



HEALTH-MOR

An HMI Industries Inc. Company

Who manufactures the Defender?

Health-Mor is an Ohio-based company that has been manufacturing extremely high-level filtration appliances since 1928. The Defender is built in Brooklyn, Ohio. Health-Mor is an American company that has customers in over 40 countries around the world using products that are all built in Ohio for 93 years. Health-Mor has an A+ rating from the Better Business Bureau.

How long has Health-Mor been making a Class II Medical Device air purifier?

The Defender Room Air Cleaner was first registered with the U.S. FDA as a Class II Medical Device back in March of 2001, and it is built to the highest quality standards. This is the only portable room air cleaner in the world that has been a Class II Medical Device for more than 20 years.

What is the expected life of the Defender?

The Defender has a brushless motor designed for long life. Ongoing life testing estimates over 100,000 hours of use before needing service.

What is the manufacturer's warranty on the Defender?

The Defender comes with Health-Mor's unique "Lifetime Perpetual Warranty." In order for the Defender to continue operating as intended, the Medi-Filter needs to be changed once per year. Each year when you purchase the replacement Medi-Filter for the Defender, Health-Mor extends the warranty for another year. This process ensures two things: 1) That the Defender will always be filtering properly; and 2) that you will never have to worry about a future bill for service or repair on a Defender, even 20 or 30 years down the road. The entire point of the Defender is to plug it in and let it work for decades to come without needing attention. It simply needs one annual filter change per year.

How much noise does the Defender make?

On high speed, the Defender registers at 65 decibels. (Normal conversation is 60-70 decibels.)
On medium speed, the Defender registers at 56 decibels. (A refrigerator is 55 decibels.)
On low speed, the Defender registers at 46 decibels. (A quiet library is 40 decibels.)



HEALTH-MOR
An HMI Industries Inc. Company

How much electricity does the Defender need?

The Defender is very efficient, using only 0.24 amps and 29 watts on low speed, and only 0.67 amps and 80 watts on its highest speed. It uses a Polarized Type A plug, which can be plugged into any standard U.S. 100/120 volt outlet or extension cord.

What is the CFM of the Defender?

The maximum CFM is 138 sf per minute.

How many room changes an hour will the Defender provide?

This is a function of the volume of air in the room, so the room size (cubic feet of volume) determines this. In a standard 10 x 10 room with 8-foot ceilings, the Defender will change the air over 10 times per hour on high speed, and over 6 times on low speed.

Does the Defender have either a CADR or MERV rating?

We do not publish CADR rates because the CADR is a fundamentally flawed measurement when it comes to the science of filtration. The reason is because any air cleaner can artificially boost their CADR measurement by simply lowering their actual filtration capability. The more porous the filter, the more air can move through it in a given timeframe. So in other words, a manufacturer has to choose between having an arbitrary CADR rate that is higher OR an actual filtration level that is higher. We believe that's junk science. (If the objective is not filtration, but high volume of air movement, let's face it – a simple fan would do!)

Manufacturers and filtration experts who are serious about filtration do not put any stock in the CADR number. The filtration industry relies more on the MERV rating system, which is actually a scientific measurement of the effectiveness of filters (not just in a portable air cleaner, but ANY kind of air filter). The MERV rating of the Defender is 19 (whereas a HEPA filter only has a 17 MERV rating). That chart and explanation can be found at Johns Hopkins Center for Health Security's site below:

https://www.centerforhealthsecurity.org/resources/interactives/protecting_building_occupants/merv.html



HEALTH-MOR

An HMI Industries Inc. Company

Is there independent testing of the Defender filter's ability?

Yes. IBR Laboratories Test IBR JN:16313 determined that the Defender's Medi-Filter cartridge removes over 99.99% of particles at 0.1 micron in size.

Have any independent studies been done on the Defender's effectiveness in specific settings?

The Defender was evaluated by the Hospital Infection Control Team at Ghent University Hospital to investigate its potential use in high-risk hospital settings. The study concluded:

"Before activation of the device, microbiological air sampling showed contamination of fungal species in the air (6 to 17 cfu/m³). After activation of the FQD (FilterQueen Defender), the number of fungal colonies was reduced to zero within one hour."

"Although the FQD is more economical than most competitors, the effect on indoor air quality for both particles and fungal colonies was, in this test, obvious."

"Based upon this experience, we decided to purchase multiple FQD devices that are now routinely used throughout the hospital."

What makes the Defender's filtration capability better than the HEPA standard?

The Defender is designed so that it captures over 99.99% of all particles at 0.1 micron in size. Health-Mor chose that standard because modern research has found that the 0.1 particle size is the hardest size to capture. Particles larger than 0.1 micron are more likely to impact a filter media, which is intuitive. Counter-intuitive, however, are the findings that particles SMALLER than 0.1 micron are ALSO easier to capture. The reason has to do with a physics phenomenon known as the Browning Effect – whereby particles smaller than 0.1 are so light that they leave the air flow path at higher rates than the 0.1 particle and therefore also impact the filter media more frequently, just as the larger particles do.

Based on these modern research findings (which make the HEPA standard created in the 1940's obsolete), Health-Mor focused specifically on developing a portable air cleaner that could capture the most difficult particle size to catch at a rate of at least 99.99%, with the understanding that everything larger AND smaller will be captured at an even higher efficiency. A filter only needs to capture 99.97% particles at 0.3 microns to be a HEPA filter. Today we know that many of the most dangerous particles reside between the 0.1 and 0.3 micron sizes. SARS-COV-2, for example, is 0.125 microns.



HEALTH-MOR

An HMI Industries Inc. Company

The important point here is that the Defender was designed SPECIFICALLY to capture the **hardest** of all particles to capture – 0.1 micron particles – at a level above 99.99% *on the first pass through*. That means that all particles smaller and larger are also being filtered out at a level *above 99.99% on the first pass through*.

Has Health-Mor worked with any government entities in developing the Defender?

In 2018, NASA's Glenn Research Center in Ohio selected Health-Mor for a research project that involved improving the air flow and reducing noise from the Defender. The partnership was extremely successful, and the Defender, originally introduced in 1994, was made even more effective.

Does the Defender incorporate UV technology?

No. The U.S. Environmental Protection Agency, in its landmark study on air cleaner technology, concluded that incorporating UV technology in a room air cleaner is ineffective, expensive and potentially dangerous.

This 74-page comprehensive report, now in its 3rd edition, is titled *Residential Air Cleaners: A Technical Summary*. (EPA 402-F-09-002, July 2018).

For UV light to effectively kill or inactivate microorganisms requires both adequate bulb strength AND adequate contact time with the targeted microorganism. In an environment with minimal contact time (such as air passing through an air cleaner at a very high speed), the UV bulb strength would have to be quite substantial. A portable air cleaner is not going to have the space for such a bulb.

On Page 17 of this report, the EPA specifically lists several disadvantages to including UV technology in a portable room air cleaner, among them:

- *Effectiveness increases with lamp intensity, which is typically low in residential UVGI air cleaners*
- *Uncoated lamps can generate ozone*
- *Potential for eye injury*
- *High electrical power draw requirements*

On Page 26, the EPA specifically and directly explains why UV light is not effective in a portable room air cleaner:



HEALTH-MOR

An HMI Industries Inc. Company

Given sufficient exposure time and lamp power, UV light can penetrate the outer structure of a microorganism's cell(s) and alter its DNA, preventing replication and causing cell death. But some bacterial and mold spores are resistant to UV radiation, and to achieve reliable deactivation of spores, the lighting power must be high and the exposure times must be long (i.e., on the order of minutes and hours rather than the few seconds typical of most UVGI air cleaners).

On page 28, the EPA report cites further studies that have looked specifically into the effectiveness of adding UV technology to both HVAC systems AND portable air cleaners, and cites their conclusions:

*Some UVGI cleaners used in HVAC systems or portable air cleaners are advertised to reduce dust mite allergens, airborne microorganisms (e.g., viruses, bacteria, molds) and their spores, and gaseous pollutants from indoor air. However, it is likely that the **effective destruction of airborne viruses and fungal and bacterial spores requires much higher UV exposures than a typical residential UVGI air-cleaning unit provides** (Kowalski and Bahnfleth 2000; Scheir and Fencel 1996; VanOsdell and Foarde 2002).*

Typical UVGI air cleaners designed for use in homes do not deliver sufficient UV doses to effectively kill or deactivate most airborne microorganisms because the exposure period is too short and/or the intensity is too low.

The EPA study also cautions repeatedly about the danger that UV bulbs pose by creating ozone, a health hazard that both the EPA and CDC have identified. The stronger the UV bulb, the more ozone is generally introduced into the indoor air environment. On page 28, the EPA cites another study that details this danger, concluding:

Similar to ESPs, UVGI cleaners can generate large amounts of ozone as a byproduct of their operation (Morrison et al. 2014).

The Defender does not include UV technology in the Defender precisely because such technology is expensive, ineffective and introduces toxic ozone into the room.