

# IONFRESHER® LS-212 PLUS Personal Air Purification Shield White Paper v1.0

Subtitle: A New Generation of Air Protection Built Around the Breathing Zone

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## 1. Personal Air Purification Shield: A Product Definition Built for the Breathing Zone

The air we actually breathe is not the average air in a room. It is the small, constantly moving volume of air directly in front of the nose and mouth.

When people spend long periods of time at a desk, beside a bed, inside a car, in a fixed seat, or in a small enclosed space, what repeatedly enters the body is often not the average air of the entire room, but the narrow band of air closest to the breathing position. That air is influenced immediately by nearby movement, speech, disturbed dust, odor molecules, and localized airflow. It has always been part of everyday life, yet it has long lacked a product genuinely designed around it.

Masks and face coverings address wearable protection. Room-scale air purifiers address the air of the larger indoor space. Both matter, and both serve real purposes, but neither is the same as a product specifically designed to operate continuously around the breathing zone of a person who remains in one place for extended periods.

That is where the IONFRESHER® LS-212 PLUS Personal Air Purification Shield begins. It is not a smaller version of a conventional air purifier, and it is not a mask under another name. It is a new generation of air protection designed to stay close to the breathing zone, operate over long periods, and fit naturally into everyday life.

The importance of the Personal Air Purification Shield does not come from inventing a new phrase. It comes from defining a product position that has existed for a long time without being clearly named: not a wearable barrier, and not a whole-room treatment device, but a product centered on the localized breathing zone around where a person actually remains, continuously helping create a cleaner, more stable, and more livable pocket of air.

That is the starting point of the IONFRESHER® LS-212 PLUS. It was not created merely to enter an existing category. It was created to fill a distance that has long been overlooked: the distance between the person and the air closest to breathing.

## 2. Why a Personal Air Purification Shield Has Been Difficult to Realize

The idea of a Personal Air Purification Shield is easy to understand. The difficulty lies in making it real.

The market has never lacked products that try to move closer to the user, and it has never lacked devices associated with personal air. But a product does not become a true Personal Air Purification Shield simply because it is smaller, more portable, or described in more personal language. It cannot be nothing more than existing air-cleaning technology moved onto a desktop. To truly qualify, it must satisfy multiple conditions that work against one another at the same time.

It must stay close to the user without feeling intrusive. It must run for long periods without creating excessive noise or disruptive airflow. It must be easy to power without sacrificing core air-treatment performance. It must fit into desk areas, bedsides, vehicles, and everyday spaces without turning ownership into a high-maintenance routine with frequent replacement parts. In other words, it cannot simply be a device placed near a person. It must become a near-body air-treatment system that people can live with, keep using, and continue trusting over time.

That is why a Personal Air Purification Shield has been difficult to realize. The obstacle has not been a lack of demand. The obstacle has been the need to satisfy near-user placement, low interference, long-duration operation, convenient power access, flexible placement, and stable air-treatment performance at the same time. If any one of those conditions falls out of balance, the product quickly slips back into a more familiar category: a wearable gadget, a small fan-like device, a miniaturized room air purifier, or a short-lived concept product.

At minimum, a product must satisfy two major requirements before it can credibly be called a Personal Air Purification Shield.

First, it must satisfy the air-treatment requirement. It cannot merely sit near the user. It must actively treat the air around the breathing zone. For the IONFRESHER® LS-212

PLUS, this means three core functions: plasma sterilization, electrostatic dust collection, and negative ion purification.

Second, it must satisfy the personal-use requirement. It must be suitable for long-term presence and continued operation near the user. For the IONFRESHER® LS-212 PLUS, this means near-body use, quiet low-interference operation, USB power, portability, and flexible deployment.

Only when both sets of requirements are satisfied at the same time does the product become more than a machine placed near a person. Only then does it truly qualify as a Personal Air Purification Shield. That is also why the IONFRESHER® LS-212 PLUS deserves a technical white paper. If this were easy to achieve, it would simply be a product with a clear specification sheet. Because it is not easy, it becomes necessary to explain how it was achieved, where the difficulty lies, and what technical threshold was actually crossed.

### 3. The Technical Threshold That Makes a Personal Air Purification Shield Possible: A USB 5V High-Voltage System

The real breakthrough behind the IONFRESHER® LS-212 PLUS is not simply that its power architecture moved from the earlier DC 12V platform to USB 5V Type-C. The real breakthrough is that under a far more constrained and convenience-driven power condition, it still successfully establishes the high-voltage system required to support plasma ionization.

This is not a routine power-spec update. It is a real technical threshold.

For a Personal Air Purification Shield to exist in a meaningful way, the product must simultaneously deliver near-user operation, long-duration performance, low interference, low maintenance, and convenient power access. That means it cannot succeed merely by becoming smaller, and it cannot succeed merely by becoming USB-powered. The real challenge is whether a high-voltage system can still be established reliably under USB 5V conditions, and whether it can continue supporting the air-treatment functions that depend on it.

The difficulty is not just stepping low voltage up to a higher voltage. The difficulty is building a high-voltage system that remains sustainable, controllable, and stable over extended operation under limited input power. It cannot be an occasional discharge. It cannot be a short-lived demonstration. And it cannot be an effect that appears only under ideal conditions. It must become a stable system that can enter everyday product use and continue operating in real-world environments. That is where the technical threshold truly exists.

If that threshold is not crossed, the so-called Personal Air Purification Shield remains

only a concept. A device may be compact and may look convenient, but if the high-voltage system is unstable and plasma ionization cannot be established consistently, the three core technologies that follow cannot truly exist at the same time. In that case, the product may resemble a personal air device, but it still falls short of becoming a fully realized Personal Air Purification Shield.

That is the true new-generation significance of the IONFRESHER® LS-212 PLUS. USB 5V itself is not the value. The value lies in successfully building a stable high-voltage plasma system under USB 5V conditions. And because that technical threshold was crossed, the three core technologies of the IONFRESHER® LS-212 PLUS are not just names and not just marketing language. They are a complete technical system that can genuinely coexist and reinforce one another within a single product.

From a product-generation standpoint, the IONFRESHER® LS-212 PLUS is not simply an earlier product with a new connector. It is a product goal that was previously difficult to realize under modern power conditions, now successfully brought into a form that can actually live in everyday use. That is the most fundamental difference between this generation and the one before it.

For that reason, the USB 5V high-voltage system is not a secondary specification, and it is not a minor upgrade. It is the technical core that allows the IONFRESHER® LS-212 PLUS to exist as a true Personal Air Purification Shield. It must be established first, because every downstream air-treatment function depends on it.

#### 4. The Three Core Technologies of the IONFRESHER® LS-212 PLUS

The IONFRESHER® LS-212 PLUS Personal Air Purification Shield is not built around stacked filters, and it is not built around high airflow. Its core is built around three coordinated air-treatment technologies that can fully exist together only when the underlying system is in place: plasma sterilization, electrostatic dust collection, and negative ion purification.

**\*\*Plasma Sterilization × Electrostatic Dust Collection × Negative Ion Purification = The Three Core Technologies of the IONFRESHER® LS-212 PLUS\*\***

These three technologies are not separate, isolated features. They are the combined result of a single USB 5V high-voltage plasma system. Once that system is stably established, the three core technologies can then exist together around the breathing zone, forming the technical foundation of the IONFRESHER® LS-212 PLUS.

##### 4.1 Plasma Sterilization

The IONFRESHER® LS-212 PLUS uses a high-voltage needle-tip discharge structure to form a stable ionization zone. The key point is not moving air quickly with high airflow, but establishing a sustained ionization effect within a small near-body area so

that the air passing through the treatment zone is first exposed to high-voltage ionization.

As bacteria, viruses, and mold spores pass through this zone, their activity can be affected. As airborne suspended particles pass through the same zone, they are more easily ionized and charged. In other words, plasma sterilization does not only create the conditions for microbial influence, but also establishes the prerequisite for downstream electrostatic dust collection.

For that reason, plasma sterilization in the IONFRESHER® LS-212 PLUS is not simply a matter of airflow. It depends on a stable ionization zone created by high-voltage needle-tip discharge, allowing microorganisms and particles passing through the treatment zone to enter different downstream pathways: the former toward affected activity, and the latter toward easier charging and subsequent capture by the collection plates. This is one of the major differences between the IONFRESHER® LS-212 PLUS and traditional products that depend primarily on high-volume circulation or filter interception.

#### 4.2 Electrostatic Dust Collection

Once suspended particles acquire charge inside the ionization zone, their movement and attachment behavior changes. The IONFRESHER® LS-212 PLUS uses grounded stainless-steel collection plates to provide a stable destination for those charged particles, making dust, allergens, and some suspended pollutants more likely to be captured on the metal surface rather than remain suspended in the breathing zone.

In other words, electrostatic dust collection does not occur as an isolated result. It is the downstream effect of the upstream plasma ionization process. Airborne particles must first be influenced by high-voltage ionization and become charged before they can be more easily captured by the collection plates. This is why electrostatic dust collection in the IONFRESHER® LS-212 PLUS does not rely on disposable filters, but on an electric-field-driven collection structure built around reusable metal surfaces.

The collection plates in this product are made of stainless steel, not aluminum alloy. The significance of that choice goes beyond durability and structural stability. It supports a dust-collection logic designed for long-term use, repeatable maintenance, and operation without dependence on replaceable consumables. That matters in a Personal Air Purification Shield, because a product intended to remain near the user over time cannot push its maintenance burden into frequent consumable replacement.

#### 4.3 Negative Ion Purification

As the high-voltage ionization system continues operating, the IONFRESHER® LS-212 PLUS also continuously releases negative ions into the surrounding air. These

negative ions help suspended particles settle more readily and contribute to a cleaner, fresher near-body air experience.

Unlike electrostatic dust collection, negative ion purification does not end with internal collection inside the device. Instead, it extends the influence of the high-voltage ionization system into the local air environment around the user. In other words, electrostatic dust collection is responsible for formally capturing some charged particles on the stainless-steel collection plates, while negative ion purification extends the system's effect beyond the unit itself, helping some suspended particles settle more easily and improving the near-body air experience.

In the IONFRESHER® LS-212 PLUS, negative ion purification is not an extra add-on feature. It is the third core effect that naturally emerges once the high-voltage plasma system is stably established. According to the product specification, the negative ion concentration can reach approximately 6 million ions/cm<sup>3</sup>, providing an important extension of the product's near-body air purification effect.

5. The Eight Conditions Required for a Personal Air Purification Shield to Truly Exist  
The IONFRESHER® LS-212 PLUS qualifies as a Personal Air Purification Shield not because one feature stands out on its own, but because multiple conditions are satisfied at the same time. These eight conditions are not a list of selling points. They are the criteria that determine whether the category itself can truly be said to exist. Remove any one of them, and the product can easily fall back into more familiar categories rather than remain a complete Personal Air Purification Shield.

#### 5.1 Plasma Ionization Must Be Established

A Personal Air Purification Shield can only truly exist if stable plasma ionization is established first. Without stable ionization, there can be no downstream plasma sterilization, electrostatic dust collection, or negative ion purification. This is not an optional add-on feature. It is the starting point of the entire technical system.

#### 5.2 USB Type-C Power Must Be Established

If a Personal Air Purification Shield is meant to enter everyday life, it cannot depend on inconvenient, situationally limited, or easily interrupted power sources. USB Type-C matters not merely because it is convenient, but because it allows the product to genuinely enter desktops, bedsides, vehicles, power banks, and the broader ecosystem of modern personal electronics as a device that can be used continuously.

#### 5.3 Fan-Free Design Must Be Established

In a near-body product, excessive airflow and noise undermine the comfort of long-term coexistence. If a product depends heavily on a fan, it easily slips back into the logic of a desktop blower or a miniaturized air purifier. A fan-free design means the product does not rely on forced airflow as the basis of its existence, but instead

treats the breathing zone in a lower-interference way.

#### 5.4 A Consumable-Free Design Must Be Established

A Personal Air Purification Shield intended for long-term use should not be built around heavy dependence on replaceable consumables. Frequent replacement means not only cost, but also interruption of use, added maintenance burden, and dependency on supply. A consumable-free design means the product can remain present over time with lower intervention and lower ownership burden, which is especially important for a near-body device.

#### 5.5 Near-Body Protection Must Be Established

The product must focus primarily on the small-range breathing zone around where a person stays. It cannot simply present itself as a large-area rapid air-circulation device. If the core treatment zone is no longer the breathing zone and instead returns to the logic of treating average room air, then it is no longer a Personal Air Purification Shield. It becomes another type of air device.

#### 5.6 Long-Term Stable Operation Must Be Established

A Personal Air Purification Shield cannot be merely a short-term demonstration product, nor can it be a concept device meant only for occasional activation. It must be able to operate for long periods in everyday life. That requires structural stability, power stability, and operational stability to exist together. Only when it also succeeds across time does the product gain real near-body coexistence value.

#### 5.7 Portable Convenience Must Be Established

A Personal Air Purification Shield should not be confined to one fixed location. It must be able to move with the user's life position, from desktop to bedside and from indoors to vehicle, so that protection around the breathing zone is not broken by a change of setting. If the product cannot move with the user, it becomes difficult for it to truly function as a personal device.

#### 5.8 Flexible Application Must Be Established

It cannot be tied to only one scene of use. It must be able to enter multiple daily environments where people remain for meaningful periods of time. From personal desks, bedsides, and vehicles to clinic seating, waiting areas, and short-stay spaces, the product should retain the same logic of validity. Flexible application means it was not created for a single display scenario, but as a product capable of entering real life.

### 6. From a Single Point to a Protection Network: The Logic of Point, Line, and Surface Deployment

The value of a Personal Air Purification Shield lies not only in close-range treatment at a single position, but also in its ability to extend into real-life use and spatial

deployment scenarios.

When a device is placed at a desk, bedside, sofa side, dining table, office seat, clinic seat, or any other place where a person remains for long periods, it first creates a fixed close-range air-treatment point. That is the logic of a point, and it is the most basic starting point of a Personal Air Purification Shield.

That point does not have to remain inside a fixed private space. It can move with the user into cafés, libraries, hospitals, hotels, vehicle seating, rental apartments, camper vans, or camping tents, entering temporary yet real staying environments. From this perspective, the value of a Personal Air Purification Shield is not limited to one room or one route. It extends into daily mobility and short-term living situations.

When multiple staying points are arranged according to daily movement paths, seating layouts, and practical needs, those points begin to connect into a line. When multiple lines extend into a larger area, they form a surface. At that stage, the Personal Air Purification Shield is no longer merely an individually placed product. It becomes a near-body protection unit that can be deployed, planned, and understood systematically.

This point-line-surface logic represents the ability to extend from personal use to multi-point deployment. It allows the product to move beyond a single consumer and potentially enter hospital rooms, postpartum care centers, infant care centers, classrooms, tutoring environments, theaters, waiting zones, rest areas, conference centers, and other spaces where people remain for periods of time, forming a more structured near-body protection network.

#### 7. Operating Boundaries, Ozone Control, and Maintenance Principles

A mature product definition must do more than explain what a product can do. It must also explain its boundaries honestly. For the IONFRESHER® LS-212 PLUS, this is not a sign of caution. It is a sign of professionalism. Only when the product's mission, boundaries, control logic, and maintenance principles are clearly stated can it become a device worthy of long-term trust.

The IONFRESHER® LS-212 PLUS is not positioned as a whole-home central air-treatment system, and it is not a large-area rapid air-exchange device. Its core interpretation is that of a small, near-body personal zone. In other words, when it is placed near the user, the air it prioritizes is the small-range, near-body air around where that person actually remains.

That does not make its value smaller. On the contrary, it makes its mission more precise. It is not intended to replace every kind of air-treatment equipment. It is intended to fill a distance that traditional products have rarely treated as their true



focus: the near-air space between the person and the breathing zone.

This distinction matters. If the IONFRESHER® LS-212 PLUS is interpreted incorrectly, for example by comparing it under the same standard used for large-airflow, large-area, whole-room circulation devices, its real value is easily misunderstood. The IONFRESHER® LS-212 PLUS does not exist to answer the average number of an entire room. It exists to prioritize the air closest to the user.

Under high-voltage plasma operation, the system may generate trace ozone. The IONFRESHER® LS-212 PLUS does not treat ozone as a selling point. It addresses it through honest explanation and control logic. The key issue is not whether ozone can be exaggerated into an advantage, but whether the system can operate stably within a reasonable and controlled range while keeping the product's technical logic centered on what truly matters: plasma sterilization, electrostatic dust collection, and negative ion purification. In other words, ozone is not the purpose of the product and not the main source of its value. It is simply one aspect of high-voltage plasma operation that must be understood correctly and handled responsibly.

In maintenance, the IONFRESHER® LS-212 PLUS uses electrostatic dust collection to capture dust and allergens. The stainless-steel collection plates do not need washing. For daily maintenance, dust only needs to be removed with a plastic brush, and a dry cloth may be used when necessary. This maintenance approach emphasizes safety, simplicity, and long-term stability, avoids the risk of moisture affecting electrical components, and better fits the nature of a near-body device intended for long-term coexistence.

The maintenance logic itself also reflects the product's underlying philosophy. The IONFRESHER® LS-212 PLUS does not sustain its existence by forcing constant consumable replacement. It supports long-term use through stable structure, electrostatic dust collection, and low-intervention maintenance. This low-burden, sustainable, repeatable ownership model is one of the reasons a Personal Air Purification Shield can integrate naturally into everyday life.

## 8. Conclusion

The IONFRESHER® LS-212 PLUS Personal Air Purification Shield is not a product squeezed into an empty slot inside an existing market map. It begins with the real need of the breathing zone and re-establishes a product type that has long existed without being clearly defined.

It deserves to be seen as a new generation of air protection not because it adopted a new name, and not because it simply rearranged familiar functions, but because it first crossed a genuine technical threshold: under USB 5V conditions, it successfully established the system required to support high-voltage plasma ionization. And

because that threshold was crossed, the three core technologies of the IONFRESHER® LS-212 PLUS were finally able to exist together in a single product.

That is why the IONFRESHER® LS-212 PLUS is more than a new model. It is a new answer. What it answers is not how to make an air product smaller, but how to give the air closest to human breathing a product that truly belongs to it for the first time.

## 9. Specifications & Packaging

### 9.1 Product Specifications

- Product Name: Personal Air Purification Shield
- Model: LS-212 PLUS
- Power Input: USB Type-C DC 5 V
- Power Consumption: Approx. 2 W
- Main Unit Dimensions: 15.0 × 9.0 × 28.0 cm
- Main Unit Weight: 690 g
- Ozone Concentration: ≤ 0.02 ppm
- Negative Ion Concentration: Approx. 6 million ions/cm<sup>3</sup>
- Ion airflow: approx. 3 CFM

### 9.2 Packaging Specifications

- Single-Unit Box Size: 16.5 × 10.0 × 35.5 cm
- Carton Size: 51.0 × 43.5 × 38.5 cm
- Units per Carton: 12
- Net Weight per Carton: 10.2 kg
- Gross Weight per Carton: 11.7 kg

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