

Air Purification Through Bi-Polar Ionization

Nu-Calgon has partnered with Global Plasma Solutions (GPS) to bring a new, advanced air purification technology to the HVACR market. This patented technology called needle-point bi-polar ionization uses carbon fiber brushes to produce a refined electrical charge to proactively and safely clean the air in residential and commercial buildings. The GPS approach produces equal amounts of positive and negative ions (combined charge neutral) that react and break down pathogens, allergens, particles, smoke, odors and VOCs in the air, creating a healthy environment without producing any harmful byproducts like ozone or unstable ROS (Reactive Oxidation Species) molecules that result in the use of PCO technologies.



How Bi-Polar Ionization Works

GPS by Nu-Calgon devices are bi-polar, meaning they use two emitters to create equal amounts of positive and negative ions. When these ions are injected into the air stream, creating a plasma region, they break down passing pollutants and gases into harmless compounds like oxygen, carbon dioxide, nitrogen and water vapor. When the ions come in contact with viruses, bacteria or mold, they remove the hydrogen molecules from the pathogens. Without hydrogen, the pathogens have no source of energy and will die. The ions also attach to allergens, such as pollen, smoke and other particles, causing them to band together until they are large enough to be caught by filters.



GPS' technology generates the same ions that nature creates with lightning, waterfalls, ocean waves, etc. Nature uses ion energy to break apart molecules, naturally cleaning the air and producing a healthy environment. The only difference between GPS' technology and nature is that GPS does it without developing detectable ozone. In fact, third party testing of GPS technology by Intertek/ETL to the UL867 ozone chamber test confirmed ozone levels less than 0.00PPM!

How GPS Ionization Differs from PCO Technology

Unlike GPS' bi-polar ionization method, Photo Catalytic Oxidation (PCO) technology uses UV light, commonly with titanium dioxide (TiO₂) and often with other alloys, to create ionization. The Centers for Disease Control (CDC) has warned of cancerous risks involved with TiO₂* – not something you want in a building's air quality!

ASHRAE issued a position document in January 2015 on Filtration and Air Cleaning where they cautioned UV lamps used in many PCO devices can emit significant ozone – known to be harmful for human health. They also observed and reported on page 9 of the document "...potential of an incomplete oxidizing process, which produces by-products of reaction that can be more toxic or harmful than the original constituents (i.e. formaldehyde). The catalysts can be contaminated (poisoned) by airborne reagents and/or products of oxidation, which results in reduced or total efficiency failure of the process." Lastly, the PCO approach requires the replacement of the UV cell every year or two. Bi-polar ionization requires no replacement parts, and on the self-cleaning models, they are maintenance free. The chart on the next page shows several advantages of GPS technology over two common market approaches.

*CDC Current Intelligence Bulletin 63



Advantages of GPS Technology Over Two Common Market Approaches:

| Feature | GPS by Nu-Calgon | UVPCO Ionizers | UV Lights |
|------------------------------|---|----------------------------------|-------------------------------|
| Kills pathogens downstream? | Yes | Yes | Only line-of-sight pathogens |
| Controls odors? | Yes | Yes | No |
| Reduces airborne particles? | Yes | Poor | No |
| Replacement parts? | No | UV cell replaced every 1-2 years | Bulb replaced every 1-2 years |
| Self-cleaning options? | Yes | No | No |
| Performance | Self-cleaning provides continual peak performance | Fades with UV output | Fades with UV output |
| Harmful byproducts? | No | Creates ozone & other byproducts | Some bulbs emit ozone |
| Cleans entire depth of coil? | Yes | Yes | Cleans only one side |
| Mercury in airstream? | No | Yes | Yes |
| Energy required | < 60 watts | > 60 watts | > 60 watts |
| Universal voltage? | Most models | Most models don't | No |
| Robust construction? | Solid state design | UV bulbs can break | UV bulbs can break |
| UV material breakdown? | No | UV lights hard on materials | UV lights hard on materials |
| Contains Titanium Dioxide? | No | Maybe | No |
| Three Year Warranty | Yes | Replace parts in 1-2 years | Replace parts in 1-2 years |

GPS by Nu-Calgon Products:



4900-20

iWave®-R

With technology installed in over 100,000 applications worldwide, iWave-R is the world's first self-cleaning, bi-polar ionization air cleaner specially designed for residential duct air conditioning systems up to 6 tons (2400 CFM) in size. Needle-point ionization actively treats air in the living space with no replacement parts, no maintenance and universal voltage (24-240VAC). It can mount easily inside or outside of duct in about 15 minutes, or it can attach magnetically near indoor fan. iWave-R always works at peak performance, producing over 160 million ions/cc, more than any interior air quality product on the market. Patent-pending self-cleaning design includes programmable cleaning cycle with alarm contact option. UL and cUL approved. Three-year warranty.



4900-30

iWave®-F

iWave-F is a flexible and highly versatile three foot ion-generating bar that can treat IAQ in nearly any HVAC application. Its revolutionary circuit bar with special ion-generating needles suitable for any HVAC cooling coil up to 48" wide. Plus, it can be shortened in the field to any size! Perfect for ducted package or ductless HVAC systems in living centers, hotels, commercial buildings, residential (including mini-splits), transport cooling coils or even in ice machines – applications where mold is an issue. Provides the highest level of ionization energy in the most compact size available on the market. Can be used to reduce outside air for commercial applications per ASHRAE 62.1 IAQP. UL and cUL approved with universal voltage (110-240VAC). Virtually maintenance free with no replacement parts. Produces over 240 million ions/cc per foot of flexible ribbon. Three-year warranty.



4900-40

iWave®-V

With technology currently installed in over 100,000 applications worldwide, iWave-V is a versatile, low-maintenance bi-polar ionization generator for treating air in residential duct air conditioning systems up to 6 tons (2400 CFM) in size. Needle-point ionization actively treats air in the living space with low maintenance and no replacement parts. Produces over 160 million ions/cc, more than any other interior air quality product on the market. Requires only 15 minutes to install inside or outside of duct, or attach magnetically near indoor fan. UL and cUL approved. Three-year warranty.



4900-10

iWave®-C

Although it can be used for residential applications, the original iWave-C is especially suitable for light commercial systems up to 12 tons (4800 CFM). iWave-C is a self-cleaning, bi-polar ionization generator for treating a building's air quality that does not require replacement parts in a year or two like competing technologies. iWave-C always works at peak performance, producing over 200 million ions/cc, making it superior to other market approaches. Special features include a programmable cleaning cycle, waterproof housing, digital display and integral alarm contact. Can be used to reduce outside air for commercial applications per ASHRAE 62.1 IAQP. Duct mount to air handler inside or outside of building. For systems larger than 12 tons, multiple iWave-C units can be applied. UL and cUL approved with universal voltage (24-240VAC). Three-year warranty.

| Application | iWave-F | iWave-V | iWave-R | iWave-C |
|--|---------|---------|---------|---------|
| Residential - Mini-Split A/C Systems | X | | | |
| Commercial - VRF A/C Systems | X | | | |
| PTAC Systems | X | | | |
| Residential Duct HVAC Systems | X | X | X | X |
| Light Commercial Duct HVAC Systems | X | | | X |
| Transport HVAC Systems | X | | | |
| Industrial HVAC Systems | X | | | |
| Ice Machines to Reduce Mold in Cabinet | X | | | |

| Features | iWave-F | iWave-V | iWave-R | iWave-C |
|---|----------------|----------------|----------------|----------------|
| Patented Self-Cleaning Technology | | | X | X |
| No Replacement Parts | X | X | X | X |
| No Maintenance | * | * | X | X |
| Kills Mold, Bacteria, and Viruses | X | X | X | X |
| Controls Odor (Cooking, Pet, VOCs) | X | X | X | X |
| Reduces Allergens | X | X | X | X |
| Prevents/Eliminates Dirty Sock Syndrome | X | X | X | X |
| Controls Particles in Air | X | X | X | X |
| Reduces Smoke | X | X | X | X |
| Reduces Static Electricity | X | X | X | X |
| Actively Treats Pathogens in Space (entire coil/living space) | X | X | X | X |
| Universal Voltage (24-240VAC) | 110-240VAC | 24VAC | X | X |
| Reduces Outside Air Requirement for Commercial Systems | X | | | X |
| Universal Mounting | X | X | X | Duct Mounted |
| Customizable Length | X | | | |
| Digital Display/Weatherproof Housing | | | | X |
| Alarm Contact Option for Notification | | | X | X |
| Replaceable Emitters | | | X | X |
| Service Temperature Range | -40°F to 140°F | -40°F to 160°F | -40°F to 160°F | -40°F to 160°F |
| Limited Three Year Warranty | X | X | X | X |

* Both the iWave-F and iWave-V require low maintenance. The ionizer tape may require a wipe with damp cloth from time to time to ensure ionizer tips are clear of particles. After power is turned off, the carbon bristles on the iWave-V should be looked at periodically (every time the air filter is replaced) to ensure they are clean for optimum performance.

Frequently Asked Questions:

What makes GPS by Nu-Calgon products unique?

- The GPS by Nu-Calgon products are patented ion-generating devices that produce the highest available ion outputs and do not create ozone or harmful byproducts, which are different than current ionizers on the market. Not only that, there are self-cleaning options that require no maintenance, no replacement parts, universal voltage and universal mounting, making these highly versatile devices game-changers in the IAQ market for proactive whole home/office purification. The devices offer a superior three-year warranty – other products require light/cell replacement in a year or two.

What does it mean when you are saying ‘killing pathogens in space’?

- The ions are circulated downstream of the iWave-F, iWave-V, iWave-C and iWave-R to where they thoroughly address pathogens through the coil, duct and living space, making it an active whole purification system. This is different than UV lights with a passive approach that only address pathogens that circulate past the UV light in the duct and only affect part of the coil.

How long will GPS by Nu-Calgon products last?

- GPS by Nu-Calgon products are designed to last for a very long time, up to the design life of the air conditioning equipment.

What should be covered when installing an iWave-V or iWave-R in a residential A/C system?

- Install between the air filter and the indoor coil.
- The air current must flow through the “goal posts” (two emitters) so total ionization output is achieved.
- Attach IN or ON duct or indoor fan with air current flowing through “goal posts.” If installing on fan housing (shaft side), make sure self-tapping screws are used to secure device to housing, since the magnets alone may not be adequate if there is excessive vibration.
- Keep emitter brushes at least two inches from any metal surface. Electrical wires from the ionizer (or any wire in the equipment) must be kept away from emitter brushes.
- The products are only performing if there is air flow across the device.
- The devices pull low power (10VA), which allows maximum flexibility for installation.

Any electrical hook-up guidelines for residential A/C systems?

- The iWave-C and iWave-R have universal voltage capability between 24-240VAC for maximum versatility on electrical service options that are available for duct A/C systems. The iWave-F will handle between 110-240VAC voltage outputs typical for its intended application. The iWave-V requires 24 volts VAC.
- For residential duct A/C systems where 24/7 operation is desired, connect the device wires with “R” and “C” terminals/auxiliary board hook-ups, commonly available for 24VAC or 120VAC, but 240VAC is also an option.
- For the iWave-V running 24/7, the brushes may need to be cleaned a little more often, which is not an issue with the iWave-C/iWave-R because of the self-cleaning feature. Without air flow, the air is not being cleaned. With the device continuously on, the ions are quickly neutralized and there is no ion build-up in the home, smell at start-up or health concerns.

NOTE: If the device is wired to be cycled with fan, for best results to quickly address IAQ in home, turn indoor fan to “On” position (continuously run) for 24-48 hours, then cycle with thermostat.

- For residential duct A/C systems where it is desirable to cycle the ionizer with the internal fan, connect the device wires with “R” and “G” terminals/auxiliary board hook-ups. Another easy option is to add a 24VAC or 120VAC current relay to the wire of the blower so it energizes the ionizer every time the blower is energized.
- NOTE: Depending on circumstances and what is being powered by a commonly used 40VA transformer, another 40VA foot-mounted transformer may be needed to power the ionizer.

