

GARDINER

31300 Bainbridge Road
Solon, OH 44139
p (440) 248-3400
f (440) 349-6980

www.whgardiner.com

GARDINER

X

 **PlasmaAir**

GARDINER / PLASMA AIR INFORMATION GUIDE

PLASMA AIR TECHNOLOGY

Bi-Polar Ionization technology is a highly effective way to combat COVID-19. When utilizing the products from *Plasma Air*, positive & negative charged oxygen ions are dispersed into the airstream with virtually no ozone created in the process. Once these particles are taken into the HVAC system, they bond with bacteria and virus cells, neutralizing and destroying the harmful contaminants, odorous gases & Volatile Organic Compounds (VOCs). A test was conducted with *Plasma Air*'s technology against the spread of the coronavirus. The resulting outcome came out to a 99% reduction after ten minutes of exposure to ionization. You can find the document regarding this procedure & further information on this technology attached.



600 Series



7000 Series



Plasma Bar

GARDINER / PLASMA AIR INFORMATION GUIDE

CLEARING THE AIR WITH PLASMA AIR : FREQUENTLY ASKED QUESTIONS

What sets Plasma Air apart from the competition?

Plasma Air's needlepoint bi-polar ionization technology is some of the most advanced technology in this spectrum of Indoor Air Quality (IAQ). Some manufacturers utilize one needle for positive ions and the other for negative ions. This can cause issues due to the opposite polarities dispensing from the product attracting to each other instead of linking to VOCs and other viruses in the airstream. Plasma Air's products do not run into this issue, as they produce both polarities at the same time. This allows the positive & negative oxygen ions to repel instead of attract & attach to the harmful contaminants in your airstream (Figure 1).

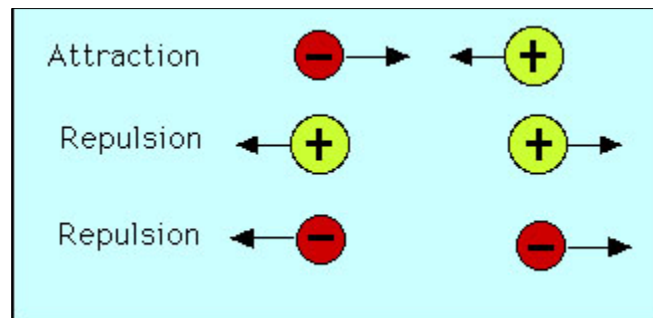


Figure #1: Ion Attraction/Repulsion Visual

How many ions are produced from Plasma Air's products?

- 600 Series / 7000 Series = 10 billion ions per second
- Plasma Bar = 10 billion ions per second for every 6 inch increment (For example, an 18 inch bar produces 30 billion ions per second)

Is there any extra work required prior to installation?

Plasma Air's products are fully assembled in the factory with no extra labor required prior to installation. No extra pieces to attach or mount together.

What does maintenance & lifespan look like for Plasma Air's products?

With a 10 year lifespan, Plasma Air's technology will last a decade with no maintenance required.

Does this technology create ozone?

Plasma Air's products are certified by the Underwriters Laboratory (UL). The products are UL 867 / UL 2998 certified. This means that Plasma Air's technology produces less than 50 ppb (parts per billion). Achieving this requirement meets the definition of zero ozone emissions as defined by UL.

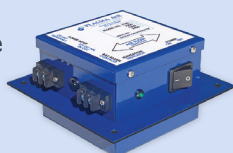
Commercial Product Selection Guide

Plasma Air products can be used in a variety of IAQ applications with varying pollutant levels. This guide will help you select the proper Plasma Air product and concentration of ionization for your application.

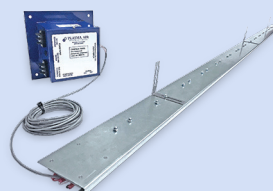
Needlepoint, Brush & Portable Style Ionizers



**600 Brush-style
Needlepoint
Ionizer**



**7000 Series
Needlepoint
Ionizer**



**Plasma Bar (PB)
Needlepoint
Ionizer**



**NV200 / NV900 Series
Portable Plasma
Generator**



**Defend 1050 Series
Portable Plasma
Generator**

POLLUTANT LOAD FACTOR

- A** Office, Classroom, Library, Church, Day Care Center
- B** Gymnasium, Auditorium, Arena, Athletic Facility, Cafeteria, Hospital
- C** Cannabis Grow Facility, Senior Living, Airport, Non-Smoking Casino, Train Station
- D** Light Manufacturing, Animal Facility, Smoking Casino, Nail/Beauty Salon, Food Processing Facility
- E** Industrial Facility, Heavy Manufacturing, Garbage Room
- F** Odors and Chemicals Typical of a Waste Water Treatment Facility

The table below provides recommended products based on airflow (CFM) and typical pollutant loads:

| Pollutant Load Factor | Airflow (CFM) & Recommended Product(s) | | | | | | |
|-----------------------|---|--------------|--------------|-----------------|-----------------------|-----------------------|--------------------|
| | 1,000 | 2,000 | 3,000 | 5,000 | 8,000 | 10,000 | 20,000 |
| A | 600 or 7100 | 600 or 7200 | 7300 | 7400 | (2)7300 or PB-42 | (2)7400 or PB-48 | (4)7400 or PB-96 |
| B | 600, 7200 or 100D | 7300 or 100E | 7400 or 200D | (2)7300 or 200E | (2)7400, PB-60 or 50E | (3)7400, PB-72 or 50F | (2)PB-72 or (2)50F |
| C | 100D | 100E | 200E | 50E | 50F | (2)50E | (3)50F |
| D | 100E | 200E | 50E | 50F | (2)50E | (2)50F | (4)50F |
| E | 200D | 50E | 50F | (2)50E | (2)50F | (3)50F | (6)50F |
| F | * Consult Plasma Air Engineering Department | | | | | | |



Plasma Air Ionization Proven to Reduce Coronavirus Surrogate by 99% Airborne and 80% on Surfaces in 10 Minutes

POSTED IN [CASINOS](#), [COMMERCIAL](#), [CORONAVIRUS](#), [HOTELS](#), [RESIDENTIAL](#), [SCHOOLS](#), [UNCATEGORIZED](#).

Successful certified testing conducted in a building facility proves virus destroying power

Testing carried out by Tayra and backed by the Spanish Ministry of Defense Biological Laboratory in Spain has proven the effectiveness of Plasma Air Ionization technology in the reduction of MS2 Bacteriophage, a surrogate for SARS-CoV-2 (COVID-19), in indoor environments.

There is mounting research to suggest that clean, disinfected air plays a vital role in preventing the spread of SARS-CoV-2, the virus causing COVID-19. While respiratory droplets are considered the primary transmission route, aerosols are being considered by many health authorities as a possible mode of infection transmission along with surface contact. This suggests that viral particles can remain suspended in the air for long periods and can be inhaled.

The research tests were conducted in a Madrid hotel converted into a residence and confinement center for medical staff during the pandemic. The experiments took place in simulated ICU hospital rooms within the hotel. This environment was explicitly designed to test air ionization on small aerosolized viral particles. The laboratory analysis was carried out at a nearby operations center of the Spanish Ministry of Defense from May 4th to May 14th.

The Plasma Air ionizer was chosen to suit the specific airflow and installed in the fan coil unit supply air duct that delivered air to the test space. The bacteriophage MS2 was then nebulized into the test space. During the first phase of the test, the supply air into the room was untreated. During the second phase, the supply air entering the test room was ionized using Plasma Air's bipolar ionization system. A reduction of approximately 2 log units of the bacteriophage was obtained in the air that was ionized by the Plasma Air system. This corresponds to a **99% reduction after only 10 minutes** of exposure to ionization.

The tests also included using manikins to simulate ICU patients. The manikins were equipped with specialized filters to measure the amount of bacteriophage that was being breathed in with and without air ionization. The levels of MS2 bacteriophage and associated particle counts were measured using Electrical Low-Pressure Impactors, and swabs were taken from walls and surfaces for analysis. The level of airborne MS2 bacteriophage was measured using the Spanish authorities' calibrated equipment for detecting biothreats. Results from this test showed a reduction in the order of 0.70-0.85 log pfu/cm² corresponding to nearly **80% reduction in surface MS2 bacteriophage after 10 minutes** between the test with and without ionization.

The research project was guided and coordinated by Plasma Air's long-term business and technical partner in Spain, Tayra, a specialist in air purification. In addition to the Spanish Government ministries, the experiments also involved academics in the fields of engineering, microbiology, and computational fluid dynamics, along with Spanish Government appointed testing labs.

“Coronavirus is a global crisis and nowhere more so than inside built environments such as transport hubs and work environments,” explains Chris Russell, Vice President of Plasma Air. “The effective elimination of airborne virus is a major breakthrough that can make workplaces, transport, entertainment and educational facilities safer for employees, commuters and students.”

“We were very motivated to facilitate these critical tests at our laboratories here in Madrid, and we are extremely impressed by the results achieved,” stated Lieutenant Coronal Juan Carlos Cabria, the Technical Director of the biosecurity laboratories of the Ministry of Defense. “We are extremely grateful to the team of Scientists, Engineers, Microbiologists and Academics who have worked tirelessly here for the last three weeks voluntarily to achieve this incredible and important result in the battle against coronavirus.”

About Air Ionization

Air ionization works through the reaction of negatively and positively charged ions. The ions attach to airborne pathogens, such as viruses causing a chemical reaction on the cell membrane’s surface. This deactivates the viruses, rendering them harmless, so they can no longer spread or cause infection.

Plasma Air’s ionization system used during the Spanish trials are available commercially on a worldwide basis from a network of distributors and are used in offices, hotels, transport hubs, schools and hospitals, as well as in the Los Angeles Airport (LAX) and the new Doha and Riyadh metro systems.

About Plasma Air

Plasma Air is the leading innovator in indoor air quality by manufacturing HVAC and air purification products that result in healthier, more productive indoor environments in institutional, commercial, residential and industrial applications. The Plasma Air HVAC purification systems use highly efficient bipolar ionization technology to kill harmful airborne viruses and neutralize indoor air pollutants. Plasma Air systems have been proven in thousands of applications to provide the highest level of air quality improvement for airports, train systems, schools, hotels, casinos, arenas, offices and homes.


About Tayra

Tayra is a specialist HVAC company based in Madrid. Founded in 2004, it provides advanced technologies and products to the market. Tayra’s technical team brings together more than 30 years of experience in the field of air conditioning installations, both in the design and application of advanced systems of high performance and quality. Tayra has been working closely with Plasma Air and has been successfully deploying ionization to major companies such as Engie and Danone in the region.

[<PREVIOUS](#)

Sars-Cov-2 (COVID-19) Testing

July 2020 Report #1

| Criteria | Plasma Air Independent Test on Sars-Cov-2 Surrogate |
|--------------------|--|
| Independent Test? | Testing conducted and certified by the Minister of Defense of the Spanish Government* |
| Test Set up | Full scale hotel/hospital room |
| Sample Delivery | Aerosolized virus throughout space |
| Ion Density | Testing performed at a representative ion level of 1,000 ions/cm ³ |
| Ion Delivery Rate | Normal 50 FPM in occupied space |
| Model Tested | Testing performed on current Plasma Air model – PA600  |
| Results – Airborne | 99% deactivation rate in 10 min |
| Results – Surface | 80% deactivation rate in 10 min |

*Details of the independent test can be found in the [news](#) section of our website.

Plasma Air is the leader in third party independent efficacy testing. We also lead the ionization industry in internal testing with an in-house state of the art microbiology lab and three certified test chambers.