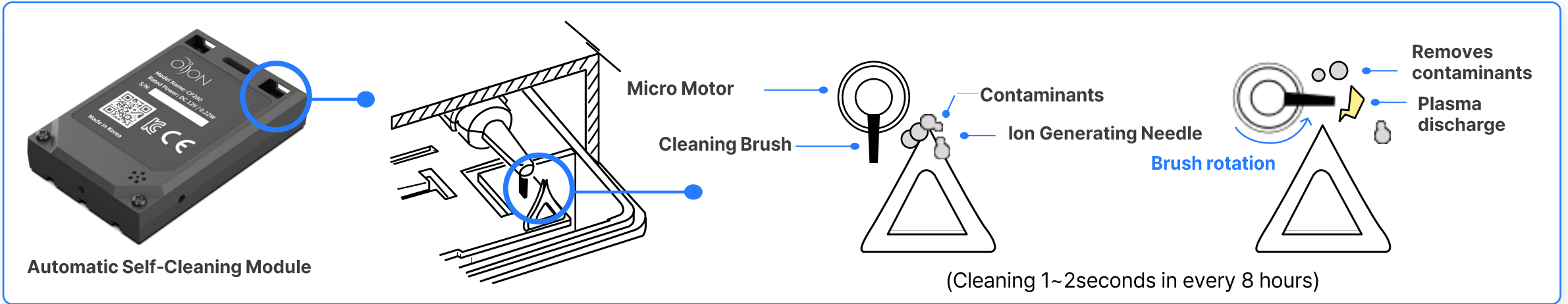
Remove dust from the electrode area

\*출처: SHARP FP-J80EU User Manual

SHARP FP-J80EU User Manual

# ● Automatic Self-Cleaning Function

## ✔ How it works



## ✔ Intellectual Property

Applicant	Country	Patent	Registered No.	Patent Name
OION Inc.	Korea	Registered	#10-2362179	plasma ion generator needs no manual cleaning and synchronous plasma ion generator assembly
OION Inc.	Korea	Registered	#10-2445885	Plasma ion generator with automatic self-cleaning function



# Issues of Other Plasma Products

Technical Issues	Issues in the Market Side		
	Design/Manufacturing	Sales	VOC
<ul style="list-style-type: none"> <li>● Periodic cleaning maintenance required</li> <li>✓ Oxide is generated and deposited in the plasma generator</li> <li>✓ <b>Cleaning is required in 2 weeks ~ 1 month</b></li> <li>✓ <b>No ions are generated when it's not cleaned</b></li> </ul>	<ul style="list-style-type: none"> <li>● <b>Design limitations</b> <ul style="list-style-type: none"> <li>✓ Requires product design with an easy opening and closing structure for cleaning</li> </ul> </li> <li>● Needs cleaning brush as an accessory</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Application limitations</b> <ul style="list-style-type: none"> <li>✓ Difficult to apply to buried type, wall mounted type, ceiling type and lighting products that are difficult to clean</li> </ul> </li> <li>● Difficult to apply to public transportation</li> <li>● Difficult to apply to fields requiring large-scale installation</li> </ul>	<ul style="list-style-type: none"> <li>● There are inconvenience of periodic cleaning and the occurrence of management costs</li> <li>● It is easy to lose the cleaning brush</li> <li>● <b>There are many cases where it is just used without cleaning (ineffective products)</b></li> </ul>
<ul style="list-style-type: none"> <li>● There are no plasma modules for efficient and safe space sterilization</li> <li>● <b>A large number of ozone generators are commonly called and used as plasma</b></li> </ul>	<ul style="list-style-type: none"> <li>● Strong sterilization power to cover a large space and minimization of ozone harmful to the human body</li> <li>● <b>When using a UV lamp or DBD plasma, it is inevitable to install a separate multi-activated carbon filter to remove a large amount of ozone.</b></li> </ul>	<ul style="list-style-type: none"> <li>● Different criteria <ul style="list-style-type: none"> <li>✓ Recommendation standard for indoor ozone generation by the Ministry of Environment: 0.05PPM</li> <li>✓ Air Purifier Organization Standard (CA) ozone generation standard: 0.03PPM</li> <li>✓ The level of demand in the actual market: less than 0.005PPM</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>There are concerns about ozone generation when used indoors for a long time</b> <ul style="list-style-type: none"> <li>✓ Ozone-free or equivalent safety requirements</li> </ul> </li> </ul>

# Differentiation of V-Guard

## ● Conventional plasma module

- ✓ If cleaning is not performed regularly, ions will not be generated
- ✓ Incompatible consumer electronics/automobiles/air conditioners/furniture, etc. requiring landfill/built-in design
- ✓ Suitable for small products only and insufficient efficiency for large-scale space sterilization

## ● V-Guard

- ✓ No need for cleaning management with automatic cleaning function
- ✓ Embed/closed and freely applicable to all spaces and products without distinction in general
- ✓ Korea's first and only test performed in USA for aerosolized COVID-19.  
(99.998% in 36m<sup>3</sup>)

“

Self-Cleaning  
Ozone Free  
Covid-19 Tested

Safe and Clean  
High Performance

Airborne Virus Protection

Free to apply to any  
space you need

“

Compact Size  
Easy to Install

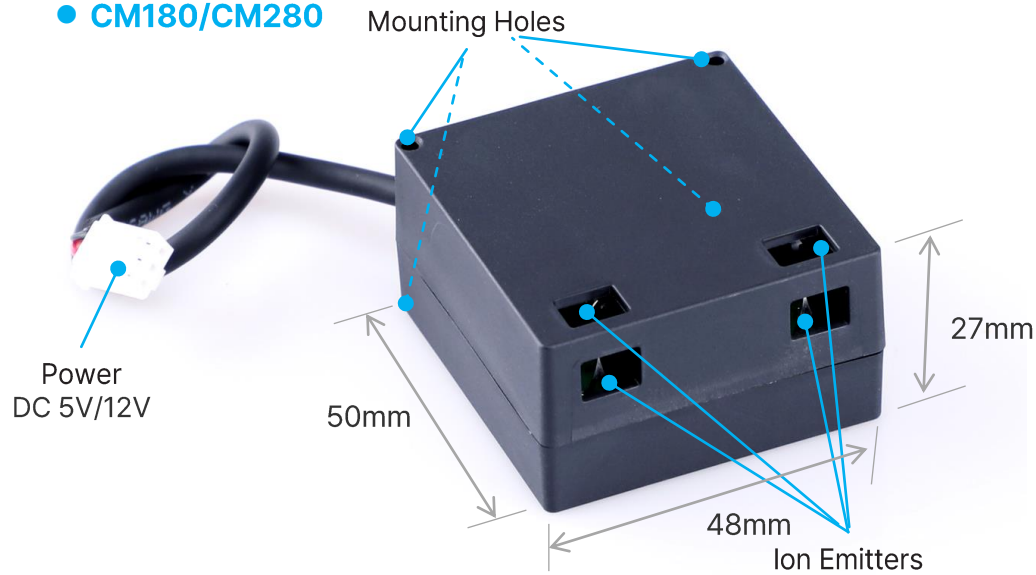
Efficient sterilization  
for Large and medium size space



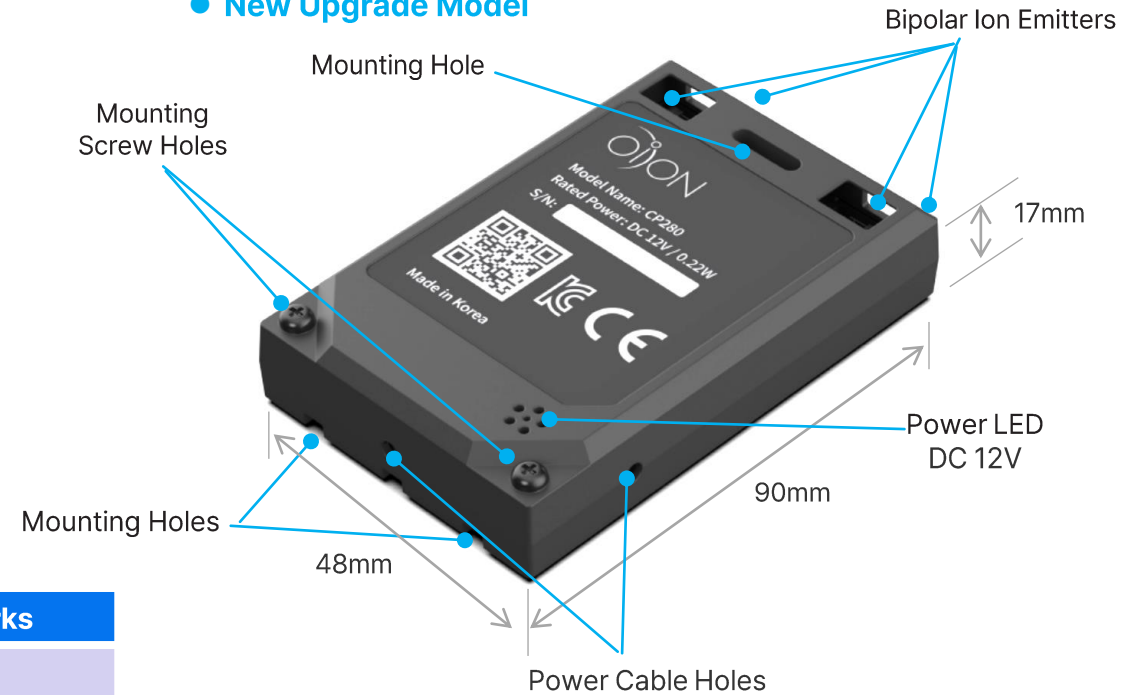
# ● V-Guard Series Plasma Module

## ✔ Specification

### ● CM180/CM280



### ● New Upgrade Model



Category	CM180	CM280	Remarks
Type	Self-Cleaning	Self-Cleaning	
Power	DC5V	DC12V	
Current	53mA	50mA	±10%
Power	0.27W	0.6W	±10%
Output	-1.3kV ~ +1.65kV	±2.7kV~2.6kV	±10%
Temperature	-20°C ~ 80°C		
Humidity	RH 20% ~ 90%		

- ✔ Silicon brushes mounted on the micro motors automatically remove accumulated particles on the ion generating needle points of the plasma module
- ✔ automatic cleanings conduct three times a day regularly (cleaning time - less than 2 seconds)

# ● Test Report (USA)

## COVID-19 Virus Aerosol Test (Innovative Bioanalysis)



Korea First

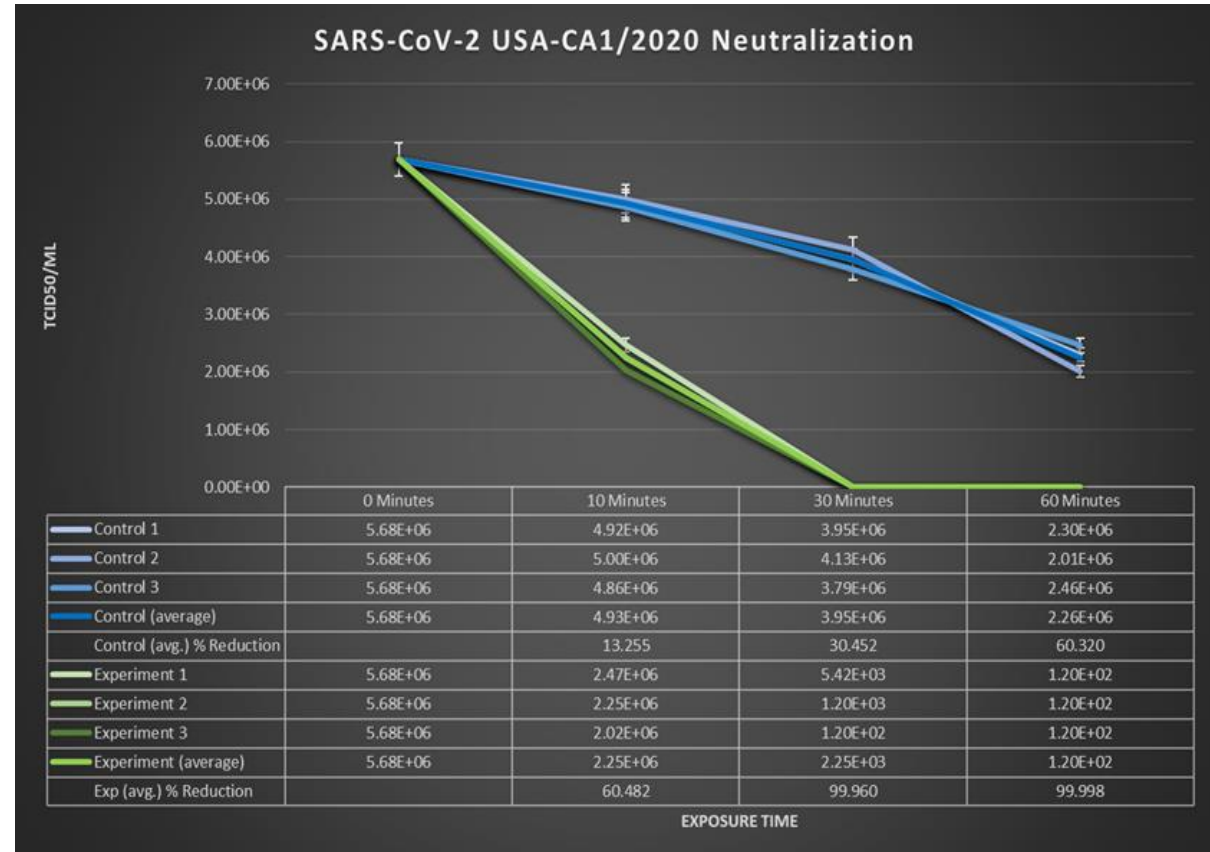
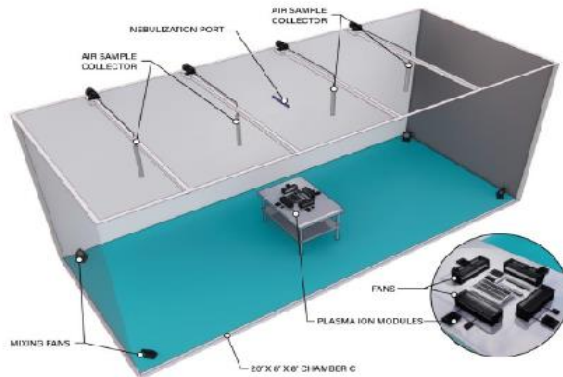
**INNOVATIVE BIOANALYSIS**  
creating solutions | getting results

### Testing Layout

All testing was conducted in a sealed 20'x8'x8' chamber following DSL-3 standards. The room had a displacement volume of 1,280 cubic feet, approximately 36,245 liters of air. The room remained closed to prevent any air from entering and leaving the room during testing. A nebulizing port connected to a programmable compressor system was located in the center of the 20' wall protruding 24" from the wall opposite the door. A low-volume mixing fan (approx. 30 CFM) was positioned at 45-degree angles at each chamber corner and continuously operated for the duration of testing to simulate light air movement and for better mixing in the test chamber. Four air sampling probes connected to Gilian 10i programmable vacuum devices hang in the room's centerline, 6" off the chamber floor. The device was placed on a stainless-steel table in the center of the test chamber (Figure 7).



Figure 6. Closeup of the Oion prototype with two plasma ion modules and the tubular fan.




- ✓ Testing for COVID-19 (SARS-COV-2) virus in an aerosol state conducted at Innovative Bioanalysis (Biosafety level 3 Lab) in the US
- ✓ Chamber Size - 20 X 8 X 8 Feet (approx. 36m<sup>3</sup>) / Time - 3 tests each for 10 minutes / 30 minutes / 1 hour
- ✓ Application sample: Kit with 8 V Guard plasma modules and a fan (see photo)
- ✓ Test result: Corona virus sterilization - 10 minutes (60.48%), 30 minutes (99.96%), 60 minutes (99.99%)

Excellent removal of RNA viruses (corona-19, MERS, influenza A/B, bird flu, foot-and-mouth disease, etc.)

# ● Test Report (Korea)

## KCL (Korea Conformity Laboratories)



### 시험성적서

1. 성적서 번호 : CT21-114516K  
 2. 의뢰자  
 ○ 업체명 : 오아미온 주식회사  
 ○ 주소 : 경기도 화성시 동탄기흥로 570-6, 313호 (영천동, 동탄골드아이타워)  
 3. 시험기간 : 2021년 11월 02일 ~ 2021년 11월 24일  
 4. 시험성적서의 용도 : 품질관리  
 5. 시료명 : V-Guard  
 6. 시험방법  
 (1) SF3-KACAD02-132:2021

7. 시험결과  
 ; V-Guard

시험항목	단위	시험방법	시험결과	비고	시험장소
오존발생농도	umol/mol	(1)	0.005 미만	121 ± 1) °C, (46 ± 5) % R.H.	A

\* 작동모드 : POWER ON  
 \* 시험장소  
 A : 인천광역시 남동구 당항로 85

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확인	작성자 성명	검인수	검인수	기술책임자 성명	신원철	시서원

비고: 1. 이 성적서는 KS Q ISO/IEC 17025 및 KOLAS 인정과 관련이 없으며, 의뢰자가 제시한 시료 및 시료명에 한하여 결과로서  
 전체제품에 대한 품질을 보증하지는 않습니다.  
 2. 이 성적서는 복사, 선전, 광고 및 소송용으로 사용될 수 없으며, 용도 이외의 사용을 금합니다.  
 3. 이 성적서의 일부만을 발췌하여 사용한 결과는 보증할 수 없습니다.  
 4. 이 성적서의 권위여부는 홈페이지(www.kcl.re.kr)에서 확인 가능합니다.

2021년 11월 24일  
 한국건설생활환경시험연구원

<Ozone>

✓ Ozone Free: less than 0.005ppm



### 시험성적서

성적서번호 : CT21-111022K

7. 시험결과


시험 항목	시험방법	의뢰자 제시	시험 결과			시험환경
			가동 전 농도 (CFU/m <sup>3</sup> )	가동 후 농도 (CFU/m <sup>3</sup> )	감소율 (%)	
부유미생물 저감 시험 (대장균)	V-Guard plasma ion module	의뢰자 제시	1.1 × 10 <sup>4</sup>	< 10	99.9	(23.0 ± 0.1) °C (50.0 ± 2.0) % R.H.

\* CFU : Colony Forming Unit  
 \* 시험균주 : Escherichia coli ATCC 25922  
 \* 챔버크기 : 30 m<sup>3</sup>  
 \* 측정장비 : MAS-100 NT (MERCK, 유량 : 100 L/min)  
 \* 가동시간 : 3 시간  
 \* 결과값 농도 : Feller Conversion Table 적용  
 \* 의뢰자제시조건 : ISO 16000-36:2018에 준함 (단, 가동시간 : 3 시간)  
 \* 시험장소 : 경기도 수원시 영통구 월드컵로 150번길 56 한경대학교 경기친환경농업연구소센터 3층

총 3페이지 중 2페이지

< Escherichia coli >

✓ Escherichia coli reduction rate: 99.9%



### 시험성적서

성적서번호 : CT21-111023K

7. 시험결과

시험 항목	시험방법	의뢰자 제시	시험 결과			시험환경
			가동 전 농도 (CFU/m <sup>3</sup> )	가동 후 농도 (CFU/m <sup>3</sup> )	감소율 (%)	
부유미생물 저감 시험 (황색포도상 구균)	V-Guard plasma ion module	의뢰자 제시	1.0 × 10 <sup>4</sup>	< 10	99.9	(23.0 ± 0.2) °C (50.0 ± 2.0) % R.H.

\* CFU : Colony Forming Unit  
 \* 시험균주 : Staphylococcus aureus ATCC 6538  
 \* 챔버크기 : 30 m<sup>3</sup>  
 \* 측정장비 : MAS-100 NT (MERCK, 유량 : 100 L/min)  
 \* 가동시간 : 3 시간  
 \* 결과값 농도 : Feller Conversion Table 적용  
 \* 의뢰자제시조건 : ISO 16000-36:2018에 준함 (단, 가동시간 : 3 시간)  
 \* 시험장소 : 경기도 수원시 영통구 월드컵로 150번길 56 한경대학교 경기친환경농업연구소센터 3층

총 3페이지 중 2페이지

< Staphylococcus aureus >

✓ Staphylococcus aureus reduction rate: 99.9%

# Case Studies of V-Guard



Air Sterilizer  
by K-Project



Wardrobe Sterilizer  
by CosysLK



4way Air Conditioner  
by AP



Elevator  
by OTIS Korea



Kiosk  
by Naicom



Air Shower Gate  
by Purium



Air Shower  
by Grex

# Case Studies of Plasma Ionizer – Japan Transportation

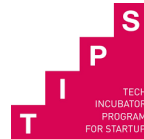


**SHARP**



# Convergence Ion Generator by OION

- 'TIPS' program from Ministry of SMEs and Startups (Oct. 2023)



- ✓ High performance of Ion & Ozone Free
- ✓ Technology Convergence: Plasma + UV + Photocatalyst

- Paradigm Change with OION New Module

- ✓ Closer to People

UV: "Being used when it's vacant"



UV is harmful when it's directly shown to human body (& eyes)

"Always" even if there are people



Space Sterilization + No Concern for Ozone  
(No need for charcoal filter)



**Be clean, be safe  
with improved plasma technology**

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