

AIR POLLUTION

Is it worse indoors or outdoors?



DID YOU KNOW?



- Levels of many indoor air pollutants may be 2-5 times, and occasionally more than 100 times higher than outdoor levels.¹
- It is estimated that 90% of the average person's day is spent indoors with 60% or more of that time spent in his/her own home.¹
- Biological air pollutants are found to some degree in every home, school and workplace. Sources include human occupants who shed viruses and bacteria, animal occupants (insects and other arthropods, mammals) that shed allergens, indoor surfaces and water reservoirs where fungi and bacteria can grow, such as humidifiers, dehumidifiers, air conditioners and drip pans under cooling coils (as in refrigerators), and outdoor air.²

¹ U.S. Environmental Protection Agency (EPA) - Title: Indoor Air Quality Projects in EPA Region 10 - (2009)

² Indoor Air Pollution: An Introduction for Health Professionals - Co-sponsored by: The American Lung Association, The Environmental Protection Agency, The Consumer Product Safety Commission and The American Medical Association

WHAT CAUSES INDOOR AIR PROBLEMS?

1

Airborne Particles

- **Dust, pollen, smoke, fabrics**

Sources: Combustion sources (oil, gas, kerosene, coal, wood, tobacco), building materials and furnishings (insulation, carpet, cabinetry or furniture made of certain pressed wood products), outdoor air, products for household cleaning and maintenance, personal care items, fabrics and paper products.

2

VOC/Gases (Volatile Organic Compounds)

- **Formaldehyde, benzene, perchloroethylene**

Sources: Cooking, chemicals and fragrances, air fresheners, candles, cosmetics, paint fumes, solvents, aerosols and everyday cleaning products, pesticides and outdoor air; also, off-gassing of carpet, furniture, plastic, drywall, particle board and other building materials.

3

Bio-Aerosols (Biological Particles)

- **Dust Mites, Animal Dander, Insect feces, Viruses, Mold and Mildew, Bacteria and Fungi:**

Sources: Human occupants, animal occupants, insects and other arthropods, mammals/pets, damp or wet surfaces, higher than 50% relative humidity, water reservoirs such as those in humidifiers, dehumidifiers, air conditioners and drip pans under cooling coils (as in refrigerators), inadequate exhaust or air exchange in wet rooms like kitchens, bathrooms and basements and outdoor air.



HOW TO ADDRESS PARTICLES

1

Airborne Particles

- **Dust, pollen, smoke, fabrics**

Sources: Combustion sources (oil, gas, kerosene, coal, wood, tobacco), building materials and furnishings (insulation, carpet, cabinetry or furniture made of certain pressed wood products), outdoor air, products for household cleaning and maintenance, personal care items, fabrics and paper products.

First, try to eliminate the source(s). This can be difficult and expensive depending on the source(s).

Second, increase ventilation. Run the air conditioner or heater more often and use air filters designed to capture a higher percentage of airborne particles. Also, vent or exchange inside air with outside air more frequently.

Third, utilize air cleaners. To remove particles, manufacturers utilize **media filtration**, known as mechanical filtration. This can range from inexpensive and largely ineffective A/C and furnace filters to high efficiency HEPA filters. The key to effective particle filtration is high air flow through the filter combined with high efficiency filters.



HOW TO ADDRESS VOC/GASES

2

VOC/Gases (Volatile Organic Compounds)

- **Formaldehyde, benzene, perchloroethylene**

Sources: Cooking, chemicals and fragrances, air fresheners, candles, cosmetics, paint fumes, solvents, aerosols and everyday cleaning products, pesticides and outside air; also off-gassing of carpet, furniture, plastic, drywall, particle board and other building materials.

First, try to eliminate the source(s). This can be difficult and expensive depending on the source(s).

Second, increase ventilation and air exchange with outside air. VOC gases cannot be removed by media filtration so running the air or heat more won't help.

Third, utilize air cleaners. To remove VOCs manufacturers utilize **Ozone (O₃)** which alters the chemical composition of VOCs, or they use **Carbon/Zeolite** filters which adsorb the VOC gases. The key to effective VOC removal is consistent high air flow across an ozone chamber outside of the living space and/or through carbon/zeolite high efficiency filters.



HOW TO ADDRESS BIOLOGICALS

3

Bio-Aerosols (Biological Particles)

- **Dust Mites, Animal Dander, Insect feces, Viruses, Mold and Mildew, Bacteria and Fungi:**

Sources: Human occupants, animal occupants, insects and other arthropods, mammals/pets, damp or wet surfaces, higher than 50% relative humidity, water reservoirs such as those in humidifiers, dehumidifiers, air conditioners and drip pans under cooling coils (as in refrigerators), inadequate exhaust or air exchange in wet rooms like kitchens, bathrooms and basements and outdoor air.

First, try to eliminate or eradicate the source(s). This can be difficult and expensive depending on the source(s).

Second, run air conditioners, furnaces or dehumidifiers to remove excess moisture from the home. High moisture in a home encourages dust mite populations and allows fungal growth.

Third, utilize air cleaners. To remove biological air pollutants, most manufacturers are addressing bio-aerosols with **Ultraviolet Light** to disinfect the air, or they are using **Ozone (O₃)** to alter the chemical composition of these biological pollutants.



BACTERIA



MOLD



DUST MITE

HEALTHWAY®

The Global Leader in Air Quality Solutions

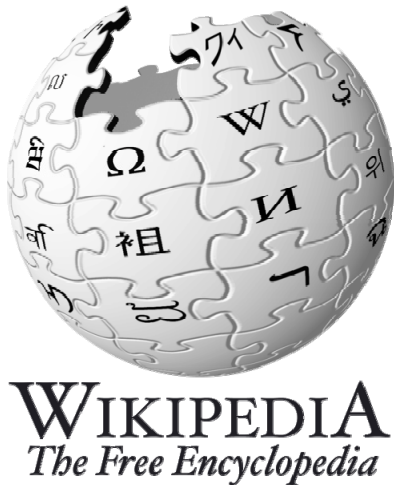


HealthWay is the manufacturer of the HW Deluxe DFS. Healthway has been providing effective air cleaning solutions for over 30 years with residential, commercial, medical and hospitality applications worldwide. HealthWay's successful heritage includes building air purification equipment for government facilities, submarines, computer clean rooms, hospitals, and other mission critical locations.

A few of HealthWay's customers:

The Mayo Clinic • The Ronald McDonald Houses • Shriner's Hospitals • The Red Cross • FEMA • Marriott Hotel Corporation • Wyndham Hotels • Hilton Hotel Group • Sheraton Hotels • Hyatt Hotels • Harvard University • Florida State University • University of California • General Mills Corporation • IBM Singapore • Bank of America • U.S. Internal Revenue Service • Pepsi Cola Bottling • General Motors • U.S. Navy • Dow Chemical etc...

HEALTHWAY'S HW Deluxe DFS is a Class II Medical Device



All language and definitions below taken from Wikipedia website address:
http://en.wikipedia.org/wiki/Medical_device#endnote_FDA3132

A medical device is a product which is used for medical purposes in patients, in diagnosis, therapy or surgery. Medical devices are included in the category *Medical technology*. Medical devices are regulated by the FDA Center for Devices and Radiological Health (CDRH).

In the United States, the FDA has recognized three classes of medical devices based on the level of control necessary to assure the safety and effectiveness of the device.³

Class II devices are subject to special controls in addition to the general controls of Class I devices. Special controls may include special labeling requirements, mandatory performance standards, and postmarket surveillance.⁴ Devices in Class II are held to a higher level of assurance than Class I devices that they will perform as indicated and will not cause injury or harm to patient or user. Devices in this class are typically non-invasive and include x-ray machines, PACS, powered wheelchairs, infusion pumps, surgical drapes, surgical needles, and so on.

³ FDA Website: Classify your Medical Device - <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/default.htm>

⁴ FDA Website: Device Classification - <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/default.htm>

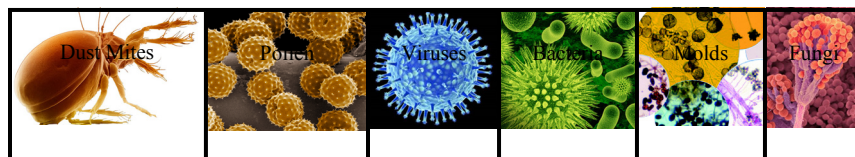


Disinfecting Filtration System (DFS) patented technology is a cleaning process developed by HealthWay for the U.S. Department of Defense to protect our service men and women from germ warfare. This DFS technology later evolved and is used today in clean rooms where the air needs to be particulate free. This revolutionary process creates a zoned area wherein bacteria, mold, fungi and viruses are trapped and killed to create a medically clean environment. The HW Deluxe is the only residential air treatment product that incorporates DFS technology, which far exceeds HEPA type filtration. Over time, a HEPA filter can breed bacteria, mold and other microorganisms that can grow within the filter and disperse back into the air. When using the HW Deluxe, microorganisms won't be passed back into the living environment.

 **LRI™ Environmental Solutions**
A Division of Life's Resources Inc.

The HW Deluxe has been tested by the independent medical lab, LRI Environmental Solutions, a division of Life's Resources, Inc. The subject of the test was, *The Effect of the HW Deluxe DFS Air Cleaner on the Survival of Microorganisms*. A complete copy of the eleven page report can be provided upon request. The testing was performed by Kerby F. Fannin, Ph.D. The conclusions of his findings are as follows:

- ✕ 99.99% collection efficiency at 0.3 micron size particles (the most penetrating particle size and the most difficult to capture)
- ✕ 99-100% Virus Kill rate
- ✕ 98-100% Bacteria Kill rate
- ✕ 94-100% Mold/Fungi Kill rate



The HW-Deluxe DFS is the first to address all

3

classes

Particle
VOC/Gases
Bio-Aerosols

Control Panel

- Filter light - indicates when to service DFS filter
- Bio-monitor light - indicates DFS germ killing zone is working at peak efficiency
- Three speed control

DFS Filter

- 99.99% particle capture at 0.3 micron size
- Four times the particle reduction capacity as similar sized HEPA filters
- Traps micro-organisms for germicidal exposure

Patented Germ Killing Zone

- 16 - 18 kv of continuous energy effectively kills the heartiest micro-organisms

SST (Spun Sealed Technology)

- Each filter is spun sealed, guaranteeing a 100% filter seal

Dual Air Intake Blower

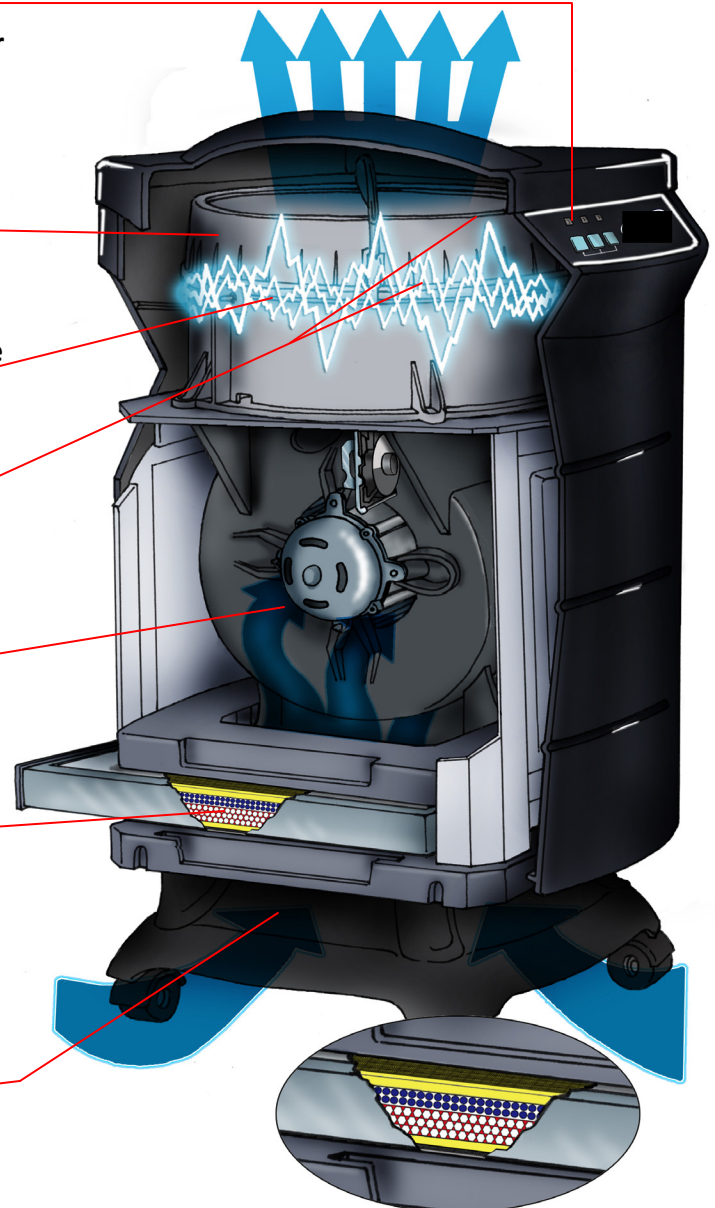
- Increases air intake and provides low sound operation

Super Adsorbent 6 Stage Pre-filter

- Polypropylene mesh large particle collector
- Anti-microbial inhibits bacteria growth in filter
- Carbon pellets VOC/Gas scrubbing
- Potassium permanganate VOC/Gas scrubbing
- Anti-microbial inhibits bacteria growth in filter
- Polypropylene mesh large particle collector

360° Air Entry Design

- Allows placement anywhere in a room



HealthWay

Certified: ISO9901:2

UL
CSA
EMI
CE



THE HW Deluxe DFS IS THE WORLD'S MOST EFFECTIVE RESIDENTIAL AIR CLEANER

HEPA filters have long been the standard for particulate removal. HEPA filters have an excellent ability to remove particles however this filter technology doesn't meet the capabilities of the HW Deluxe.

HEPA's main drawbacks are:

- High airflow restriction
- Very noisy
- No filter monitoring
- Short filter life
- No destruction of mold, bacteria, viruses and fungi
- Filter seal leaks creating air that bypasses filter

The HW Deluxe:

- Better than 99.99% particle capture with lower airflow restriction
- Higher airflow per decibel level of noise
- True filter monitoring with pressure differential switch
- Certified independent testing for the destruction rate of 94-100% for mold, viruses, bacteria and fungi
- High VOC/Gases Adsorption
- Each machine is individually tested and certified before it ships
- FDA Listed Class II Medical Device
- SST - Spun Seal Technology guarantees 100% filter seal



HW Deluxe

Whole House Air Purification Solution

Healthway's HW Deluxe DFS



The world's most advanced medical grade air cleaning system!

FDA Listed as a Class II Medical Device

8 Stage System

STAGE 1: Air passes through the HW Deluxe **Polypropylene Mesh Filter** which collects large particles of dust, hair and lint.

STAGE 2: Air passes through the HW Deluxe **Anti-Microbial Filter** which reduces bacteria growth in the six phase pre-filter.

STAGE 3: Air passes through the HW Deluxe **Carbon Pellets** where VOC/Gases are adsorbed.

STAGE 4: Air passes through the CHW Deluxe **Potassium Permanganate Filter** for additional VOC/Gas scrubbing.

STAGE 5: Air passes through the additional **Anti-Microbial Mesh Filter** which further reduces bacteria growth.

STAGE 6: Air passes through the additional HW Deluxe **Polypropylene Mesh Filter**.

STAGE 7: Air passes through the HW Deluxe **Patented Germ Killing Zone**.

STAGE 8: Air passes through the HW Deluxe **DFS Filter** to complete better than 99.99% particle capture at 0.3 micron size. Four times the particle reduction capacity of similar sized HEPA filters.



AIR PURIFICATION

The Ultimate Whole House Air Purification Solution

10 Stages of Cleaning and Disinfecting Combined in the Qualitair and HW Deluxe DFS

Qualitair

Provides purified air for the entire house:

- Eliminates odors
- Freshens stale air
- Kills many common bacteria & molds in air within central air/heat duct work



HW Deluxe DFS

The world's most advanced medical grade air cleaning system!

FDA Listed as a Class II Medical Device

Exclusive 8 stages of filtration with a powerful 6 stage chemical adsorption filter for VOC/Gas scrubbing

AIR PURIFICATION

The Ultimate Whole House Air Purification Solution

10 Stage System

STAGE 1: Air passes through the Qualitair **Ultraviolet (UV) Light** killing many airborne bacteria and molds that contribute to household allergies.

STAGE 2: Air passes through the Qualitair **Ozone Lamp**, neutralizing problem odors from pets, cooking and other household sources. Automatic airflow sensor allows the unit to operate only when air is flowing through your HVAC system.



Qualitair

STAGE 3: Air passes through the HW Deluxe **Polypropylene Mesh Filter** which collects large particles of dust, hair and lint.

STAGE 4: Air passes through the HW Deluxe **Anti-Microbial Filter** which reduces bacteria growth in the six phase pre-filter.

STAGE 5: Air passes through the HW Deluxe **Carbon Pellets** where VOC/Gases are adsorbed.

STAGE 6: Air passes through the HW Deluxe **Potassium Permanganate Filter** for additional VOC/Gas scrubbing.

STAGE 7: Air passes through the additional **Anti-Microbial Mesh Filter** which further reduces bacteria growth.

STAGE 8: Air passes through the additional HW Deluxe **Polypropylene Mesh Filter**

STAGE 9: Air passes through the HW Deluxe **Patented Germ Killing Zone**.

STAGE 10: Air passes through the HW Deluxe **DFS Filter** to complete better than 99.99% particle capture at 0.3 micron size. Four times the particle reduction capacity of similar sized HEPA filters.



HealthWay

HW Deluxe DFS



HW Deluxe

PROFESSIONAL DFS
AIR FILTRATION SYSTEMS



HW Deluxe Professional DFS Air Filtration Systems

Utilizing technology developed through a United States Military Grant focused on germ warfare, the professional line of air cleaning by HealthWay is the only system to effectively address all three pollutant categories. The systems have been proven to capture 99.99% of all particles as small as .002 micron in size. A heavy duty commercial-grade gas and odor filter eliminates most gases and the patented DFS technology kills 94-100% of harmful viruses, molds, and bacteria, leaving nothing but fresh, pure, healthy air. This technology is currently used in hospitals, medical clean rooms, government buildings, and military applications.



FEATURES

Particle efficiency - 99.99% @ .002 micron

7-stage VOC adsorption filter for heavy removal of harmful gases and odors

Patented DFS technology kills:

94-100% of mold

98-100% of bacteria

99-100% of Viruses

Each machine is independently tested and certified to guarantee better than HEPA efficiency

Four easy glide castors and remote control for ease of use

FDA listed as a class 2 medical device

CE, UL, CSA and ISO approved

SPECIFICATIONS

Dimensions (inches)	15 w x 16 d x 27 h		
Weight	36lbs (16.3kg)		
	high	med	low
Power Consumption (Watts)	125	75	65
CFM (Cubic Feet/Minute)	200	125	85
Operation noise (dB)	58	51	45

1. EXCLUSIVE SEVEN-STAGE FILTER (TOTAL SYSTEM NINE-STAGE FILTER)

- Poly Propylene Mesh: Large particle collector of dust, hair and lint
- Anti-Microbial: Reduces bacteria growth in filter
- Zeolite Pellets: VOC/GAS Adsorbent
- Carbon Pellets: VOC/Gas Adsorbent
- Potassium Permanganate: VOC/Gas Adsorbent
- ANTI-MICROBIAL: Reduces bacteria growth in filter
- Poly Propylene Mesh: Large Particle collector of dust, hair and lint

2. 360 DEGREE AIR INTAKE

- Allows placement anywhere, assuring full room treatment

3. DUAL AIR INTAKE BLOWER

- Drives a consistent volume of air and provides ultra-quiet operation

4. 100% SEALED FILTRATION CHAMBER

- All incoming air is treated in the 100% sealed filter chamber

5. DFS GERMICIDAL TECHNOLOGY

- Captures dust, mold, pollen, dust mite, debris, and more; and destroys up to 100% of these captured contaminants

6. DISINFECTING FILTRATION SYSTEM (DFS) Main Filter

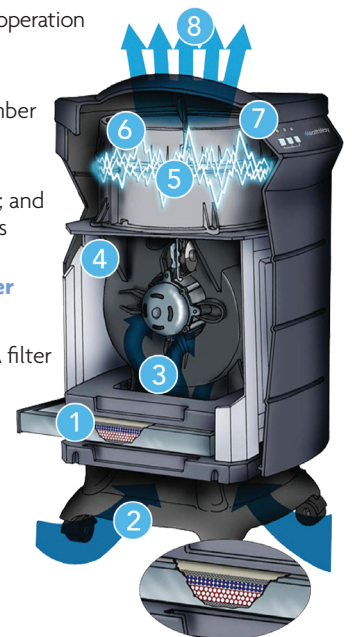
- Better than 99.99% particle reduction at 0.3 micron
- Four times the particle holding capacity as a similar HEPA filter
- Traps microorganisms for germicidal exposure

7. ELECTRONIC CONTROL PANEL

- Indicates when to replace main filter.
- Bio-monitor light shows DFS Germ Killing Zone is working efficiently
- Convenient 3-speed control
- Low speed ultra-quiet air flow control

8. CLEAN FRESH AIR

- The HealthWay 20600-3-DELUXE delivers clean, fresh air 365 days a year 24/7



healthway.com

HealthWay



Handheld Laser Particle Counter MODEL P311-H

Airy Technology P311-H is designed for showing the efficiency of air purifiers. P311-H can display particle counts of 3 different sizes simultaneously in cubic foot, cubic meter, or liter. The results are updated every 3 seconds. Its maximum concentration of 4,000,000/ft³ is the highest in the market. P311-H is accurate, dependable, user friendly and compact.



Applications

- Sales Promotional Tool for Air Purifiers

Filter Testing

- Particle Source Investigation

Features

- Three Channel Particle Counter
- Large Color Display
- Cumulative and Differential Count
- Maximum Concentration: 4,000,000 particles / ft³
- Measure by cubic foot, cubic meter, liter

Large Color Display

AUTO	0012 / 8000	05.00
▲▼ CNT	Σ	Δ
0.3µm	4936	3701
0.5µm	1235	1165
5.0µm	70	70

LOC. 001 CYCLES 00/01
STIME 00:10 INT 00:10

START Stopped MENU

Streamlined & Lightweight



Healthway

3420 Maple Avenue, Pulaski, NY 13088, USA
Tel: 315-298-2904, 800-843-3860
info@healthway.com

Specifications

Size Range	0.3 -5.0 μm
Channel Sizes	Channel 1: 0.3/0.5 μm ; Channel 2: 0.5/1.0/2.0/2.5 μm ; Channel 3: 5.0 μm
Counting Efficiency	50% at 0.3 μm ; 100% for particles > 0.45 μm (per JIS)
Concentration Limits	4,000,000 particles / ft ³ at 5% coincidence loss
Light Source	Laser diode
Zero Count Level	<1 count / 5 minutes Meets JIS B9921
Flow Rate	0.1 CFM (2.83 LPM)
Calibration	NIST traceable
Sample Probe/Tubing	Isokinetic sampling probe, probe for tubing
Sampling Modes	Concentration (updates every 3 seconds)
Vacuum Source	Internal pump
Power	DC 5V 1A (Mini USB TYPE-B)
Battery	4 x AA
Battery Life	Up to 4.5 hours of continuous use (LCD Backlight low, Included Ni-MH Battery)
Dimensions (L x W x H)	178x90x47mm (without isokinetic inlet)
Weight	480g (without battery)
Standards	CE, JIS B9921, ISO 21501-4
Warranty	1 year limited warranty
Operating Conditions	5° to 35°C 20% to 95%RH non-condensing
Storage Conditions	-20° to 50°C Up to 98%RH non-condensing

* ISO 5-9 @ 0.3-5.0 μm excluding ISO 5 @ 5.0 μm

Included Accessories AC Adaptor, Isokinetic Inlet, USB Cable, Zero Filter, 4 x AA Batteries with Charger, Calibration Certificate, Carrying Case



CAUTION

All specifications are subject to change without notice. For safe and trouble-free operations, please read the "Operation Manual" carefully before using the instruments.



Healthway

3420 Maple Avenue, Pulaski, NY 13088, USA
Tel: 315-298-2904, 800-843-3860
info@healthway.com

