

## WM-317 Wall-Mounted Air Purification System

The issue of indoor air quality (IAQ) has had significant attention called upon it in recent years, as air quality improvement technologies have seen great technological advancements. Additionally, as increasing amounts of patient data are collected, the various harmful effects of poor air quality are being quantified across multiple industries and settings – demonstrating that environments usually perceived as relatively safe can carry high risks. The magnitude of hospital-based concomitant infections due to poor air quality, for example, has always been a known risk, yet increasing amounts of data show that risk to be significantly greater than previously thought. Similarly, the economic impact of “Sick Building Syndrome” demonstrates that IAQ has consequences that reach beyond the immediate comfort of individuals.

Various methods have been proposed and successfully implemented in order to combat the effects of poor air quality. However, the “holy grail” of a completely effective system remains elusive. In order to maximize air quality, many situations call for a combination of IAQ systems. For example, while implementing UVC lamps in an HVAC cooling coil will combat mold and fungal growth on the cooling coil, leading to overall improvements in air quality throughout the HVAC system, this does not preclude installation and maintenance of particulate filters (such as HEPA-class filters), and even with the highest-quality filters, air quality may still suffer.

The lack of a perfect system to combat harmful compounds in the air is inherently linked to the fact that air quality is affected by a large number of factors. A completely effective HVAC purification system, for example, may ensure that any air travelling through the duct system is completely purified, but various factors (most notably the simple fact that a building is occupied) ensure that the air in a room may be of poor quality before it reaches the HVAC system. Obviously, if a room is occupied by 20 people, one of whom is carrying an infectious disease, every person in that room is at risk of contracting that disease via airborne transmission even before the air has had a chance to travel through the air ducts located in that room.

In designing the WM-317, our goal was to combine well-known, tested effective technologies in a unique configuration, in order to provide the most effective air purification possible. In addition, we were determined to provide a high-quality design, with features implemented for a maximum of efficiency and usability. The result is a highly functional, versatile, in-room air purification system that can be used in almost any setting. Installation is kept to a minimum, allowing for quick and easy use out of the box, as well as providing a level of portability unmatched by conventional in-duct purification systems.

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The WM-317 is capable of over 90% kill efficiencies on many common airborne pathogens, including influenza, rhinovirus, parvovirus, and tuberculosis after only a single pass through the system. These kill rates increase to over 99.9% across multiple filtration passes – even the hardest pathogens are completely eliminated after a maximum of 6-8 passes through the WM-317. The primary innovation for increasing kill rates to such a high level is the implementation of an activated carbon pre-filter and a HEPA/ULPA-class filter, with a high-intensity UV-C lamp found inside the air chamber. In addition to their filtration capabilities, the pre-filter and filter decrease airflow inside the WM-317 by over 45%, significantly increasing residence time of contaminated air inside the chamber. This increased residence time allows the UV-C light in the air chamber to affect the contaminated air for much longer, leading to increased kill rates.

The WM-317 unit is capable of 6 complete air changes per hour, in a room of up to 2500ft<sup>3</sup>. This means that the WM-317 is able to completely cycle the air in a room once every 10 minutes. The smaller the room, the more air changes per hour (ACH) the WM-317 is capable of. We chose 6 ACH for two primary reasons: previous data has shown that at least 6 ACH is the ideal level of air purification for subjective air quality comfort levels, and 6 passes (i.e. one hour of operation) is the minimum amount needed for 99.9% kill rates for most target pathogens. Many pathogens are virtually eradicated significantly more quickly (for example, influenza A virus requires only 2 passes for a 99.96% kill rate). Designating 6 ACH also allowed us to set a maximum reasonable room size for efficient use. Above 2500ft<sup>3</sup>, more than one unit is recommended. However, for rooms smaller than that maximum recommended volume, the system efficiency is increased, and air is able to be filtered at a higher rate.

In addition to aiding in the UV-C disinfection of the system, combining the use of a high-intensity UVC lamp and multiple filters enhances the effectiveness of the filters and extends their useful life. Traditionally HEPA/ULPA filters work by trapping larger particles inside them. However, trapping these particles does not kill them, and the result is a filter that ends up saturated with live particles, usually in the form of various fungi and molds. In addition, these filters are not entirely effective, and smaller particles may pass through them. In the WM-317, the activated carbon pre-filter is directly exposed to constant UVC light inside the air chamber. This ensures that trapped particles in the filter are completely inactivated, extending the life of the filter, but more importantly ensuring that no organisms can grow on the filter. While the HEPA filter and UVC light effectively control airborne pathogens, the activated carbon pre-filter ensures effective VOC and odor control, while also trapping larger particles, both adding a 2<sup>nd</sup> line of filtration, and allowing particles trapped in the pre-filter to be inactivated before they ever even reach the HEPA filter. The WM-317 comes installed with a class H13 (≥99.95%, ≤0.3µm particle filtration) HEPA filter, which can be easily upgraded to a class U15 (≥99.9995%, ≤0.12µm particle filtration) for maximum effectiveness in areas of higher risk.

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Internally, the WM-317 is designed for maximum efficiency in every function it provides. Externally, the WM-317 features a professional design, with a full-color LCD screen providing multiple points of information about the functionality of the unit. The WM-317 is housed in a 22-gauge steel enclosure, with options for either high-grade stainless steel or painted cold-rolled steel. Filter and lamp replacement are designed to be quick and easy, while a key-operated safety system ensures that replacement and maintenance can be performed safely without unplugging the unit. The WM-317 is easily wall-mounted, and is small and light enough (20.5"x19"x12", 32lbs.) to be moved to other rooms if necessary. The full-color LCD status screen displays fan speed (with multiple speed settings), air quality indication via a 1.0µm-sensitive particle sensor, air chamber pressure (which assists in indicating the effectiveness of the filters), UV-C lamp status, and a counter indicating the number of days of effective use remaining for each replaceable part (lamp, filter and pre-filter). In addition, visual and audible alarms are present for indicating lamp failure, necessity of part replacement, and other maintenance necessities. Additionally, the audible and visual alarms are battery-powered and will activate if the unit is unplugged. An optional remote control allows for on/off and fan speed functionality. The Wm-317 comes fully warranted, carrying the following warranties: 5 years for the product housing, 3 years for the fan/motor, 1 year for electrical components, lifetime warranty for the lamp ballast, 1 year for the UV-C lamp, and 90 days for the filters.

The WM-317 was designed for high-occupancy, rapid-turnover areas, where the constantly-changing occupancy of a room is simply not addressed by conventional HVAC filtration systems. By effectively filtering the entirety of a room's air supply every 10 minutes, the WM-317 is ideal for ensuring the safety and comfort of a room's occupants. This design makes the WM-317 ideal for a variety of clinical applications. Patient waiting rooms, a well-known source of concomitant infection in medical settings, are a primary installation point. Additionally, individual treatment and recovery rooms are an excellent candidate for the WM-317. The portability and ease of installation of the WM-317 allows for easy transfer of the unit from unoccupied rooms, eliminating the need for 1 unit for every room at all times.

Finally, in today's culture, there is an ever-increasing level of patient knowledge and expectations. For this reason, we offer an optional decal for the front of the unit. This decal contains a concise explanation of the functionality and effectiveness of the WM-317, allowing patients to learn, understand, and most importantly appreciate the lengths their caregivers go to ensure their safety and comfort.

From the ground up, the WM-317 was designed and manufactured to meet the increasing need for a safe, powerful and effective means of reducing airborne infectious organisms and volatile compounds and increasing indoor air quality, without the need for expensive HVAC retrofits, hazardous chemicals, or other pitfalls associated with conventional air-quality solutions.

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