

TECHNICAL GUIDANCE



INDUSTRIES AND SOLUTIONS



PRODUCTS



Product Catalog

Our mission is to help you to protect your environment,
reduce your business risk, and
optimize your clean air related spending.

We will always strive to invest our time and expertise
to help you improve your business,
not just to sell you a product.



BETTER AIR IS OUR BUSINESS®

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A Trusted Leader and Partner in Clean Air Solutions

At AAF, we understand the importance of clean air.

“We inhale over 3,500 gallons of air each day.”

While we think about the health benefits of clean water, we actually only consume about two quarts per day. But we take in an extraordinary amount of air in the course of a workday. As weeks and months and years go by, we realize that there is nothing as critical to our well being than the quality of that air. The EPA reports that indoor air can be up to 100 times more polluted than outside air. In fact, 94% of all respiratory ailments are caused by polluted air.

The AMA reports that a lack of proper air filtration is the #1 cause of poor Indoor Air Quality (IAQ). For over 90 years, AAF has improved and controlled the quality of air through a wide range of solutions in the air filtration industry.

Indoor Air Quality: The Air That We Breathe



34%

of American workers feel that poor IAQ had caused them to miss work



For every **1000** workers, poor IAQ results in **600** sick days per year



Up to **65%** of asthma cases in school-aged children could be prevented with proper IAQ

Indoor Air Quality (IAQ) is a term that refers to the air quality in a building, breathed in every day by the building's occupants. IAQ has been identified by the EPA as one of the top five most urgent environmental risks to public health. Building occupants may be exposed to a variety of contaminants in the form of gases and particles from office machines, cleaning products, construction activities, carpets and furnishings, perfumes, cigarette smoke, water-damaged building materials, microbial growth (fungal, mold, and bacterial), insects, and outdoor pollutants. Many common IAQ problems are associated with improperly operated and maintained heating, ventilating, and air-conditioning (HVAC) systems.

The Centers for Disease Control and Prevention (CDC) estimate that the majority of Americans spend approximately

90%
of their time indoors

On average, office workers spend approximately

40 hours
a week in office buildings

For this reason, some experts believe that more people may suffer from the effects of indoor air pollution than from outdoor air pollution.



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Fine Particle Pollution: Long and Short-Term Effects

An extensive body of scientific evidence shows that long and short-term exposures to fine particle pollution, also known as fine particulate matter (PM), can cause premature death and harmful effects to the cardiovascular system, including increased hospital admissions and emergency department visits for heart attacks and strokes. Scientific evidence also links particulate matter to harmful respiratory effects, including asthma attacks.

People most at risk from particle pollution exposure include people with heart or lung disease (including asthma), older adults, children, and people of lower socioeconomic status. Research indicates that pregnant women, newborns, and people with certain health conditions, such as obesity or diabetes, also may be more susceptible to PM-related effects.

Improving IAQ: An Important Step

Maximizing the level of filtration employed within the constraints of the HVAC system design is an important step to improving IAQ. Significant increases in worker productivity have been demonstrated when the air quality was improved. Research has also shown that workers in buildings with optimum air quality have reduced rates of symptoms related to poor air quality.

AAF: Addressing Business Challenges in a Changing Market.

“The U.S. Indoor Air Quality market is expected to grow to **\$11.4 billion** by 2019, with the equipment segment predicted to top nearly **\$6 billion.**”

Customers Are Demanding Better Air

Customers are also demanding more from their IAQ solutions. Driven by increased consumer awareness, growing economies and new, advanced technological solutions, today's IAQ market is expected to continue to grow at an extraordinary rate. Because of these rapid changes and near future challenges, it has become more and more difficult to stay current in this state-of-the-art industry. The risks associated with rising costs and critical timing issues have never been higher.

And that's why it is even more critical to partner with an expert in the field, to form a team that can take you through the Assessment Phase involved in testing and auditing, to the Implementation Phase where the solutions chosen are utilized at their maximum performance. For your facility to run at its optimum IAQ capacity, trust **AAF**.

Sources: U.S. EPA. Indoor Air Quality- The Inside Story: A Guide to Indoor Air Quality; CDC. Healthy Housing Reference Manual: Indoor Air Pollutants and Toxic Materials; Fisk, W.J. (2000). Health and Productivity Gains from Better Indoor Air Environments and Their Relationship with Building Energy Efficiency. Annual Review of Energy and the Environment; Wellesley, Mass., October 31, 2014 –BCC Research, “U.S. INDOOR AIR QUALITY MARKET”



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Social Responsibility

At AAF International, we believe that the economic growth of our company and the conservation of our natural environment are complementary. Guided by the philosophy of taking action with the future of the earth in mind, our mission is to use our core skill sets and products to help you protect your environment, reduce overall risk, and optimize your filter-related spending.

Green Building Design

Air filtration is a major component of green building design, which is both cost-efficient and resource-saving. 78% of Americans agree that corporations have a responsibility to adopt “green” behaviors like clean air.



In addition, green buildings use on average 26% less energy, emit 33% less carbon dioxide, use 30% less indoor water, and send 50%-75% less solid waste to landfills and incinerators. Thinking green is a great way to maintain energy efficiency, minimize costly downtime, and extend the lifespan of your equipment.

Addressing the Issues

While it is often assumed that outdoor air is more polluted than indoor air, the fact is that poor Indoor Air Quality (IAQ) ranks as one of the top five environmental risks to public health. Poor IAQ in buildings can lead to allergic reactions, aggravation of respiratory conditions, asthma attacks, eye irritation, coughing, irritability, and the inability to concentrate. The air inside your building can contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

More than 88% of facilities managers say that deferred maintenance is an issue at their facility. But when looking at the total cost of ownership, while upfront costs may be higher, a high quality filter will cost 58% less (or \$4,000 less per year) within just three years, than a lower quality filter. Between respiratory illness, allergies, and asthma, along with increased worker comfort, experts estimate that improved indoor air quality would produce an annual U.S. savings of up to \$235 billion.

Continuous Improvement

In short, social responsibility comes down to optimizing air quality while choosing products that minimize total life cycle costs. AAF is committed to continuous improvement by measuring and monitoring our progress towards minimizing our environmental impact, and by identifying further opportunities to prevent pollution, reduce waste, and conserve our natural resources. We pride ourselves on taking a collaborative and consultative approach to help our clients optimize performance and lower their total cost of ownership, all while taking the well-being of our planet into consideration at all times.

Nearly
78%



of Americans agree that **corporations** have a responsibility to adopt “**green**” behaviors like clean air

62%



of **North American consumers** look for a brand that is committed to **positive environmental impact**

17%

of a company's total market capitalization is directly **tied to their reputation**



Sources: Assessing Green Building Performance, GSA Public Buildings Service; Survey, Deferred Maintenance, Facilities.net, 2015; A science based approach to selecting air filters, Pharmaceutical Engineering, 2013; The Costs and Financial Benefits of Green Buildings, Greg Katz; Doing Well by Doing Good, Neilsen, 2014; The 2015 Reputation Dividend Report, Reputation Dividend 2015

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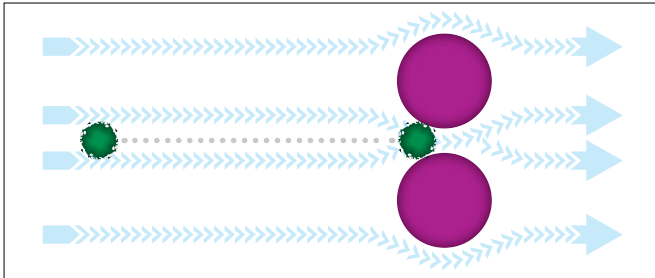
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Methods of Filtration

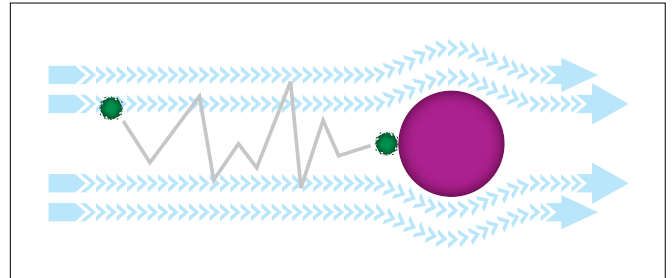
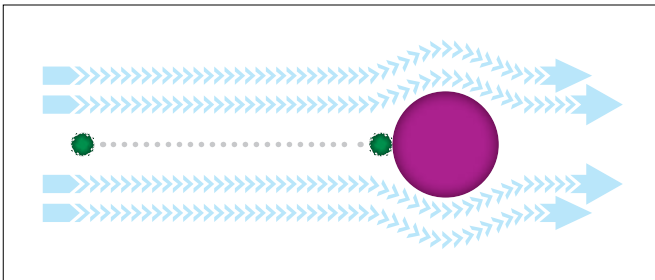
There are several methods of creating a safe and secure indoor environment. AAF takes great care in assessing and addressing the individual and specific needs of our customers and choosing the appropriate solution to any IAQ challenge.

Mechanical



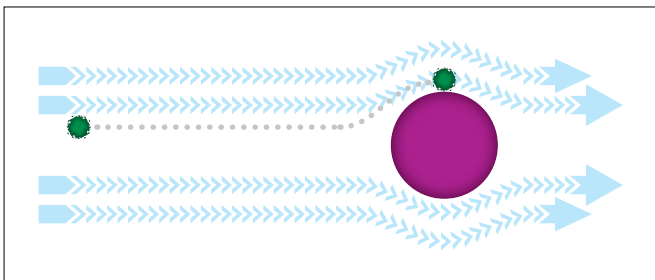
Straining

Straining occurs when a particle is larger than the opening between fibers and cannot pass through. It is a very ineffective method of filtration because the vast majority of particles are far smaller than the spaces between fibers. Straining will remove lint, hair, and other large particles.



Impingement

As air flows through a filter, it makes repeated changes in direction as it passes around each fiber. Dirt particles, especially larger particles, cannot follow the abrupt changes in direction because of their inertia. As a result, they do not follow the airstream, and they collide with a fiber. Filters using this method are often coated with an adhesive to help retain particles on the fibers.



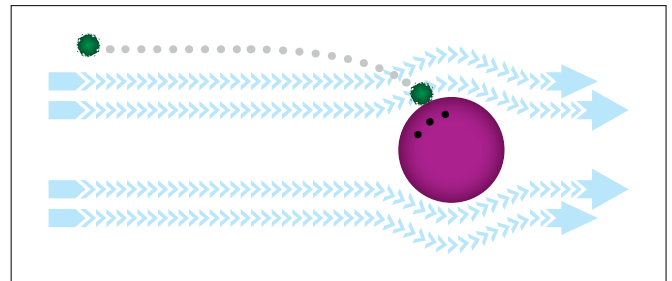
Interception

Interception is a special case of Impingement, where a particle follows the airstream, but because of its size in relation to the fiber, it comes in contact with the fiber. It is not dependent on the inertia of the particle to bring it into contact with a fiber. The particle is retained by the inherent adhesive forces between the particle and fiber, called "van der Waals" forces.

Diffusion

Diffusion takes place on particles so small that their direction and velocity are influenced by molecular collisions (called "Brownian movement"). They do not follow the airstream, but behave more like gases than particulate. These particles are battered across the direction of flow in a random "helter skelter" fashion. When a particle strikes a fiber, it is retained by the adhesive forces (van der Waals forces) between the particle and fiber.

Electrical



Electrostatic

The electrostatic method of filtration is based on the principle that objects carrying opposite electrical charges are attracted to one another. As particles enter the filter, they pass through the "ionizer" section, where a field with an intense positive charge is imparted to the particles. The particles are then carried by the airstream into the "plate" area, consisting of alternately charged collection plates. Positively charged particles are attracted to the negatively charged plates.

The accumulated dust load is removed from the plates in one of two fashions. Either the plates are periodically washed, or the dust load is left to "agglomerate" on the plates, until the enlarged particles are blown off the plates into the "storage section." The storage section consists of either an automatic roll filter or extended surface filters.

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Factors Impacting Total Cost of Ownership

Total Cost Analysis

The most significant cost normally affecting Total Cost of Filter Ownership is energy. However, other costs, such as the filter cost, installation, disposal, freight, procurement overhead, storage, and filter effectiveness in maintaining clean coils and ductwork to prevent ancillary maintenance costs, should also be considered in any total cost analysis.

For perspective, in a recent filter cost optimization study of a hospital, the annual energy cost was approximately 65% of the total cost of ownership, while the filters represented approximately 25%, the other costs were approximately 10%, and the Price of Energy was only \$0.067/kWh, while the National Commercial Average was \$10.28/kWh.

Because energy is normally the most significant cost, an understanding of the factors that affect energy costs is particularly useful.

The Annual Filter Energy Cost factors can simply be shown in the following equations:

$$\text{Annual Filter Energy Cost (\$/year)} = \text{Price of Energy (\$/kWh)} \times \text{Filtration Energy (kWh/year)}$$

Where Filtration Energy is defined as:

$$\text{Filtration Energy (kWh)} = \frac{(\text{System Airflow (CFM)} \times \text{Average Filter Pressure Drop (in. w.g.)} \times \text{Cycle Time (yrs)})}{\text{Fan System Fractional Efficiency (0.00)} \times 8520}$$

- Where, equation units are: kWh = kilowatt-hours
- CFM = cubic feet per minute
- in. w.g. = inches of water gauge
- yrs = years
- 0.00 = digital fraction, to convert digital fraction to %, then multiply by 100
- 8520 = conversion factor

The **Factor Table** below shows the key relationship between the different variables in the above equations:

Annual Filter Energy Cost (\$/yr)		Cycle Time (yrs)		Price of Energy (\$/kWh)		System Airflow (CFM)		Average Filter Pressure Drop (in. w.g.)		Fan System Efficiency (0.00)
Goes Down	with	Same	as	Goes Down	and/as	Goes Down	because	Goes Down	or as	Goes Up
Goes Up	with	Same	as	Goes Up	and/as	Goes Up	because	Goes Up	or as	Goes Down

Factor – Price of Energy (\$/kWh)

The Retail Price of Energy can range in base rate from 0.04\$/kWh to over 0.25\$/kWh in different regions in the U.S. However, additional charges, such as customer charge, distribution, commodity charge, purchase energy adjustment and state taxes added to the base rate will increase the electricity cost on a \$/kWh basis. “Single Issue Ratemaking” Surcharges for items like aging infrastructure, conservation, renewable resources, and storm damage, among other items, will also add to the electricity cost on a \$/kWh basis. A fair, accurate assessment of the electricity cost is to divide the total bill by the number of kilowatt hours.

US Department of Energy State	2013 Total Electric Industry - Average Retail Price (cents/kWh)	
	Commercial	Industrial
New England	13.97	12.25
Middle Atlantic	13.06	7.27
East North Central	9.58	6.65
West North Central	8.98	6.67
South Atlantic	9.38	6.55
East South Central	9.81	5.98
West South Central	8.11	5.82
Mountain	9.35	6.48
Pacific Contiguous	12.57	8.13
Pacific Noncontiguous	25.49	26.08
U.S. Total	10.28	6.84

Approximately **50%** of a building's energy consumption goes to the heating, cooling, and moving of air

Source: Department of Energy; 2006 Buildings Energy Data Book

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Factors Impacting Total Cost of Ownership

Factors – System Airflow (CFM) and Average Filter Pressure Drop (in. w.g.) – Filter Physics

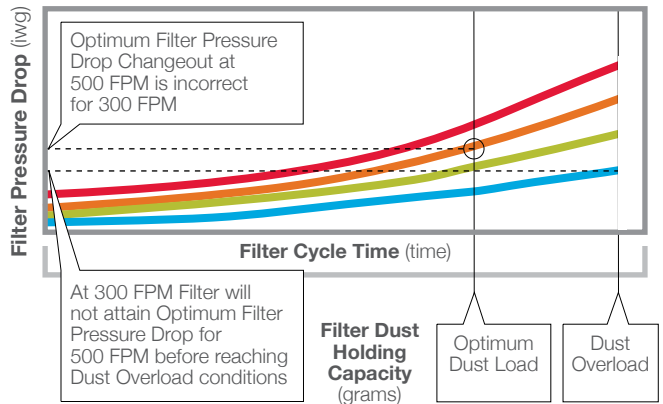
The System Airflow and the Average Filter Pressure Drop are interrelated through Filter Physics. As shown in the Factor Table, as the System Airflow increases, then so does the Filter Pressure Drop, and conversely, as the flow decreases, so does the pressure drop.

The Filter Dust Holding Capacity Test graphic shows the relationship between System Airflow (as velocity) and Filter Pressure Drop, where a filter was tested at 600, 500, 400, and 300 FPM velocities. Filter specifications for life cycle and recommended pressure changeout are normally for 500 FPM velocity. In practice, many filtration units are operating at velocities in the 300 to 400 FPM range. At these velocities the filters likely will not attain the manufacturer's recommended changeout pressure, based on 500 FPM. This could result in the filter being left in the filtration unit for an excessive period of time, likely wasting energy and possibly leading to issues like fungal growth.

Calculations for Annual Filter Energy Cost should compensate for the effect of the system velocity on initial filter pressure drop, recommended pressure drop, average filter pressure drop, and cycle time.

Filter Dust Holding Capacity Test:
A constant dust/air mixture is applied to the filter at a constant airflow velocity, filter pressure drop is measured over test cycle

Legend: Airflow Velocity
 600 FPM
 500 FPM
 400 FPM
 300 FPM



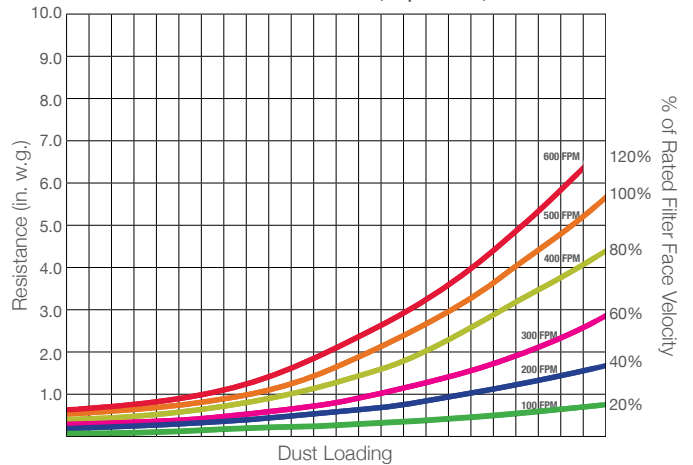
FILTRATION PRINCIPLES

15% - 40%
 of the lifetime ownership
 cost of an air
 handler unit
 (AHU) is directly
 attributable to
 the **air filters**
 selected

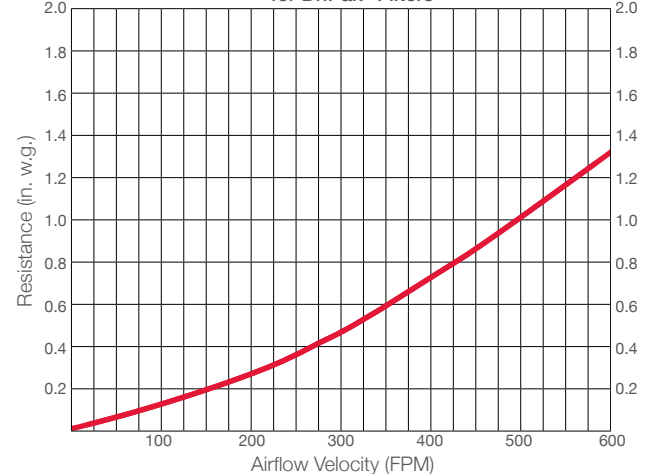


Source: Department of Energy; 2006 Buildings Energy Data Book

Resistance vs. Dust Loading at Various Velocities for 90% DriPak® Filters, 7 pockets, 37"



Recommended Final Resistance at Various Velocities for DriPak® Filters



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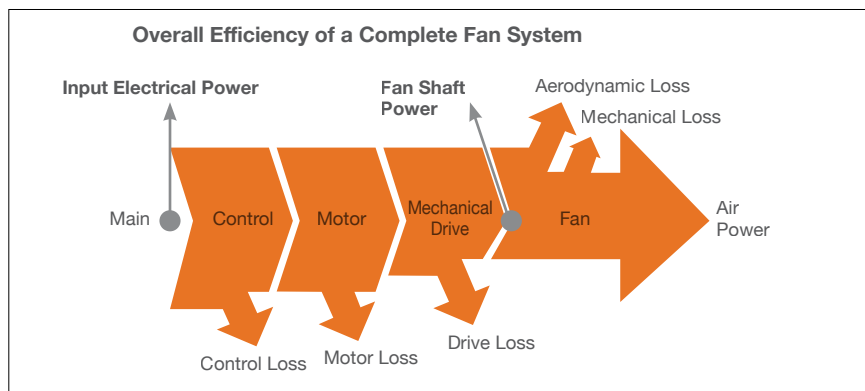


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Factors Impacting Total Cost of Ownership

Factor – Fan System Fractional Efficiency (0.00)

The Fan System Fractional Efficiency is a difficult value to determine because of the many variables in fan system design and operations, as shown in the figure below.



Research shows that facilities with **poor IAQ** can expect an **overall daily productivity drop of around 9%** with individual losses up to **33%** – another factor in **return on investment**

Sources: Staples Employee Study 2013; Presenteeism and productivity analysis; General Consulting Associates

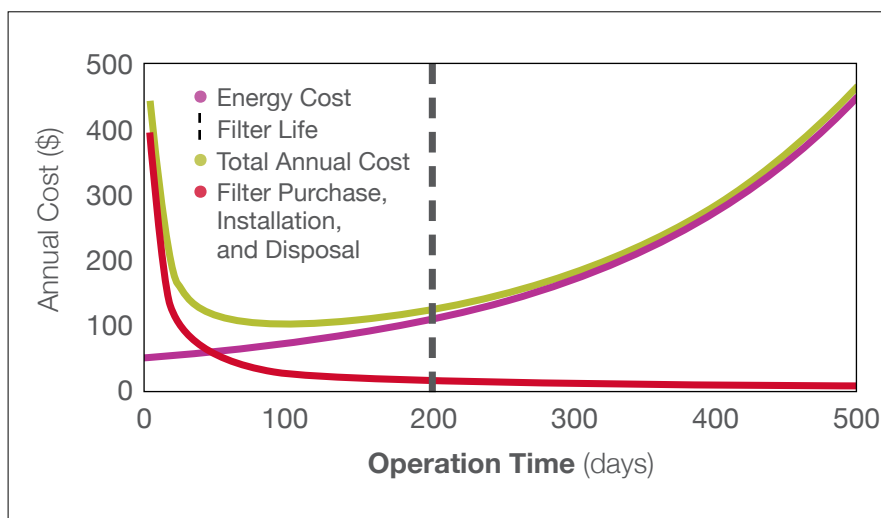
Fan system fractional efficiency values used in total cost of ownership and energy calculations can range from 0.50 to 0.80. The impact of an improper assumption of the fractional efficiency is shown in the following table.

Annual Filter Energy Cost (\$/yr)		Cycle Time (yrs)		Price of Energy (\$/kWh)	Annual Filter Energy Cost (\$/yr) based Fan System Efficiency (0.00)		
					Low Efficiency 0.50	Assume Correct Efficiency 0.75	High Efficiency 0.80
Assume	with	Assume	as	Assume	Low Efficiency 0.50	Assume Correct Efficiency 0.75	High Efficiency 0.80
\$1,000/yr	with	Same	as	Same	\$1,500/yr Error 50%	\$1,000	\$937/yr Error 6%

There are methods to directly determine the fan system fractional efficiency that allow for accurate values to be used in the total cost of ownership calculations. **Contact an AAF specialist for more information.**

Annual Cost

Total Cost of Ownership (TCO) quantifies the cost of a purchase across the product's entire lifecycle. Therefore, it offers a more accurate basis for determining the value — Cost vs. ROI — of an investment in air filters and their installation, rather than just considering the purchase price alone. The overall TCO includes direct and indirect expenses, as well as some intangible ones that can have monetary values assigned to them. When looking to improve your performance, in this area, you should employ the expertise of an air filtration specialist who can provide professional guidance and analysis to help you optimize performance and lower your TCO.



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ANSI/ASHRAE Standard 52.2, Appendix J

ASHRAE Standard 52.2 was originally released as a standard in 1999. This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC), which has established a documented program for regular publication of addenda or revisions. Addenda to the most recent publication, ASHRAE Standard 52.2-2012, were released in 2015. The title of the standard is:

“Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size”

As the name implies, the standard provides a methodology for determining a filter’s efficiency at removing various sizes of particles as the filter becomes loaded. The standard also measures the filter’s resistance to airflow when clean. In 2008, the arrestance test and dust holding capacity (DHC) from ASHRAE Standard 52.1 were added to ASHRAE Standard 52.2.

Removal efficiency is calculated by counting the number of particles upstream and downstream of the filter through a range of particle sizes, detailed in the table below. The challenge aerosol is poly-dispersed solid-phase (dry) potassium chloride (KCl) particles generated from an aqueous solution. The removal efficiency is measured when the filter is clean and after each of 5 incremental dust loadings as the filter is loaded to its final resistance. Fractional efficiency curves are developed for the clean filter and after each dust loading. A composite minimum efficiency curve is developed, which reflects the lowest efficiency for each particle size from the 6 curves.

Range	Size Range Lower Limit (µm)	Size Range Upper Limit (µm)	Range Geometric Mean Particle Size (µm)
1	0.30	0.40	0.35
2	0.40	0.55	0.47
3	0.55	0.70	0.62
4	0.70	1.00	0.84
5	1.00	1.30	1.14
6	1.30	1.60	1.44
7	1.60	2.20	1.88
8	2.20	3.00	2.57
9	3.00	4.00	3.46
10	4.00	5.50	4.69
11	5.50	7.00	6.20
12	7.00	10.00	8.37

The composite minimum efficiency curve has all of the detailed data to make an appropriate filter selection. For example, if filters are being used to clean the air supplied to a paint booth where particles 4 micron and larger can cause a defect in the painted finish, filters which remove 100% of the particles in range 9 through range 12 when tested can be selected. However, to simplify the selection and specification of air filters, the test standard provides an “overall” reporting value of a 52.2 evaluated air filter expressed as the Minimum Efficiency Reporting Value (MERV).

ASHRAE advances the arts and sciences of heating, ventilation, and air conditioning with more than

53,000 members from over **132** nations



Source: ASHRAE www.ashrae.org

MERV is a single number on a 16 point scale that is determined by placing the efficiencies of the 12 size ranges from the composite minimum efficiency curve into three larger groups as follows:

- E1** = Ranges 1 to 4 (0.3 to 1.0 µm)
- E2** = Ranges 5 to 8 (1.0 to 3.0 µm)
- E3** = Ranges 9 to 12 (3.0 to 10 µm)

The efficiency for each group is arrived at by averaging the composite minimum efficiencies of the 4 ranges.

Range	Size	Group
1	0.30 to 0.40	E1
2	0.40 to 0.55	E1
3	0.55 to 0.70	E1
4	0.70 to 1.00	E1
5	1.00 to 1.30	E2
6	1.30 to 1.60	E2
7	1.60 to 2.20	E2
8	2.20 to 3.00	E2
9	3.00 to 4.00	E3
10	4.00 to 5.50	E3
11	5.50 to 7.00	E3
12	7.00 to 10.00	E3

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ANSI/ASHRAE Standard 52.2, Appendix J

The average particle-size efficiency (PSE) for each group is referenced against the Minimum Efficiency Reporting Value (MERV) parameters (see table below). Moving up from the bottom of the table, the MERV will be in the left hand column of the first row where that PSE for each group generates a true statement. For example, if the PSE for Range 3 is 81%, and the PSE for Range 2 is 42%, the filter would be MERV 9 (Range 1 efficiency is not taken into consideration for MERV 9).

Minimum Efficiency Reporting Value (MERV) Parameters Table

Standard 52.2 Minimum Efficiency Reporting Value (MERV)	Composite Average Particle Size Efficiency, % in Size Range, μm			Average Arrestance, %
	Range 1 0.30-1.0	Range 2 1.0-3.0	Range 3 3.0-10.0	
1	N/A	N/A	$E_3 < 20$	$A_{avg} < 65$
2	N/A	N/A	$E_3 < 20$	$65 \leq A_{avg}$
3	N/A	N/A	$E_3 < 20$	$70 \leq A_{avg}$
4	N/A	N/A	$E_3 < 20$	$75 \leq A_{avg}$
5	N/A	N/A	$20 \leq E_3$	N/A
6	N/A	N/A	$35 \leq E_3$	N/A
7	N/A	N/A	$50 \leq E_3$	N/A
8	N/A	$20 \leq E_2$	$70 \leq E_3$	N/A
9	N/A	$35 \leq E_2$	$75 \leq E_3$	N/A
10	N/A	$50 \leq E_2$	$80 \leq E_3$	N/A
11	$20 \leq E_1$	$65 \leq E_2$	$85 \leq E_3$	N/A
12	$35 \leq E_1$	$80 \leq E_2$	$90 \leq E_3$	N/A
13	$50 \leq E_1$	$85 \leq E_2$	$90 \leq E_3$	N/A
14	$75 \leq E_1$	$90 \leq E_2$	$95 \leq E_3$	N/A
15	$85 \leq E_1$	$90 \leq E_2$	$95 \leq E_3$	N/A
16	$95 \leq E_1$	$95 \leq E_2$	$95 \leq E_3$	N/A

Filters that have a Range 3 value of less than 20% undergo an Arrestance test to establish the MERV.

The arrestance test is also useful for comparing filters, particularly those that are MERV 10 and less. The removal efficiency tests to establish MERV are conducted with a dry aerosol. Some filters show declining efficiency values in Range 3 as the particle size gets larger. This is because the larger dry KCl particles do not adhere as well to dry clean media. A filter's ability to stop and retain the large KCl particles does not necessarily translate into a greater ability to capture dirt. There are MERV 9 and 10 filters that have lower arrestance values (capture less dirt) than MERV 8 filters. It is a good idea to compare the arrestance values and dust holding capacity (DHC) of filters MERV 10 and below to ensure you are getting good filtration value.

There have been many studies globally that have demonstrated a loss in efficiency in some filters as they are exposed to sub-micron particles. Appendix J was added to ASHRAE Standard 52.2 in 2008 as a non-ANSI approved, optional conditioning step to provide a method of identification of the drop in efficiency. The reported value per Appendix J is referred to as MERV 'A'. Filters tested per Standard 52.2 with the Appendix J option have both a MERV and a MERV 'A.'

A motion at the ASHRAE meetings in New York City in 2014 to make appendix J a mandatory part of the standard was subsequently voted down. For the time being, it remains an optional appendix.



How to Read a Test Report

The intent of the ASHRAE Standard 52.2 test report is to assist customers in selecting the proper air filtration products, by defining expected performance throughout the useful life of a filter. Independent, third-party testing provides objective analytical data on product performance and is the most credible way to ensure air filters perform to their published metrics.

An ASHRAE 52.2 test report from an independent lab provides unbiased, validated evidence that air filter products and technologies meet standards, specifications, and performance results as promised. This information is vital in selecting the proper air filter to meet optimum air quality requirements, at the most favorable Total Cost of Ownership possible.

The test report contains data to evaluate filter costs and energy costs associated with filter performance criteria such as pressure drop, dust holding capacity, and efficiency values.

Particle size removal efficiency values and initial resistance values

Mean Particle Size (µm)	Particle Size Removal Efficiency Detail					Initial Resistance Detail	
	Initial Efficiency (%)	Load 1 Efficiency (%)	Load 2 Efficiency (%)	Load 3 Efficiency (%)	Load 4 Efficiency (%)	Air Flow (CFM)	ΔP (in WC)
0.35	3.5	4.0	5.1	16.2	21.6	24.8	0
0.47	5.0	6.4	22.8	34.5	40.0	50.4	0.06
0.62	9.2	22.5	42.9	55.1	63.2	72.3	0.13
0.84	17.4	43.0	63.4	77.3	83.0	89.0	0.20
1.14	24.5	61.2	80.4	90.1	93.6	96.4	0.29
1.44	32.4	70.2	88.3	95.0	96.9	96.4	0.41
1.88	41.6	78.8	94.8	99.4	99.5	94.8	0.48

The efficiency results include the test airflow, the efficiency for each of the 3 ranges, and the resulting MERV, along with the particle size removal efficiency curves

Efficiency Results

Airflow Rate (CFM): 1968
 Nominal Face Velocity (ft/min): 452
 E1 (% Initial Efficiency 0.30 - 1.0 µm): 9.0
 E2 (% Initial Efficiency 1.0 - 3.0 µm): 39.0
 E3 (% Initial Efficiency 3.0 - 10.0 µm): 77.0
 Minimum Efficiency Reporting Value (MERV): 9

Dust Holding & Resistance Results

Initial Resistance (inches WC): 0.29
 Final Resistance (inches WC): 0.41
 Dust Fed at Final Resistance (g): 234
 Dust Held at Final Resistance (g): 210
 Average Arrestance (%): 92.30

Dust holding and resistance data, including the initial and final resistance, the initial resistance curve, and the DHC and arrestance to selected end points

Dust holding and arrestance curves

For additional assistance in reading an ASHRAE 52.2 test report and how to factor the data into a Total Cost Analysis, contact an AAF air filtration specialist.

Final ΔP (in WC)	Dust Fed (g)	Dust Held (g)	Avg. Arrestance (%)
0.39	40.0	35.0	87.5
0.49	60.0	73.0	90.1
0.61	100.0	109.6	91.3
1.00	189.0	174.5	92.3
1.50	234.0	217.6	93.0

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HEPA & ULPA Filter Testing

AAF International understands the critical environment in which HEPA/ULPA filters are used. To provide the highest quality product, we factory test every HEPA/ULPA filter we manufacture. We use the recommended practices outlined by the Institute of Environmental Sciences and Technology (IEST) as the basis for our test protocols.

Since HEPA performance is not a “one size fits all” scenario, IEST RP-CC-001 defines filter types and grades. The information below is applicable to our entire line of HEPA (High Efficiency Particulate Air) and ULPA (Ultra Low Penetration Air) filters.

Air Filter Classification According to IEST-RP-CC001

Recommended Test and Minimum Rating for Filters Types A Through K

Filter Type	Penetration Test		Last (Scan) Test ¹			Minimum Efficiency Rating	Designated Leak Penetration
	Method	Aerosol	Method	Aerosol	Comments		
HEPA (type A)	MIL-STD-282	Thermal DOP	None	None		99.97%	n/a
HEPA (type B)	MIL-STD-282	Thermal DOP	None	None	Two-flow leak test	99.97%	n/a
HEPA (type C) ¹	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP/PAO		99.99%	0.010%
HEPA (type D) ¹	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP/PAO		99.999%	0.0050%
HEPA (type E) ¹	MIL-STD-282	Thermal DOP	None	None	Two-flow	99.97%	n/a
HEPA (type F) ¹	IEST-RP-CC007	Open	Particle Counter	Open		99.9995% at 0.1-0.2 or 0.2-0.3 μm	0.00250%
HEPA (type G) ¹	IEST-RP-CC007 ²	Open	Particle Counter	Open		99.9999% at 0.1-0.2 or 0.2-0.3 μm	0.0010%
HEPA (type H) ¹	IEST-RP-CC007	Open	None	None		99.97% at 0.1-0.2 or 0.2-0.3 μm	n/a
HEPA (type I) ¹	IEST-RP-CC007	Open	None	Open	Two-flow leak test	99.97% at 0.1-0.2 or 0.2-0.3 μm	n/a
HEPA (type J) ¹	IEST-RP-CC007	Open	Particle Counter or Photometer	Polydisperse DOP/PAO		99.99% at 0.1-0.2 or 0.2-0.3 μm	0.010%
HEPA (type K) ¹	IEST-RP-CC007	Open	Particle Counter Photometer	Polydisperse DOP/PAO		99.995% at 0.1-0.2 or 0.2-0.3 μm	0.0080%

¹Either of the two scan test methods or an alternative method may be used for filter types C, D, F, and agreed. Designated leak details for these filter types are given in IEST-RP-CC034.

²Filter medium tested at most-penetrating particle size (MPPS) prior to filter assembly. All filters are leak-tested but in some instances may not be tested for overall penetration. The MPPS for testing this filter type is determined from the media according to IEST-RP-CC021.

Test Types

The test methodologies generally fall into two categories: efficiency/penetration testing and leak scanning. The efficiency/penetration test determines the overall effectiveness of the filter to remove particles. Leak scanning involves testing the entire face of a filter to verify there are no localized areas where the penetration exceeds the specified maximum value. One or the other, or sometimes both, are performed on a filter.

HEPA and ULPA

air filters are widely used in hospitals, as well as pharmaceutical, food and beverage, and microelectronics manufacturing facilities, and are one of the most important factors in clean space



Source: Bin Zhou, Jinming Shen HVAC and Gas Institute, Tongji University, Shanghai, China

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HEPA & ULPA Filter Testing

Efficiency/Penetration Test

During an efficiency/penetration test, the filter is challenged, at rated flow, with an aerosol such as PAO (poly-alpha-olefin) or PSL (polystyrene microspheres). The upstream and downstream concentrations are measured, and the filter's overall penetration is determined by the following equation:

$$\text{Penetration (\%)} = (C_d/C_u) \times 100$$

C_d = Downstream aerosol concentration or particle count

C_u = Upstream aerosol concentration or particle count

For any filter, the efficiency (%) and penetration (%) must equal 100, so the efficiency can be calculated as:

$$\text{Efficiency (\%)} = 100 - \text{Penetration (\%)}$$

Example: If a filter has a penetration of 0.03% based on 0.3 micron particles, the efficiency will be 100 – 0.03% or 99.97%. If the filter does not meet the specified efficiency requirements, it must be repaired per IEST recommended practices or scrapped.

Leak Scan Testing

Scanning is typically constructed with an operator using overlapping strokes across the face of the filter with an aerosol detection device (e.g. photometer) continually monitoring the downstream concentration. If the ratio of the downstream to upstream concentrations are exceeded, the filter is rejected and must either be repaired according to IEST recommended practices or scrapped.

Scan testing per DIN 24.184 is also available.

Automatic Scanning Method

AAF AstroCel® II and TM ducted filters can be tested using AAF's AutoScan test protocol. AutoScan (Automatic Scanning) involves using a computer-controlled probe to more precisely control the scan speed and distance for the probe to the filter face. In addition to leak detection, the AutoScan method collects the data while scanning the filter face and calculates the overall filter efficiency. The AAF AutoScan method is the most rigorous test offered.

AutoScan testing is conducted in an ISO 4 cleanroom. Filters auto-scanned are first manufactured in AAF's state-of-the-art ISO 7 cleanroom.

Pressure Drop Measurement

Pressure drop is measured at rated flow, using calibrated pressure measurement devices in compliance with our ISO 9001 certification. Filters not meeting the pressure drop requirements are rejected.

Filtration Media Test

The suppliers of fiberglass media are required to test each roll of media manufactured on several parameters, including pressure drop, efficiency, and tensile strength. Rolls that do not meet our requirements are rejected and returned to the manufacturer.



UL Filter Testing & Factory Mutual Approval

UL Standards

Underwriters Laboratories, Inc. (UL) is an agency that lists products they have tested against criteria deemed appropriate for public safety. For AAF's Commercial and Industrial filter product lines, the UL criteria are set forth in UL Standard 900.

Smoke and flammability limits for clean air filters are established with UL 900. However, the toxicity of products of combustion, which result from a filter's exposure to flame, is outside the scope of UL 900. The filter's filtration capability before or after flame exposure is also outside this scope.

To obtain a UL listing on a product, application is made to Underwriters Laboratories. Several samples are then submitted for test, and all of these samples must pass the criteria established successfully. The manufacturer further agrees to a follow-up service procedure, in order for the listing to be granted. A UL representative visits each point of manufacture during this procedure and selects at random a sample of the listed product. This sample is returned to UL for retest, ensuring continued compliance with the appropriate test criteria.

Only products which have met the criteria for listing may use the UL label. Products manufactured by AAF, which specifically do not bear the UL label, are not required by UL to comply with UL 900 requirements, even though they may be similar in appearance to other listed products.

Listings and Classifications for a company's products are published on the Underwriters Laboratories website in their Online Certifications Directory at www.ul.com.



AAF prints the above logo, as provided by Underwriters Laboratories, directly on our products, or on a product label, signifying the product is UL qualified. The logo is a registered trademark of Underwriters Laboratories.



Underwriters Laboratories (UL) UL 900, Standard for Air Filter Units

UL 900 is a test standard that determines flammability and smoke characteristics on a clean air filter. Only filters that do not exceed the stated limits of flammability and smoke generation of UL Standard 900 can carry the UL symbol. All of AAF's HEPA/ULPA filters have been UL tested and are certified to meet the requirements of UL Standard 900.

A complete listing of AAF's products that are UL classified is available on UL's website on the Online Certifications Directory page at www.ul.com.

UL 586, Standard for High-Efficiency, Particulate, Air Filter Units

UL 586 is specific to HEPA filters and defines construction and minimum performance under various conditions. The conditions include:

- Low temperature test at 27°F (+/- 4°F)
- High humidity test with 90% RH (+/- 5%) at 77°F
- Heated air at 700°F (+/- 50°F)
- Spot flame test

Filters meeting the requirement of UL 586 can be labeled as such and are available in many of AAF's HEPA product lines, including AstroCel I and AstroCel II. This is a separate marking from the UL 900 mark.



CAN/ULC S111-13, Standard Method of Fire Tests for Air Filter Units

Many filters manufactured by AAF are also classified as meeting the requirements of CAN/ULC S111-13, Class 2. The test requirements are similar to those of UL 900, except that the filters are tested at their rated airflow and the standard approved by the Standard Council of Canada. According to CAN/ULC S111-13, a clean Class 2 unit burns moderately or emits moderate amounts of smoke when tested.

Factory Mutual Approval



Factory Mutual Approvals Standard 4920, Testing Filters Used in Clean Room Facilities

Most of AAF's mini-pleat HEPA/ULPA filters have been tested and approved to FM 4920. Its scope reads:

1.2.1 *This standard applies to filter assemblies for use in cleanroom facilities. The purpose of this standard is to test the filter assembly for the potential of flame spread and the amount of smoke being released during the Fire Exposure Test. The filter assembly typically consists of frames, filter media, gaskets, sealing gel material, and potting compounds.*

This standard does not concern the filter's ability to contaminate other filters during a fire situation.

Filters meeting the requirements of FM 4920 are labeled with appropriate FM markings. Verification of filters eligible for the FM approval label can be found at the FM Approvals website, www.approvalguide.com.



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AAF Lab Services

AAF Research & Development Testing Laboratory

AAF operates its Global Research & Development Center in Louisville, Kentucky. This facility is equipped with the most modern instrumentation to determine efficiency, pressure drop, and other operating parameters of filters, in order to advance the science of filtration. Multiple test ducts are capable of testing filters per ASHRAE Standard 52.2-2007 and European standard EN779. Other ducts are dedicated to determining the dust holding capacity of air filters. The laboratory also has a duct capable of testing filters to the UL 900 Standard for Air Filters for the evaluation of a filter's combustibility and smoke generation potential. These ducts are in constant use as AAF evaluates new Research & Development product developments, supports quality audits of AAF's manufacturing facilities, assists with customer requested testing, and assesses competitor product performance. The laboratory maintains a database of all completed testing for rapid access by AAF sales and support staffs.



AAF Global Testing Laboratory Capabilities

The AAF Global Research & Development Center works in conjunction with the other AAF filter testing centers in Europe, which include Emmen, the Netherlands, and Cramlington, England, and in Asia, which includes Suzhou, China and Kuala Lumpur, Malaysia. AAF also utilizes the technical laboratory facilities of its sister company, Nippon Muki, Japan, and its parent company, Daikin Industries Limited's Technical Innovation Center in Japan.

Advanced Computer Simulation Program

The Research & Development Center staff utilizes advanced computer programs to simulate filtration processes in different types of filters. The program generates dynamic three-dimensional models of filter media, as well as material property predictors to characterize fluid flow, particulate material, particle movement, particle deposition in the filter media, filter clogging, and cake filtration. These dynamic filter simulations allow AAF to efficiently compare the balance in the filter design and media against target performance specifications.

More than

42%



of facilities managers

expect their time on regulatory compliance to increase in the next year

AAF assists customers through the extensive internal and external testing process:

- Assures equipment and quality control measures are met
- Provides the most efficient and therefore cost effective systems for the application

Our experts can help by utilizing state-of-the-art procedures to readily assist customers as they work toward compliance.

Source: Online Survey: Regulatory Compliance, Facilitiesnet, 2015; State of Compliance Survey 2015, PriceWaterHouseCoopers LLC, 2015

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ASHRAE— Recommended Minimum Efficiencies by Area

Recommended minimum efficiencies by area as published by the American Society of Heating, Refrigerating, & Air-Conditioning Engineers (2015, 2014 and 2012 Handbooks)

Application	Minimum Filtration Efficiency
Museums, Galleries, Libraries, and Archives	MERV 7 prefilter, plus either activated carbon, treated carbon, or potassium permanganate beds, and MERV 15
Arenas & Stadiums	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Atriums	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Auditoriums	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Convention & Exhibit Centers	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Data Processing & Electronic Office Areas	MERV 8
Hotel/Motel Assembly Rooms	MERV 8 or better
Hotel/Motel Conference/Meeting Rooms	MERV 8 or better
Hotel/Motel Guest Rooms	MERV 6 to MERV 8
Hotel/Motel Lobbies	MERV 8 or better
Houses of Worship	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Laboratories (Biological & Biomedical)	MERV 14 to MERV 15
Laboratories (Chemistry & Physics)	MERV 13
Natoriums (pool areas)	MERV 8 minimum, up to MERV 13 for facilities with expensive interior décor
Office Buildings	MERV 9 to MERV 12
School Administrative & Office Space	MERV 6 to MERV 8
School Classroom	MERV 6 to MERV 8
Warehouses	MERV 9 to MERV 12

TECHNICAL ASSISTANCE

EN 13779:2007— Recommended Minimum Filter Classes per Filter Section

Outdoor Air Quality	Indoor Air Quality			
	IDA 1 (High)	IDA 2 (Medium)	IDA 3 (Moderate)	IDA 4 (Low)
ODA 1 (pure air)	F9	F8	F7	F5
ODA 2 (dust)	F7+F9	F6+F8	F5+F7	F5+F6
ODA 3 (very high concentrations of dust or gases)	F7+GF+F9 ^a	F7+GF+F9 ^a	F5+F7	F5+F6

^a GF = Gas filter (carbon filter) and/or chemical filter

ASHRAE Standard 170:2008 Ventilation of Health Care Facilities - Minimum Filter Efficiencies

Space Designation (According to Function)	Filter Bank Number 1 (MERV)	Filter Bank Number 2 (MERV)
Classes B and C surgery; inpatient and ambulatory diagnostic and therapeutic radiology; inpatient delivery and recovery spaces	7	14
Inpatient care, treatment and diagnosis, and those spaces providing direct service or clean supplies and clean processing (except as noted below); All (rooms)	7	14
Protective environment rooms (PE)	7	HEPA
Laboratories; Class A surgery and associated semi-restricted spaces	13 ^a	N/R*
Administrative; bulk storage; soiled holding spaces; food preparation spaces; and laundries	7	N/R
All other inpatient spaces	7	N/R
Skilled nursing facilities	7	N/R

* NR = not required

^a Additional prefilters may be used to reduce maintenance for filters with efficiencies higher than MERV 7

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ASHRAE Application Guidelines

Standard 52.2 MERV Range	Dust Spot Efficiency	Arrestance	Range of Contaminants Controlled	Typical Applications	Typical Air Filter/Cleaner Type
16	n/a	n/a	0.3 to 1.0 µm Particle Size All bacteria Most tobacco smoke Droplet nuclei (sneeze) (sneeze)	Hospital inpatient care General surgery Smoking lounges Superior commercial buildings	Bag Filters Nonsupported (flexible) microfine fiberglass or synthetic media. 300 to 900mm (12 to 36 in.) deep, 6 to 12 pockets. Box Filters Rigid style cartridge filters 150 to 300 mm (6 to 12 in.) deep may use lofted (air laid) or paper (wet laid) media
15	>95%	n/a			
14	90%-95%	>98%			
13	80%-90%	>98%			
12	70%-75%	>95%	1.0 to 3.0 µm Particle Size <i>Legionella</i> Humidifier dust Lead dust Milled flour Coal dust Auto emissions Nebulizer drops Welding fumes	Superior residential Better commercial buildings Hospital laboratories	Bag Filters Nonsupported (flexible) microfine fiberglass or synthetic media. 300 to 900mm (12 to 36 in.) deep, 6 to 12 pockets. Box Filters Rigid style cartridge filters 150 to 300mm (6 to 12 in.) deep may use lofted (air laid) or paper (wet laid) media
11	60%-65%	>95%			
10	50%-55%	>95%			
9	40%-45%	>90%			
8	30%-35%	>90%	3.0 to 10 µm Particle Size Mold Spores Hair spray Fabric protector Dusting aids Cement dust Pudding mix Snuff Powdered milk	Commercial buildings Better residential Industrial workplaces Paint booth inlet air	Pleated Filters Disposable extended surface, 25 to 125mm (1 to 5 in.) thick with cotton-polyester blend media, cardboard frame Cartridge Filters Graded density viscous coated cube or pocket filters, synthetic media
7	25%-30%	>90%			
6	<20%	85%-90%			
5	<20%	80%-85%			
4	<20%	75%-80%	>10.0 µm Particle Size Pollen Spanish moss Dust mites Sanding dust Spray paint dust Textile fibers Carpet fibers	Minimum filtration Residential Window air conditioners	Throwaway Disposable fiberglass or synthetic panel filters Washable Aluminum mesh, latex coated animal hair, or foam rubber panel filters Electrostatic Self charging (passive) woven polycarbonate panel filter
3	<20%	70%-75%			
2	<20%	65%-70%			
1	<20%	<65%			

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EN 779:2012 Classification

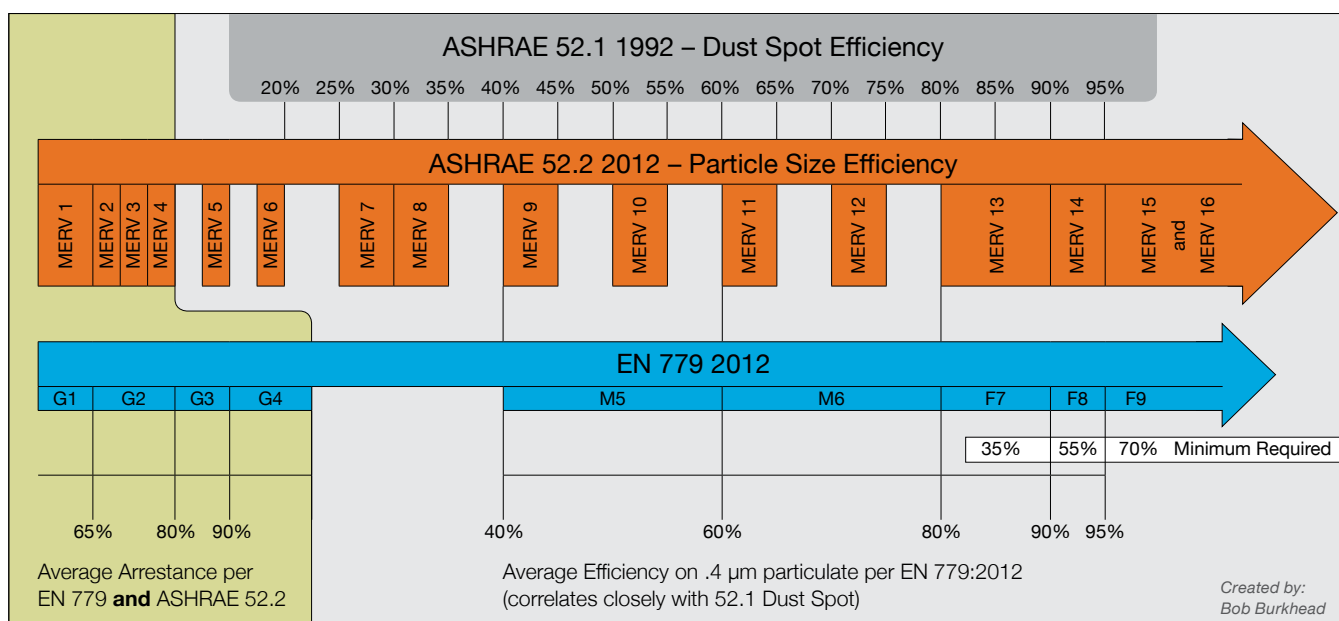
Group	Filter Class	Final pressure drop (test) Pa	Average arrestance (Am) of synthetic dust %	Average efficiency (Em) for 0.4 µm particles %	Minimum efficiency ²⁾ for 0.4 µm particles %
Coarse	G1	250	50 ≤ Am ≤ 65	-	-
	G2	250	65 ≤ Am ≤ 80	-	-
	G3	250	90 ≤ Am	-	-
	G4	250	-	-	-
Medium	M5	450	-	40 ≤ Em ≤ 60	-
	M6	450	-	60 ≤ Em ≤ 80	-
Fine	F7	450	-	80 ≤ Em ≤ 90	35
	F8	450	-	90 ≤ Em ≤ 95	55
	F9	450	-	95 ≤ Em	70

¹The characteristics of atmospheric dust vary widely in comparison with those of the synthetic loading dust used in the tests. Because of this, the test results do not provide a basis for predicting other operational performance or service life. Loss of media charge or shredding of particles or fibers can also adversely affect efficiency.

²Minimum efficiency is the lowest of any of the following three values: initial efficiency, discharged efficiency, or efficiency throughout the test's loading procedure.

TECHNICAL ASSISTANCE

Average Arrestance per EN 779 and ASHRAE 52.2



The test standard correlations above are approximations based on results obtained on a sampling of products. Actual results on products may differ somewhat from these correlations, and a product tested to one standard that needs to meet the requirements of another standard should be tested in accordance with the specified standard.

EN 1822:2009 Classification of EPA, HEPA and ULPA Filters

Filter Group Filter Class	Integral Value		Local Value	
	Efficiency (%)	Penetration (%)	Efficiency (%)	Penetration (%)
E 10	≥ 85	≤ 15	---	---
E 11	≥ 95	≤ 5	---	---
E 12	≥ 99.5	≤ 0.5	---	---
H 13	≥ 99.95	≤ 0.05	≥ 99.75	≤ 0.25
H 14	≥ 99.995	≤ 0.005	≥ 99.975	≤ 0.025
U 15	≥ 99.9995	≤ 0.0005	≥ 99.9975	≤ 0.0025
U 16	≥ 99.99995	≤ 0.00005	≥ 99.99975	≤ 0.00025
U 17	≥ 99.999995	≤ 0.000005	≥ 99.9999	≤ 0.0001

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Standards, Regulations and Recommendations

ISO 14644-1 Classification of Air Cleanliness by Particle Concentration

ISO Class Number (N)	Maximum allowable concentrations (particles/m ³) for particles equal to and greater than the considered sizes, shown below ^a					
	0.1 μm	0.2 μm	0.3 μm	0.5 μm	1 μm	5 μm
1	10 ^b	d	d	d	d	e
2	100	24 ^b	10 ^b	d	d	e
3	1,000	237	102	35 ^b	d	e
4	10,000	2,370	1,020	352	83 ^b	e
5	100,000	23,700	10,200	3,520	832	d, e, f
6	1,000,000	237,000	102,000	35,200	8,320	293
7	c	c	c	352,000	83,200	2,930
8	c	c	c	3,520,000	832,000	29,300
9 ^g	c	c	c	35,200,000	8,320,000	293,000

^a All concentrations in the table are cumulative, e.g. for ISO Class 5, the 10,200 particles shown at 0.3 μm include all particles equal to and greater than this size.

^b These concentrations will lead to large air sample volumes for classification. Sequential sampling procedure may be applied.

^c Concentration limits are not applicable in this region of the table due to very high particle concentration.

^d Sampling and statistical limitations for particles in low concentrations make classification inappropriate.

^e Sample collection limitations for both particles in low concentrations and sizes greater than 1 μm make classification at this particle size inappropriate, due to potential particle losses in the sampling system.

^f In order to specify this particle size in association with ISO Class 5, the macroparticle descriptor M may be adapted and used in conjunction with at least one other particle size.

^g This class is only applicable for the in-operation state.

Comparison of International Classification Standards

Number of part 0.5 μm/m ³ (approx.)	U.S. Federal Standard 209 E 1992		EN ISO 14644-1 1996
-	-	-	ISO 1
1	-	-	
4	-	-	ISO 2
10	M 1	-	-
35	M 1.5	1	ISO 3
100	M 2	-	-
353	M 2.5	10	ISO 4
1,000	M 3	-	-
3,530	M 3.5	100	ISO 5
10,000	M 4	-	-
35,300	M 4.5	1,000	ISO 6
100,000	M 5	-	-
353,000	M 5.5	10,000	ISO 7
1,000,000	M 6	-	-
3,530,000	M 6.5	100,000	ISO 8
10,000,000	M 7	-	-
35,000,000	-	-	ISO 9

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Standards, Regulations and Recommendations

U.S. Federal Standard 209 Class

U.S. Federal Standard 209 Class		0.1 µm	0.2 µm	0.3 µm	0.5 µm	5 µm
SI (E)	English (D)	m ³	m ³	m ³	m ³	m ³
M 1		350	75.7	309	10.0	-
M 1.5	1	1,240	265	106	35.3	-
M 2		3,500	757	309	100	-
M 2.5	10	12,400	2,550	1,060	353	-
M 3		35,000	7,570	3,090	1000	-
M 3.5	100	-	26,500	10,600	3,530	-
M 4		-	75,700	30,900	10,000	-
M 4.5	1,000	-	-	-	35,300	247
M 5		-	-	-	100,000	618
M 5.5	10,000	-	-	-	353,000	2,470
M 6		-	-	-	1,000,000	6,180
M 6.5	100,000	-	-	-	3,530,000	24,700
M 7		-	-	-	10,000,000	61,800

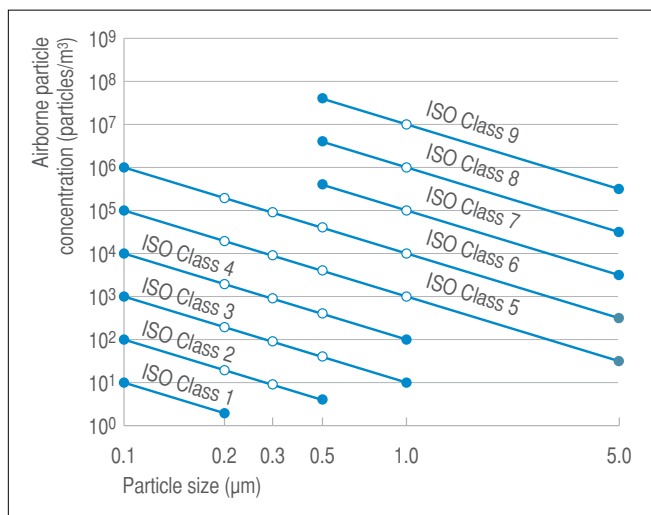
Particles / m³ = 10^M (0.5/d)^{2.2}
 Particles / ft³ = N_c (0.5/d)^{2.2}

ISO 29463 Filter Classes and Equivalents

ISO Filter Class	Efficiency	IEST*	EN 1822
ISO 15 E	>95%	-	H 11
ISO 20 E	>99%	-	
ISO 25 E	>99.5%	-	H 12
ISO 30 E	>99.9%	-	
ISO 35 H	>99.95%	-	H 13
-	>99.97%	A,B,E,H,I	-
ISO 40 H	>99.99%	C,J(K)	
ISO 45 H	>99.995%	K	H 14
ISO 50 U	>99.999%	D	
ISO 55 U	>99.9995%	F	U 15
ISO 60 U	>99.9999%	G	
ISO 65 U	>99.99995%	G	U 16
ISO 70 U	>99.99999%	G	
ISO 75 U	>99.999995%	G	U 17

*IEST Type A, B, C, D, and E are classified per test results using photometers (Mil Std 282). Types F, G, H, I, J, and K are classified per test results using particle counters.

ISO 14644-1 Cleanroom Class Particulate Concentration Limits



The graph shows the minimum and maximum particle size limits acceptable for each of the ISO classes shown. The classification lines do not represent actual particle size distributions found in cleanrooms and clean zones.

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Air Filter Classification According to IEST-RP-CC001

Recommended Test and Minimum Rating for Filters Types A Through K

Filter Type	Penetration Test		Last (Scan) Test ¹			Minimum Efficiency Rating	Designated Leak Penetration
	Method	Aerosol	Method	Aerosol	Comments		
HEPA (type A)	MIL-STD-282	Thermal DOP	None	None		99.97%	n/a
HEPA (type B)	MIL-STD-282	Thermal DOP	None	None	Two-flow leak test	99.97%	n/a
HEPA (type C) ¹	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP/PAO		99.99%	0.010%
HEPA (type D) ¹	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP/PAO		99.999%	0.0050%
HEPA (type E) ¹	MIL-STD-282	Thermal DOP	None	None	Two-flow	99.97%	n/a
HEPA (type F) ¹	IEST-RP-CC007	Open	Particle Counter	Open		99.9995% at 0.1-0.2 or 0.2-0.3 µm	0.00250%
HEPA (type G) ¹	IEST-RP-CC007 ²	Open	Particle Counter	Open		99.9999% at 0.1-0.2 or 0.2-0.3 µm	0.0010%
HEPA (type H) ¹	IEST-RP-CC007	Open	None	None		99.97% at 0.1-0.2 or 0.2-0.3 µm	n/a
HEPA (type I) ¹	IEST-RP-CC007	Open	None	Open	Two-flow leak test	99.97% at 0.1-0.2 or 0.2-0.3 µm	n/a
HEPA (type J) ¹	IEST-RP-CC007	Open	Particle Counter or Photometer	Polydisperse DOP/PAO		99.99% at 0.1-0.2 or 0.2-0.3 µm	0.010%
HEPA (type K) ¹	IEST-RP-CC007	Open	Particle Counter Photometer	Polydisperse DOP/PAO		99.995% at 0.1-0.2 or 0.2-0.3 µm	0.0080%

¹ Either of the two scan test methods or an alternative method may be used for filter types C, D, F, and agreed. Designated leak details for these filter types are given in IEST-RP-CC034.

² Filter medium tested at most-penetrating particle size (MPPS) prior to filter assembly. All filters are leak-tested but in some instances may not be tested for overall penetration. The MPPS for testing this filter type is determined from the media according to IEST-RP-CC021.

Pharmaceutical CGMPs - Air Classifications^a 2004

Clean Area Classification (0.5 µm particles/ft ³)	ISO Designation ^b	≥ 0.5 µm Particles/m ³	Microbiological Active Air Action Levels ^c (cfu/m ³)	Microbiological Settling Plates Action Levels ^{c,d} (diam. 90mm; cfu/4 hours)
100	5	3,520	1 ^e	1 ^e
1000	6	35,200	7	3
10,000	7	352,000	10	5
100,000	8	3,520,000	100	50

^a All classifications based on data measured in the vicinity of exposed materials/articles during periods of activity

^b ISO 14644-1 designations provide uniform particle concentration values for cleanrooms in multiple industries. An ISO 5 particle concentration is equal to Class 100 and approximately equals EU Grade A.

^c Values represent recommended levels of environmental quality. You may find it appropriate to establish alternate microbiological action levels due to the nature of the operation or method of analysis.

^d The additional use of settling plates is optional.

^e Samples from Class 100 (ISO 5) environments should normally yield microbiological contaminants.



Standards, Regulations and Recommendations

Cleanroom Classification According to EU GMP Annex 1

Maximum Permitted Number of Particles /m ³ Equal to or Greater than the Tabulated Size					International Cleanroom Standard Comparison for 'At-rest'		
Grade	At-rest		In Operation		FED 209E	FED 209D	ISO 14644
	0.5 µm	5.0 µm	0.5 µm	5.0 µm			
A	3,520	20	3,520	20	M 3.5	Class 100	ISO 5
B	3,520	29	352,000	2,900	M 3.5	Class 100	ISO 5
C	352,000	2,900	3,520,000	29,000	M 5.5	Class 10,000	ISO 7
D	3,520,000	29,000	Not Defined	Not Defined	M 6.5	Class 100,000	ISO 8

Typical Cleanroom Activities for Terminal Sterilization and Aseptic Preparation

GMP Grade	Examples of Typical Activities	
	Terminal Sterilization	Aseptic Preparation
A	Filling of products for sterilization (unusual risk profile)	Handling of sterile starting materials and components Preparation of materials and products (non-sterile filtering) Handling and filling of aseptically prepared products
B	-	Background area for grade A zones
C	Filling of products for sterilization (usual risk profile) Preparation of materials and products (sterile filtering)	Preparation of components (unusual risk profile)
D	Preparation of components (usual risk profile)	Handling of components after washing

ISA 71.04 Classification of Reactive Environments

Severity Level	G1 Mild	G2 Moderate	G3 Harsh	GX Severe		
Copper Reactivity Level (in angstroms, Å)	< 300	< 1000	<2000	2000		
The gas concentration levels shown below are provided for reference purposes. For a given gas concentration, the Severity Level can be expected to be increased by one level for each 10% increase in relative humidity above 50% or for a relative humidity rate of change greater than 6% per hour.						
Reactive Species	Contaminant	Gas Concentrations (in ppb)				
		Gas	Concentration			
Reactive Species	Group A	H ₂ S	< 3	< 10	< 50	50
		SO ₂ , SO ₃	< 10	< 100	< 300	300
		Cl ₂	< 1	< 2	< 10	10
		NO _x	< 50	< 125	<1250	1250
	Group B	HF	< 1	< 2	< 10	10
		NH ₃	< 500	< 10,000	< 25,000	25,000
		O ₃	< 2	< 24	< 100	100

ASHRAE TC 9.9 Guideline for RoHS Compliant Corrosion Control

Applications: Data Centers, Tire Manufacture Facilities, Rubber Manufacture Facilities, Paper Mills, Refineries
Protected Equipment: RoHS compliant circuitry in control rooms, motor control centers, or other such areas.

Class	Copper A/30 days	Silver A/30 days	Reliability Statement
G1 (Mild)	< 300	< 200	Acceptable
G2 (Moderate)	<1000	<1000	Not acceptable – corrosive attack may occur
G3 (Harsh)	< 2000	< 2000	
GX (Severe)	> 2000	> 2000	

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Standards, Regulations and Recommendations

Filter Engineering Calculations and Conversions

Filter Engineering – Calculations

An air filter's efficiency is expressed in 3 forms:

The Efficiency Percentage: $R = \frac{(I-E)}{I} \times 100$

The Penetration Percentage: $P = \frac{E}{I} \times 100$

The Purification Coefficient (no units): $CE = \frac{I}{E}$

Energy Consumed

Energy consumed by an air filter due to its pressure drop:

q = flow rate (m³/s)

dP = pressure drop (Pa) $E = \frac{q \times dP \times h}{ef \times 1000} = \text{kWh}$

h = operating period (hours)

ef = fan efficiency (generally 0.6 to 0.7)

Conversions

Speed	m/s = 3.6 km/h	1 km/h = 0.278 m/s	1 ft/min = 0.00508 m/s	1 m/s = 196.85 ft/min
Length	1 mile = 1.609 km 1 ft = 0.305 m 1 mm = 1.000 µm 1 µm = 10,000 Å	1 km = 0.621 mile 1 m = 3.28 ft 1 µm = 0.001 mm 1 Å = 0.0001 µm	1 yd = 0.914 m 1 in = 25.4 mm 1 µm = 1.000 nm	1 m = 1.09 yd 1 mm = 0.039 in 1 nm = 0.001 µm
Surface	1 ft ² = 0.0929 m ²	1 m ² = 10.8 ft ²	1 in ² = 6.45 cm ²	1 cm ² = 0.155 in ²
Volume	1 ft ³ = 0.0283 m ³	1 m ³ = 35.3 ft ³	1 ft ³ = 28.3 litres	
Flow rate	1 cfm = 0.472.10 – 3 m ³ /s 1 cfm = 1.699 m ³ /h	1 m ³ /s = 3 600 m ³ /h 1 m ³ /s = 2 120 cfm	1 m ³ /h = 0.278.10 – 3 m ³ /s	
Weight	1 lb = 0.454 kg	1 kg = 2.20 lb	1 oz = 28.3 g	1 g = 0.0352 oz
Force	1 kgf = 9.80665 N	1 N = 0.102 kgf	1 lbf = 4.45 N	1 N = 0.225 lbf
Pressure	1 mmCE = 9.81 N 1 kg/cm ² = 0.980665 bar 1 psi = 6.89 kPa 1 mmCE = 1 kg/m ²	1 Pa = 0.102 mmCE 1 bar = 1.02 kg/cm ² 1 bar = 101325 Pa 1 kPa = 0.145 psi	1 kPa = pz 1 kg/m ² = 98.0665 kPa 1 atm = 101.325 kPa 1 Pa = 1 N/m ²	1 kPa = 10.2 g/cm ² 1 kPa = 0.00987 atm 1 mb = 100 Pa 1 in w.g. = 250 Pa
Energy	1 kgm = 9.80665 J 1 kWh = 3.6 MJ	1 J = 0.102 kgm 1 MJ = 0.278 kWh	1 cal = 4.184 J 1 Btu = 1.055 kJ	1 J = 0.239 cal 1 J = 0.945.10-3 Btu
Power	1 CV = 0.736 1 Btu/h = 0.292 W	1 kW = 1.36 CV 1 W = 3.42 Btu/h	1 kcal/h = 1.16 W	1 W = 0.860 kcal/h

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Filter Engineering Calculations and Conversions (cont.)

Temperature: Conversion Formula

$0^{\circ}\text{C} = 32^{\circ}\text{F}$	$0^{\circ}\text{F} = -17.8^{\circ}\text{C}$
$0^{\circ}\text{F} = (9/5) \times ^{\circ}\text{C}$	$+32^{\circ}\text{C} = (5/9) \times ^{\circ}\text{F} - 17.8$

Temperature: Conversion Table

$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$
0	-17.8	30	-1.1	50	10.0	80	26.7
10	-12.2	32	0	60	15.6	90	32.2
20	-67.4	0	4.4	70	21.1	100	37.8

Conversion Table (%)

Efficiency	Penetration	Purification Coefficient	Efficiency	Penetration	Purification Coefficient
95	5	20	99.99	0.01	10,000
99	1	100	99.995	0.0005	20,000
99.5	0.5	200	99.999	0.001	100,000
99.9	0.1	1,000	99.9995	0.0005	200,000
99.95	0.05	2,000	99.9999	0.0001	1,000,000
99.97	0.03	3,333	99.99995	0.00005	2,000,000
99.98	0.02	5,000	99.99999	90.00001	10,000,000

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Gaseous Contaminant Guidance

What are Gaseous Contaminants?

Gaseous contaminants are undesirable airborne molecules mixed with the normal molecular oxygen and nitrogen in the atmosphere. Because of their molecular size, in the sub-nano range, they are not visible. Also not visible, but present in the air, is desirable molecular water, which is referred to as humidity. Some common offensive undesirable gaseous contaminants are hydrogen sulfide, the rotten egg smell, or skatole, the dirty diaper smell. Many gases that evolve from combustion are considered to be contaminants, such as carbon monoxide, oxides of nitrogen, oxides of sulfur, and polyaromatic hydrocarbons.

Size - Gaseous Contaminants & Particulate Contaminants

The graphic in Figure 1 illustrates the relative size differences of airborne contaminants. Some particulate contaminants, such as viruses and bacteria, although not visible, have a mass size large enough to be filtered with specialized particulate filters. Gaseous contaminants can only be effectively removed using molecular gas phase filtration technologies.

Types and Sources of Gaseous Contaminants

Gaseous contaminants are generally classified as Odorous, Corrosive, or Harmful/Toxic. Examples of their sources are shown in Figure 2.

Control of Gaseous Contaminants

The principle of specialized gas-phase filtration systems, as seen in Figure 3, most often in combination with particulate filters, are used to remove molecular gaseous contaminants.

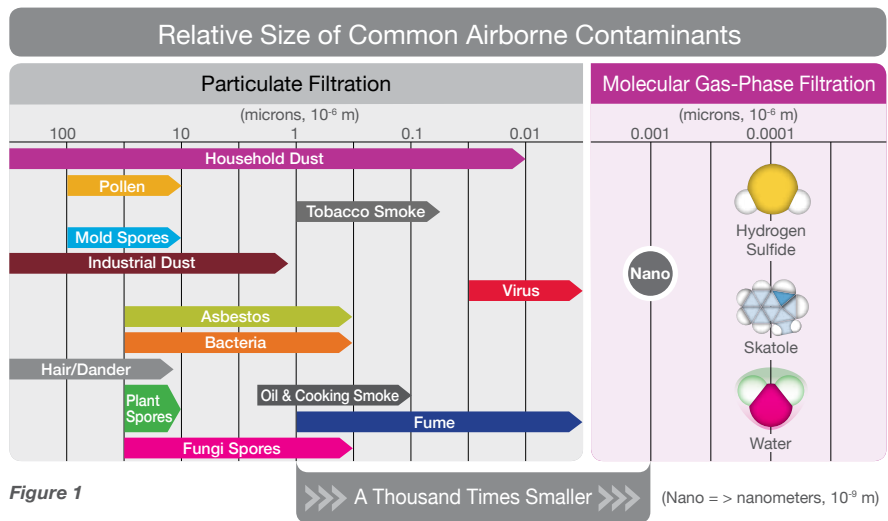


Figure 1



Figure 2

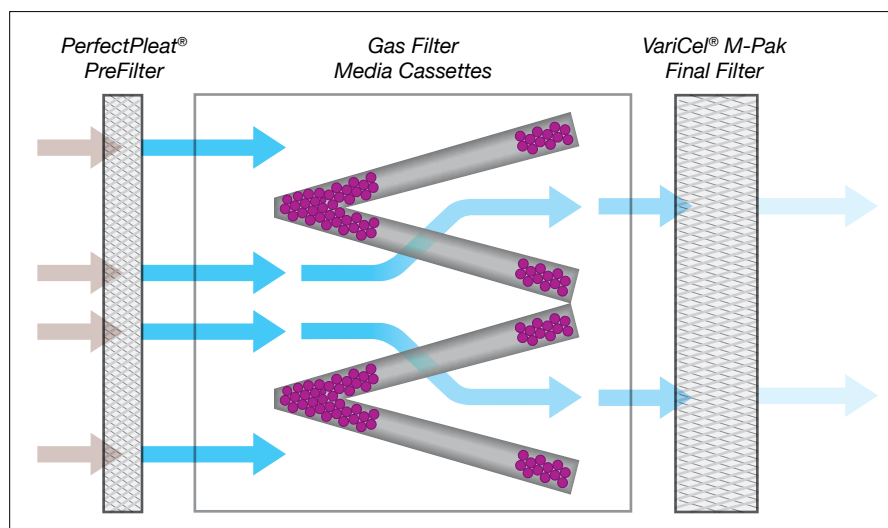


Figure 3

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Selecting the Proper Air Filter

Major Selection Factors

The most important element to consider in selecting the proper air filter is to meet the optimum air quality requirements of the facility, at the most favorable Total Cost of Ownership (TCO) possible. For example, healthcare regulations often mandate very specific filter efficiencies.

Other selection factors include:

- Consider the dimension of the tracks or frames that hold the filters within an existing installation; filters that fit the existing system will be available in various types of media and design that will directly affect the filter's pressure drop, dust holding capacity, efficiency, and price
- Utilize a TCO approach to normalize filter costs and energy costs associated with filter performance criteria like pressure drop and dust holding capacity, and note the impact of TCO against desired filter maintenance cycles, such as three, four, six, or twelve months
- Be aware of the opportunity to improve the IAQ of the facility, which has been shown to directly affect worker health and productivity, as well as the attentiveness of students and employees
- Be aware of the opportunity to reduce overall costs by using recently developed products that reduce energy costs
- Use a professional, technically capable air filtration specialist for guidance, and start by asking for an audit of the air filtration system

You should expect the following from an Air Filtration Audit:

- Analysis of your current state by a team of industry experts
- Professional guidance and analysis to reduce spend, decrease risk, and save time
- Valuable and detailed benchmark data
- Optimized TCO report which will show you where you could be performing better
- A standardized list of filters by air handler unit (AHU) and application

The Selection

Once the Air Filtration Audit is complete, review alternative recommendations for the filters, any recommendations to improve the sealing to reduce by-pass, and the TCO information on each filter alternative. After consideration of all of these factors, you're ready to make the filter selection. Ask the air filtration specialist to check the installation in regular intervals to determine if the performance is as predicted.



There are
175,268
 pages on IAQ
 in the U.S. Code of
 Federal Regulations

Companies Choose AAF's Expertise Because of Our:

- Technical approach to problem solving
- TCO diagnostic programs that factor in energy costs, filter costs, and maintenance costs, all at local, actual air velocity
- Broad range of filters for the optimal selection in each application
- Air Filtration Audits that provide professional guidance and analysis for cost savings and risk reduction

Source: Database of state indoor air quality laws, Environmental Law Institute, 2015; Code of Federal Regulations Total Pages and Volumes, Federal Register, 2015



Filter Industry Definitions

ABSOLUTE—An arbitrary term once used to describe high efficiency particulate air filters, based on minimal penetration of 0.3 micron particles. In air filtration, there are no absolutes.

ABSOLUTE FILTER—This term has been applied to air filters of high efficiency — greater than 95% against submicron particles — but is now less frequently used. Modern terminology prefers the term HEPA filter (High Efficiency Particulate Air).

ABSORB—To intercept, or drink in, as a sponge sucks in water.

ABSORPTION—A physio-chemical process in which one substance associates with another to form a homogeneous mixture that presents the characteristics of a solution.

ACFM—Actual Cubic Feet Per Minute. Airflow measured at operating temperature and pressure.

ACID—Any of a class of substances whose aqueous solutions are characterized by a sour taste, the ability to turn blue litmus to red, and the ability to react with bases and certain metals to form salts. Acids will yield hydrogen ions when dissolved in water.

ACTIVATED ALUMINA—A highly porous and granular form of aluminum oxide having preferential adsorptive capacity for moisture from gases, vapors, and some liquids.

ACTIVATED CARBON—Any form of carbon characterized by high adsorptive capacity for gases, vapors, or colloidal solids. The carbon or charcoal is produced by destructive distillation of wood, peat, lignite, nut shells, bones, vegetable, or other carbonaceous matter, but must be activated by high temperature steam or carbon dioxide, which creates a porous particle structure.

ACTIVATED CHARCOAL—*See activated carbon.*

ADHESION—Intermolecular forces which hold matter together. Also applied to the sticking together of a particle to a surface, a fiber or another particle. The main factors affecting adhesion of particles are 1) London-van der Waals forces, which are electrical in origin, 2) electrostatic forces, and 3) surface tension, due to films of moisture on particles or on the surface. Other factors influencing adhesion are the nature of the surfaces, surface contaminants, particle size, shape and roughness, and time of contact.

ADSORB—The physio-chemical phenomenon involved to attract and hold a gas, vapor, or liquid on the surface of a solid, particularly on a finely divided material.

ADSORBATE—The material which is adsorbed; i.e., the gas, vapor, or liquid which adheres, or is chemically attracted to, the surface of the solid.

ADSORBENT—The material which adsorbs; i.e., the solid which attracts and holds on its surface the gas, vapor, or liquid. Activated carbon and activated alumina are all adsorbents.

ADSORPTION—The natural phenomenon of a gas, vapor, or liquid being attracted to, and held on, the surface of a solid. To some extent, adsorption takes place on any solid surface, but certain materials have sufficient adsorbent capacity because they are finely divided and are therefore useful in such industrial applications as the purification and separation of gases and liquids.

AEROSOL—Liquid or solid particles suspended in air, gas, or vapor.

AHRI—Air-Conditioning, Heating, and Refrigeration Institute.

ALKALI—A term that applies to the type of compounds which have basic properties and will neutralize acids. Some alkaline materials are hydroxides, carbonates, or caustics.

AMBIENT—Of the surrounding area or environment.

AMBIENT AIR—The air surrounding a building. The source of outdoor air brought into a building.

AMINE—A class of organic compounds of nitrogen that may be considered to be derived from ammonia. It may be a gas, liquid, or solid. All amines are basic in nature and will usually combine readily with hydrochloric or other strong acids to form salts.

AMMONIA—A colorless gas with a characteristic pungent odor. Used for refrigeration, fertilizer, chemical manufacturing, and many other uses.

ANGSTROM—A unit of length, 10^{-10} meter, or one ten thousandth of a micron.

ANSI—American National Standards Institute.

ARRESTANCE—A measure of the ability of an air-cleaning device to remove ASHRAE loading dust from test air. Measurements are made of the weight of loading dust fed and the weight of the dust passing the device during loading. The difference between the weight of dust fed and the weight of dust passing the device is calculated as the dust captured by the device. Arrestance is then calculated as the percentage of the dust fed that was captured by the device.

AROMATIC COMPOUNDS—Compounds related to six-carbon membered rings as benzene or its derivatives.

ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers.

ASHRAE LOADING DUST—Loading dust for testing air filtration devices composed, by weight, of 72% SAE Standard J726 test dust (fine), 23% powdered carbon, and 5% milled cotton linters.

ASME—American Society of Mechanical Engineers.

ATMOSPHERIC PRESSURE—The pressure of approximately 14.7 pounds per square inch exerted at sea level in all directions by the atmosphere.

BIOAEROSOL—A suspension of airborne particles that contain living organisms or were released from living organisms.



Filter Industry Definitions

BLIND SPOTS—Places in a medium where no filtering occurs. These places are also referred to as dead areas and are the opposite of the effective area.

BREAKTHROUGH—When the downstream concentration exceeds the allowable concentration.

BRIDGING—Where particles being removed from the air form an arch over the individual openings/pleats in an extended surface filter, blocking the narrow air passages between pleats and reducing the service life of the filter.

BROWNIAN MOTION—The random movement of microscopic particles suspended in a liquid or gas, caused by collisions with molecules of the surrounding medium. Also called Brownian Movement.

BTU (BRITISH THERMAL UNIT)—A standard measure of heat content in a substance that can be burned to provide energy.

BYPASS—Condition resulting from the fluid stream flowing through a housing without flowing through the filtering medium. In air filtration, unfiltered air going around the filter.

CAPACITY—Volume of air expressed in cubic feet per minute (CFM), or similar units that a filter is rated to handle.

CFM—Cubic feet per minute.

CHEMISORPTION—The combined process of adsorption, absorption, and oxidation, where gases trapped in chemisorbent media (adsorbent with an impregnant) are changed from gases into harmless solids.

CHIMNEY EFFECT—The tendency of heated air to rise due to lower density in comparison with ambient, also called thermal, updrafts. In cleanroom areas, heat generating equipment may cause severe upward air currents, resulting in unwanted turbulence.

CLEAN PRESSURE DROP—Differential pressure (drop) across a clean filter, typically measured in inches of water column (water gauge) or pascals.

CLEANROOM—A specially constructed enclosed area environmentally controlled with respect to airborne particulates, temperature, humidity, air pressure, airflow patterns, air motion, and lighting.

CLEAN SPACE—A term referring to cleanrooms or work stations within a room.

COALESCING—Action of uniting of small droplets of one liquid, preparatory to its being separated from another liquid.

COMPOSITE MEDIA—Media made up of more than one material.

CONTACT TIME—The length of time an absorbent is in contact with a liquid or gas prior to being removed by the filter.

CONTAMINANT—Synthetic or naturally occurring chemical, particle, or microorganism in air that could have adverse effects.

CONVENTION FLOW (NON-LAMINAR FLOW)

CLEANROOM—A cleanroom with no requirements for uniform airflow patterns and air velocities.

CORROSION—Conversion of metals into oxides, hydrated oxides, carbonates, or other compounds, due to the action of air or water, or both. Salts and Sulphur are also important sources of corrosion.

CRITICAL SURFACE—The surface in a cleanroom or work station to be protected from particulate contamination.

DEAD AREAS—Places in a medium where no filtering occurs. Also referred to as blind spots. The opposite of the effective area.

DEGRADATION—The wearing down, or reduction in the efficiency of, the medium.

DELTA (Δ) P—A commonly used symbol denoting the difference in pressure between two points, such as the inlet and outlet of a filter. This difference is often referred to as the pressure drop and is typically measured in inches of water column (water gauge) or pascals.

DEPTH FILTRATION—Filtration accomplished by a progressively denser, deep medium, designed to allow finer particles to penetrate further into the medium, while larger particulates are lodged closer to the surface. A progressive density medium has superior dust holding capacity.

DIFFERENTIAL PRESSURE—Difference in pressure between two points, such as the inlet and outlet of a filter. This difference is often referred to as the pressure drop, and is typically measured in inches of water column (water gauge) or pascals.

DIFFERENTIAL PRESSURE INDICATOR—Indicator that signals the difference in pressure at two points.

DIFFERENTIAL PRESSURE SWITCH—Electrical switch operated by the difference between two pressures and often used to give warning of the end of a filtration cycle.

DIFFUSER—An air distribution outlet specifically designed to mix conditioned air with room air by induction. Mixing is accomplished by venture action, as the high velocity airstream leaving the diffuser aspirates ambient air toward the device.

DIFFUSION—A method of filtration that is effective on particles 0.1 micron and smaller, whose direction and velocity are influenced by molecular collisions (called Brownian Motion). Particulates of this size do not follow the airstream, but behave more like gases than particulate. Their dwell time in the media is longer as they are battered across the direction of flow in a random “helter skelter” fashion. When a particle strikes a fiber, it is retained by the inherent adhesive forces between the particle and fiber (van der Waals forces).

DISPOSABLE—Describes an expendable component which is to be discarded after use and replaced with an identical component. This means that the component is replaceable, not reusable.

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Filter Industry Definitions

D.O.P. (DIOCTYL PHTHALATE)—An oil-like plasticizer which is readily atomized to form the test aerosol which was once used in the overall penetration and scan tests of HEPA filters. This test aerosol is now rarely used and has been replaced with PAO (poly-alpha-olefin).

DOWNSTREAM—Portion of the system located after a filter. Also, the leaving air or the clean air side of a filter.

DUAL LAYER MEDIA—Media in a filter element that has a coarse layer followed by a fine layer, to enhance dust holding capacity.

DUST HOLDING CAPACITY (DHC)—The total weight of ASHAE test dust a filter can hold before reaching a given final resistance. This amount will vary, depending on the size and design of the filter and airflow rate. Typically reported in grams, DHC is used to provide a relative measure of filter service life.

EFFECTIVE AREA—Area of the medium exposed to flow and usable for its intended purpose (filtering). This term means the opposite of blind spots or dead area.

EFFICIENCY—Degree to which a filter will perform in removing solids, in accordance with the chosen test method.

EFFICIENCY CURVE—Graph showing the performance of a filter when challenged by specified contaminants under controlled conditions. Usually will be plotted against particle size at a given face velocity.

ELECTRET MEDIA—Filter media containing an electrostatic charge.

ELECTROSTATIC PRECIPITATION—A method of filtration that imparts a positive charge to airborne particulate matter and collects the particles on negatively charged collection plates.

EXFILTRATION—Outward air leakage from a space through openings, caused by pressure differences across these openings.

EXTENDED SURFACE FILTER—A category of filter that is designed with pleats or pockets to increase the amount of media exposed to the airstream within a given face dimension. Greater filter surface area reduces media velocity and increases efficiency and dust holding capacity.

FACE AREA—The area of a filter perpendicular to the flow direction.

FACE LOADING—The phenomenon by which contaminants in the air load up on the surface of the filter, causing an abnormal rise in resistance.

FDA—U.S. Food and Drug Administration, which is responsible for protecting and promoting public health through the regulation and supervision of food safety, tobacco products, dietary supplements, prescription and over-the-counter pharmaceutical drugs, vaccines, biopharmaceuticals, blood transfusions, medical devices, electromagnetic radiation emitting devices, cosmetics, animal food and feed, and veterinary products. The FDA enforces Current Good Manufacturing Practices (CGMPs).

FIBER—Fundamental unit comprising a textile raw material such as cotton or wool.

FIBERGLASS—A term used to describe a variety of filter media made with glass fibers.

FILTER—A term generally applied to a device used to remove contaminants from the air. A filter may be one of a number of types, such as panel, automatic self-renewable, extended surface, HEPA, electrostatic, or gas phase. The term filter is sometimes erroneously used to describe the media used inside the device.

FILTER MEDIUM—The porous material mounted in the filter through which air is passed to remove the contaminants.

FILTRATION—The process of removing contaminants from liquid or gas by forcing them through a porous medium.

FINAL FILTER—The last and usually most efficient filter in a multi-stage filtration system.

FPM—Feet Per Minute. This term refers to the speed at which air moves through an area.

FRESH AIR—Term used for outdoor air.

GAS—The state of matter in which molecules move freely, causing matter to expand indefinitely, occupying the total volume available.

GAS-PHASE FILTER—Air cleaning device that uses the adsorption and/or chemisorption removal process. Typical filter mediums are activated carbon, alumina, and zeolite, with and without chemical impregnants.

GASKET—Material inserted between contact surfaces of a joint to ensure a seal.

HEPA FILTER—High Efficiency Particulate Air filter, which is capable of removing a minimum of 99.97% of 0.3 micron particles (typically PAO) of other gases from air.

HYDROCARBON—Any one of a large number of compounds composed primarily of the elements carbon and hydrogen. As they increase in molecular weight and boiling point, these compounds may be respectively gases, liquids, or solids.

HYDROPHILIC—Water accepting, or water wetting. Having an affinity for water, the opposite of hydrophobic.

HYDROPHOBIC—Non-water wetting. Having an antagonism for water, the opposite of hydrophilic.

IEST—Institute of Environmental Sciences and Technology, whose mission is “To globally expand and communicate the knowledge of contamination control, nanotechnology facilities, and test reliability. This is accomplished through the development of Recommended Practices and Standards by a community dedicated to professional collaboration, training, and education.”

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Filter Industry Definitions

IMPINGEMENT—A method of filtration that is effective on particles with sufficient inertia to cause them to leave the airstream and collide with a fiber. Often referred to as “viscous impingement,” when the fibers are coated with an adhesive.

INCHES W.G.—Abbreviation for “inches water column gauge.” This is a method of reporting filter resistance (or pressure drop) across a filter.

INFILTRATION—Inward air leakage from a space through openings, caused by pressure differences across these openings.

INITIAL RESISTANCE—Differential pressure (drop) across a clean filter, typically measured in inches of water column (water gauge) or pascals. Synonymous with initial pressure drop, or clean pressure drop.

INTERCEPTION—A special case of the impingement method of filtration that does not depend on the inertia of the particles to bring them in contact with a fiber. Interception occurs when a particle follows the airstream but touches a fiber as it attempts to flow around it. The particle is held by the inherent adhesive forces between the particle and fiber (van der Waals force).

INTERSTICES—Spaces or openings in a medium, such as the spaces between intersecting fibers. Also referred to as pores or voids.

KNIFE-EDGE SEAL—A narrow, pointed ridge on the peripheral sealing surface of a filter or filter frame, which provides a seal by the impression of a sharp edge into a gasket or gel.

LAMINAR AIRFLOW—Airflow in parallel flow lines with uniform velocity and minimum eddies.

LAMINAR FLOW CLEANROOM—A cleanroom with a requirement for laminar airflow. Airflow velocities are usually not greater than 90 FPM.

LIFE EXPECTANCY—The service life or change-out interval of a filter cartridge. Even with known dust holding capacity, the useful life will vary according to the type and size of contaminants entering the filter, particularly on makeup air or 100% outside air systems.

LIFE CYCLE COSTS (FILTER)—Sum of all costs associated with operating a filter system, including product, energy, labor, transportation, and disposal costs.

MAKEUP AIR—Outside air introduced to the HVAC system for ventilation, pressurization, or to replace exhausted air quantities.

MASS TRANSFER ZONE—Area of the adsorbent bed where contaminants are removed from the airstream. The mass transfer zone will move away from the inlet of the bed to the discharge until breakthrough occurs (end of useful life of the medium).

MAXIMUM DIFFERENTIAL PRESSURE—The highest pressure differential which a filter is required to withstand without structural failure or collapse.

MAXIMUM RECOMMENDED PRESSURE DROP—

Published final pressure drop by manufacturer.

MEDIA—Plural of medium. This is the material that performs the actual separation of contaminants from the air stream.

MEDIA VELOCITY—Speed of the air flowing perpendicular to the media, calculated by dividing the total airflow through a filter by the effective media area.

MEDIUM—The porous material through which air is passed to remove contaminants (particulates or gases). It is usually confined within a frame or cell sides and is generally referred to as a filter or filter cartridge.

MERV—Minimum Efficiency Reporting Value is a single number that is used, along with the air velocity at which the test was performed, to simplify the extensive data generated by the ASHRAE Standard 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size. MERV is expressed on a 16 point scale (MERV 1 through MERV 16) and is derived from the particle size removal efficiency measured in the test.

MICRON OR MICROMETER—A unit of length in the metric system. This term means one millionth of a meter, 10^{-4} centimeter, 10^{-3} millimeter, or 0.000039 of one inch. It is commonly used as a measure of particle size or fiber size in filter media. The naked eye can see a particle approximately 10 microns or larger without magnification.

MICROORGANISMS—Living bodies that can be seen only through a microscope.

MIGRATION—Contaminant captured and subsequently released downstream of a filter.

MILLILITER—One thousandth of a liter, equal to one cubic centimeter.

NET EFFECTIVE MEDIA AREA—The amount of media area in a filter that is exposed to airflow and usable for collecting airborne contaminants. The opposite of blind spots or dead area, this term is synonymous with net effective filtering area.

NEGATIVE PRESSURE—Vacuum or suction.

NON-LAMINAR—As applied to cleanroom airflow, this is less desirable than laminar flow because the air supply is introduced at random, causing turbulence and induction that stir the airborne dust particles and keep them in suspension.

NONWOVEN—A filter cloth or paper that is formed of synthetic fibers that are randomly oriented in the media. It is usually held together with a binder or binder fibers.

NON-SUPPORTED FILTERS—Extended-area filters which rely on the airflow to support the media in the airstream. Filters will generally sag or collapse under low or no airflow conditions.

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Filter Industry Definitions

OFF-GASSING—Term used to express the release of a gas from a material that was previously captured by an adsorbent. Preferential off-gassing occurs when an adsorbent releases a lighter molecular weight gas in order to adsorb a heavier molecular weight gas.

ORGANIC—Describes the vast number of chemical substances containing carbon, hydrogen, and oxygen.

OUTDOOR AIR—Ambient air that enters a building through a ventilation system, through intentional openings for natural ventilation, or by infiltration.

OXIDE—Combination of oxygen with another element.

OXIDATION—Any chemical reaction in which a material gives up electrons, as when the material combines with oxygen. Burning is an example of rapid oxidation, while rusting is an example of slow oxidation.

PANEL FILTER—A low efficiency filter, consisting of a flat sheet of media that is usually contained within a cardboard frame. An alternative design has an internal wire frame. Panel filters are typically made with fiberglass or synthetic media and are often referred to as throw-away filters.

PARTICLE COUNT—In a cleanroom, the particulate concentration expressed as particles per cubic foot or particles per cubic meter, by particle size, is used to express the Airborne Particulate Cleanliness Class in accordance with Federal Standard 209E or ISO Standard 14644-1. Depending on the cleanliness class, particles are simultaneously measured from 0.1 micron to 5 microns in size.

PARTICULATE MATTER (PM)—Also known as particle pollution, PM is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

PENETRATION—The leak rate through the filter, penetration is expressed as a percentage based upon a specific particle size. The percentage of penetration is the reciprocal of the percentage of the efficiency. HEPA filters, for example, have a 0.03% maximum penetration on 0.3 micron (μ) particles.

PLEATED FILTER—A type of extended surface filter where the media is folded back and forth to increase the amount of media exposed to the airstream within a given face dimension. Greater filter surface area reduces media velocity and increases the efficiency and dust holding capacity.

PLEATING—In filters with a paper medium or other sheet material, pleating means the folding processes which provide a large surface area within a given volume of filter.

PREFILTER—A filter placed in front of another filter to remove larger, heavier particles. The primary purpose of this is to extend the life of the final filters. Prefilters are highly recommended in systems requiring high efficiency filtration, especially where a high concentration of lint and larger particles are present.

PRESSURE DIFFERENTIAL—Difference in pressure between two points.

PRESSURE DROP—Difference in pressure between two points, generally at the inlet and outlet of a filter. Pressure drop is typically measured in inches of water column (water gauge) or pascals.

PRESSURE, STATIC—The fan-induced pressure that tends to burst or collapse a duct, which is required to move air through a system. Fans must push or pull air to deliver against resistance from duct friction, filters, coils, and other airflow obstructions.

PRESSURE, TOTAL—The combination of static pressure and velocity pressure within a duct.

PRESSURE, VELOCITY—The pressure required to maintain movement of air through a duct.

RESIDENCE TIME—The theoretical time that a contaminant is within the confines of a media bed.

RETENTIVITY—The ability of an adsorbent to resist the desorption of an adsorbate.

SCAN TEST—Technique for disclosing leaks in HEPA and ULPA filters. Tests are performed by introducing a challenge aerosol upstream of the filters and passing the inlet of a sampling probe of an aerosol photometer or discrete particle in a series of parallel, slightly overlapping strokes across the downstream face of the filter (scanning), to detect any leaks.

SCFM—Standard Cubic Feet per Minute. This term refers to airflow that has been corrected to “standardized” conditions of temperature and pressure.

SKIN LOADING—The condition that occurs when collected particles build up on the surface of the media, plugging the spaces between the fibers. This is also known as blocking or surface loading. As a rule, the finer the media, the more susceptible it is to skin loading by “coarse” particles.

SORBENT—A substance that has the property of collecting molecules of another substance by adsorption or absorption.

STATIC TIP—Device used to measure static pressures in ducts or rooms. These devices are frequently installed upstream and downstream of a filter bank and connected to a pressure gauge to measure the pressure differential across the filter bank.

STOKES' LAW—A physical law which approximates the velocity of a particle falling under the action of gravity through a fluid. The particle accelerates until the frictional drag of the fluid just balances the gravitational acceleration, after which it will continue to fall at a constant velocity known as the terminal or free-settling velocity.

STRAINING—A method of filtration that removes larger particles. Straining occurs when a particle is larger than the space between fibers and cannot pass through them.

SULPA FILTER—Super Low Penetrating Air filter with a minimum efficiency of 99.9999% on 0.12 micron (μ) particles.



Filter Industry Definitions

SURFACE AREA—The surface area of an adsorbent is determined by the BET method and is usually expressed in square meters per gram of adsorbent.

TERMINAL HEPA MODULE—A HEPA filter module that is connected to the end of a duct, most often mounted in the ceiling of a cleanroom.

TERMINAL VELOCITY—Steady velocity achieved by a falling particle when gravitational forces are balanced by viscous forces. *See Stokes' Law.*

UL 586—Standard for High-Efficiency, Particulate Air (HEPA) Filter Units. For this standard, filters are tested for efficiency and penetration and undergo a moisture test, heated air test, a low temperature test, and a spot flame test. A UL 586 label can only be applied to HEPA filters whose designs have been proven to meet the requirements of UL 586 test standard and must be tested for efficiency and resistance.

UL 900—Standard for Air Filter Units. Filters that are classified to this standard and bear the UL mark meet the requirements of the test for the amount of smoke generated and the combustibility of the air filter unit. Filters meeting the standard are classified as follows: "Air filter units covered by this standard are classified as those that, when clean, burn moderately when attacked by flame or emit moderate amounts of smoke, or both."

ULPA FILTER—Ultra Low Penetrating Air filter with a minimum efficiency of 99.9995% on 0.12 micron (μm) particles.

UNLOADING—Release downstream of trapped contaminate. This can be due to a change in flow rate, mechanical shock, vibration, excessive pressure build-up, or medium failure.

VAPOR—A substance diffused or suspended in the air, especially one that is normally liquid or solid.

VENTILATION—The movement of air to and from a space by mechanical or natural means, including both the exchange of air to the outside, as well as the circulation of air within a building or space.

VOLATILE ORGANIC COMPOUNDS (VOCs)—Organic chemicals that have a high vapor pressure/low boiling point at ordinary room temperature, which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air. The health effects of VOCs in indoor environments vary, depending on the type and concentration of VOCs, along with the length of time a person is exposed.



Indoor Air Quality (IAQ)

refers to the air quality within and around buildings

and structures, especially as it relates to the health and comfort of building occupants.

Understanding and controlling common pollutants indoors can help reduce your risk of indoor health concerns.



Indoor Air Quality Research

focuses on improving the

techniques used to measure and model emissions of indoor air chemical contaminants present in free-standing structures.

Research is dedicated to investigating various approaches to eliminating mold problems in residence and office buildings.

Source: Environmental Protection Agency (EPA)

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The AAF Advantage

Professional guidance and analysis to reduce spend, decrease risk, and save time

“According to the **EPA**, the most effective audit would include **professional guidance and analysis**”

AAF prides itself on taking a collaborative and consultative approach to help our customers optimize performance, as well as lower their total cost of ownership. We invest the time to help your business get better – not just sell product.

For over 90 years, AAF has been the leading provider and manufacturer of air filtration solutions that help companies to create superior air quality and better manage their HVAC Systems. Our outcome is to provide you the highest quality air filtration solutions, while minimizing your total life cycle costs.

We do this by taking a true consultative and technical approach to understanding your complete air filtration needs, applications, and goals for total air quality. Our mission is to match our core skill sets and products to help you protect your environment, reduce your overall risk, and optimize your filter related spending.

Companies turn to AAF because they demand:

- Well-designed systems
- Professional and prompt technical support
- Collaboration, consultation, and superior communication
- Exemplary customer service providing accurate, timely answers
- Superior product performance with greater reliability
- The best life cycle cost with optimum performance
- Expert, education-based alternatives for improvement
- Rapid response times on drawings, specifications, and proposals
- Buy-in/information sharing across the entire customer organization

Choosing AAF ensures:

- Lowest total cost of ownership and minimal overall life cycle costs
- Trusted advisors to support and improve overall energy efficiency
- Reduction of risk to process and time spent
- Added value that will help companies stand out among their peers as industry leaders

Independent studies have shown that improving air quality from a mediocre level to a high level may **increase the performance of office work by 5%**



These results imply that the **gains in productivity may exceed the costs** required to implement improvements in air quality

An indoor air quality audit has proven to help companies:

- Avoid hazards
- Save money
- Reduce liability in air quality

Source: International Centre for Indoor Environment and Energy, DTU, Denmark

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Industries

Agriculture and Tobacco

Protect Your Product and Customers

The air inside one of these facilities can contain:

- Mold, spores, pollen
- Milling dust
- Bacteria and byproducts
- Volatile Organic Compounds used in processing agricultural raw materials
- Fumigants



NOTES

Prevention of Cross-Contamination

Filtration is vital in preventing cross-contamination, ensuring consistent and superior quality products and protecting people and process equipment. Cross-contamination can lead to production down time and product loss, both of which impact the yield and profitability of farmers. Having a well-sealed environment is the first step to preventing cross-contamination, and having superior filtration is key to maintaining the integrity of the process.

Toxic Fumigant

A unique niche in the agricultural production arena is tobacco harvesting, storage, drying, and packaging. The types of fumigation, the storage times and limits, and the throughput are very specific for tobacco crops. Methyl bromide is commonly used to fumigate the tobacco product as it is being dried and stored. Since this is a highly toxic fumigant, gaseous contaminant remediation is necessary.

AAF's gas-phase filtration media is ideally suited for remediation of methyl bromide and the other specialized fumigants used in the tobacco industry. Additionally, high efficiency filtration, coupled with antimicrobial treatment, is needed when moving and storing tobacco products.

Optimize Your Environment

Air filtration, as it pertains to the growing and refining of grain and crops, is very important for both particulate and gaseous contaminant remediation. With regard to grains and other agricultural products, particulate filtration is of substantial importance. Air filtration systems in facilities that deal with these products must handle relatively large volumes of air with various sizes of particulates that need to be removed.

A thorough air filter audit of your HVAC systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and liability reduction. By conducting this audit, we strive to understand your current state and advise you on how your facility could perform even better, thereby helping you save money, reduce risk, and save time.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

Source: *Building air quality, a guide for building owners and facility managers*, Environmental Protection Agency, 1991

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Industries

Commercial Buildings

Extensive Studies Show:

- 34% of American workers feel that **poor IAQ had caused them to miss work**
- For every 1,000 workers, **poor IAQ** results in 600 sick days per year
- 56% of commercial maintenance teams actually admit that their **IAQ maintenance is not carried out per IAQ guidelines**



NOTES

Critical Importance of Indoor Air Quality (IAQ)

In commercial office buildings, Indoor Air Quality (IAQ) is a primary concern. IAQ refers to the indoor air breathed in by a building's occupants. The pollution levels in this indoor air can be up to five times higher than outdoor levels, and poor IAQ ranks as one of the top five environmental risks to public health.

The Air Inside These Facilities Can Contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

Optimize Your Environment

Air filtration systems in commercial facilities must handle relatively large volumes of air. Approximately 50% of a building's energy consumption goes to the heating, cooling, and moving of air. In considering the Total Cost of Ownership (TCO), it is important to keep in mind that in order to have a cost-effective building, planning maintenance is an important step in maintaining energy efficiency, minimizing costly downtime, and extending the lifespan of your equipment.

LEED® Accreditation

AAF can assist you in the processes required to earn Leadership in Energy and Environmental Design (LEED) credits. The LEED Green Building Rating System™, administered by the U.S. Green Building Council, is the nationally accepted benchmark for designing and sustaining green buildings.

Proper Air Filtration Strategies Contribute to Four of the Six LEED Credit Categories:

- Energy and Atmosphere (Efficiency)
- Indoor Environmental Quality
- Materials and Resources
- Innovation in Design/Operations

Additional Solutions You May Be Interested In:

For Information on TCO, turn to page 52.

For Information on IAQ, turn to page 4.

For Information on Air Filtration Audit, turn to page 51.

Sources: *The real cost of poor IAQ; The effects of indoor air quality on performance and productivity*, D.P. Wyon, 2004; *The causes and costs of absenteeism in the workplace*, Forbes, 2013; *Perceptions in the U.S. building industry of the benefits and costs of improving indoor air quality*, M. Hamilton et al, 2015

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Industries

Data Centers

Types of Failures

Failures due to particulate and contaminant dust are generally classified as:

- Mechanical effects, including obstruction of cooling airflow, interference of moving or optical parts, and deformation of surfaces.
- Chemical effects, including corrosion of electrical components, due to dust comprised of sulfur and chlorine bearing salts.
- Electrical effects, including impedance changes and electronic circuit conductor bridging.



Critical Importance of Indoor Air Quality (IAQ)

Air quality within data centers is more important today than ever. Data centers have unique requirements and strict regulations, compared to a typical commercial site. Particulate and corrosive gaseous contaminants have become a serious problem for data centers and server rooms. In some cases, corrosion of electronic components has resulted in catastrophic failures of equipment, due to environmental conditions such as low concentrations of corrosive gases. These contaminants enter data centers in a variety of ways, including outdoor ventilation systems, adjacent interior areas, and with individuals entering and exiting the facility or critical areas.

Corrosive Contaminant Risk

Sulfur-bearing gases, such as sulfur dioxide (SO₂) and hydrogen sulfide (H₂S), are the most common gases causing corrosion of electronic equipment. Once introduced in a data center or server room environment, these gaseous contaminants lead to deterioration of copper surfaces and silver solder used on computer circuit boards, leading to intermittent and hard failures. These forms of corrosion can cause failure by either impeding the flow of electricity or forming unintended circuit paths. Elimination of corrosive contaminants is therefore essential in maintaining data center equipment reliability.

Optimize Your Environment

In data centers with air-side economizers, supplemental real-time monitoring, such as AAF's SAAFShield® Technology, is recommended to enable quick reaction to outdoor events that may introduce corrosive gases into data centers. Real-time monitoring is also recommended in data centers with gas-phase filtration air cleaning systems, in order to track the efficiency of the filters.

For data centers with or without air-side economizers that do not fall within the ISA-71.04 severity level G1 for copper and silver corrosion, remediation through gas-phase filtration is recommended. Blowers at air inlets, fitted with particulate and gas-phase filters, can be used to fill the data center with clean air and pressurize it to prevent contaminated outdoor air from leaking into the data center. The air in the data center can be recirculated through gas-phase filters to remove contaminants that are generated within the data center.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

For Information on Corrosion Control, turn to page 55.

NOTES



Industries

Firing Range

Controlling Contaminant Levels

By law, contaminant levels within an indoor firing range facility must be controlled.

- Lead must be limited to a level of 50 ug/m³ averaged over an 8-hour period.
- Carbon monoxide must be controlled to 50 ppm.
- Surveys from the National Institute for Occupational Safety and Health (NIOSH) indicate that the majority of indoor firing ranges operate with air contamination levels far exceeding acceptable standards.



Contaminant Risk

Indoor firing ranges produce large quantities of airborne pollutants, including lead and noxious gases. The most significant potential source of airborne lead at the firing line is caused by the hot flames of burning gunpowder acting on the exposed lead base of a projectile. The metallic lead in the projectile can also become airborne lead particles through heat from friction between the bore of the firearm and an unjacketed lead projectile. Downrange, lead may become airborne from splatter caused by projectiles hitting backstops, floors, walls, or baffles.

In addition, maintenance and/or repair of the backstop or other range equipment may cause settled lead dust to become airborne. Improper cleaning of a range may also cause lead dust to become airborne. Ranges that allow lead dust to accumulate have increased lead exposure risks, since the accumulated dust can become airborne from muzzle blast and/or shooter movement. Concentrations can easily exceed safe levels of exposure to workers and shooters, and failure to comply with the Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) regulations can result in significant fines for range owners.

Optimize Your Environment

The primary purpose of an air filtration system in these facilities is to prevent the build-up of toxic gases (CO₂, CO, NO) and particulates, including lead and other discharge products. The benefits of proper air filtration include:

- Elimination of dangerous air contaminants, resulting in improved quality of life for employees and users alike
- Compliance with EPA and OSHA regulations
- Reduced liability from lawsuits resulting from employee health problems
- Reduced employee absenteeism and disability
- Improved fire range capability

A thorough air filter audit of your HVAC systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and liability reduction. By conducting this audit, we strive to understand your current state and advise you on how your facility could perform even better, thereby helping you save money, reduce risk, and save time.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

NOTES

Source: OSHA Regulations (Standards-29 CFR) Part 1910 Occupational Safety & Health Standards

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Industries

Food & Beverage

Extensive Studies Show:

- Lack of proper air filtration is the **#1 cause of poor IAQ**
- **Government regulation** continues to rapidly **change and increase**
- There are **175,268 pages** on IAQ in the U.S. Code of Federal Regulations
- Indoor pollution levels can be **up to 5 times higher** than outdoor levels (in many cases up to 100 times higher)



Prevention of Cross-Contamination

Within the Food and Beverage manufacturing facility, filtration is vital in preventing cross-contamination, ensuring consistent and superior quality products, and protecting people and process equipment.

Cross-contamination can lead to production down time and product loss, both of which impact the yield and profitability of the food and beverage producer. Having a well-sealed environment is the first step to preventing cross-contamination, and having superior filtration is key to maintaining the integrity of the process.

Protect Your Product and Customers

When any food or beverage producer wants to make a consistent and high quality product, filtration is the line of defense that prevents mold, spores, bacteria, viruses, and other byproducts from entering the manufacturing space. Environmental, health, and safety concerns factor into the equation both inside and outside of a manufacturing space. Both production workers and the outside environment need protection from the types of contamination that could be released into the air.

The Air Inside These Facilities Can Contain:

- Molds, spores, bacteria, or viruses
- Volatile organic compounds (VOCs)
- Malodorous compounds (e.g., vinegar)
- Fine dusts from sugar, flour, and/or other dry ingredients

Optimize Your Environment

AAF is ideally positioned to assess a food and beverage facility for room sealing, filtration efficiency and effectiveness, and for continuous improvement opportunities. Using a collaborative and consultative solutions approach, AAF strives to understand your complete filtration needs and applications, as well as advising you on regulatory requirements for total air quality.

A thorough air filter audit of your HVAC systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and liability reduction. By conducting this audit, we strive to understand your current state and advise you on how your facility could perform even better, thereby helping you save money, reduce risk, and save time.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

NOTES

Sources: *State of the Air 2015*, American Lung Association, 2015; *Database of state indoor air quality laws*, Environmental Law Institute, 2015; *The impact of air pollution on cognitive performance and human capital formation*, Victor Levy et al, 2012

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Industries

Healthcare

Extensive Studies Show:

- Three to four million hospital-acquired infections (HAI) occur annually, with **up to 80,000 fatalities**
- Up to one-third of hospital-acquired infections involve **airborne transmission**
- There are **175,268 pages on IAQ** in the U.S. Code of Federal Regulations
- 56% of commercial maintenance teams actually admit that their **IAQ maintenance is not carried out per IAQ guidelines**
- Lack of proper air filtration is the **#1 cause of poor IAQ**

NOTES

Sources: *Air-treatment systems for controlling hospital-acquired infections*, HPAC Engineering, April 2, 2008; *Database of state indoor air quality laws*, Environmental Law Institute, 2015; *Perceptions in the U.S. building industry of the benefits and costs of improving indoor air quality*, M. Hamilton et al, 2015; *State of the Air 2015*, American Lung Association, 2015



Critical Importance of Indoor Air Quality (IAQ)

Clean air is vital in hospital and healthcare facility operations to protect patients, staff, and visitors from airborne diseases and infections, as well as to provide a comfortable, healthy, and odor-free environment. The Indoor Air Quality (IAQ) in the facility, referring to the air breathed by the building's occupants, is of primary importance because of patients' suppressed immune systems, making them more susceptible to adverse health effects. Poor IAQ ranks as one of the top five environmental risks to public health.

The Air Inside These Facilities Can Contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

Optimize Your Environment

Faced with an influx of potentially contagious patients and their families, it is clearly imperative to reduce risk by removing airborne contaminants generated inside and outside the doors of the facility. In addition to the effects of contaminants on patients and hospital workers, corrosive gases can damage HVAC units, control rooms and electronic instrumentation, diagnostic equipment, X-ray machines, and office equipment.

A thorough air filter audit of your HVAC systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and liability reduction. By conducting this audit, we strive to understand your current state and advise you on how your facility could perform even better, thereby helping you save money, reduce risk, and save time.

Additional Solutions You May Be Interested In:

For Information on IAQ, turn to page 4.

For Information on Air Filtration Audit, turn to page 51.



Industries

Hospitality

Extensive Studies Show:

- In the United States alone, hotels represent more than 5 billion square feet of space, nearly 5 million guest rooms, and close to **\$4 billion in annual energy use**
- 56% of commercial maintenance teams actually admit that their **IAQ maintenance is not carried out per IAQ guidelines**
- Lack of proper air filtration is the **#1 cause of poor IAQ**



Critical Importance of Indoor Air Quality (IAQ)

The hotel guest experience is critical to the highly competitive and ever-changing hospitality industry. Excellent IAQ is a key component of that experience. In a hotel, convention, or casino environment, people spend 80% of their time inside the buildings. The indoor environment is therefore the most fundamental element of service quality. Guests want a healthy and comfortable environment in order to be productive at meetings and enjoy their leisure time, be it in their rooms, in restaurants, or around establishment premises. At the same time, employees need to be able to concentrate to work efficiently. To meet these expectations, good indoor air quality is essential.

The Air Inside These Facilities Can Contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

Optimize Your Environment

Air filtration systems in hotels must handle relatively large volumes of air. Approximately 50% of a building's energy consumption goes to the heating, cooling, and moving of air. In considering the Total Cost of Ownership (TCO), it is important to keep in mind that in order to have a cost-effective building, planning maintenance is an important step in maintaining energy efficiency, minimizing costly downtime, and extending the lifespan of your equipment.

Cost-Efficient Green Building Design

The U.S. Green Building Council (USGBC) works to promote cost-efficient and resource-saving green building design, construction, and operations, with the goal of protecting the global environment and human health. Green buildings use on average 26% less energy, emit 33% less carbon dioxide, use 30% less indoor water, and send 50%-75% less solid waste to landfills and incinerators. The opportunities for hospitality venues to integrate green building strategies into their design, construction, and daily operations makes business sense and can be an important part of a company's commitment to sustainability.

AAF can assist you in the processes required to earn Leadership in Energy and Environmental Design (LEED) credits. The LEED Green Building Rating System™, administered by USGBC, is the nationally accepted benchmark for designing and sustaining green buildings.

Additional Solutions You May Be Interested In:

For Information on IAQ, turn to page 4.

For Information on TCO, turn to page 52.

For Information on Air Filtration Audit, turn to page 51.

NOTES

Sources: LEED & the Hospitality Industry FAQ, www.usgbc.org/hospitality; *Perceptions in the U.S. building industry of the benefits and costs of improving indoor air quality*, M. Hamilton et al, 2015; *State of the Air 2015*, American Lung Association, 2015; *CHP in the Hotel & Casino Market Sectors*, U.S. Environmental Protection Agency CHP Partnership, December 2005; *Assessing Green Building Performance*, GSA Public Buildings Service



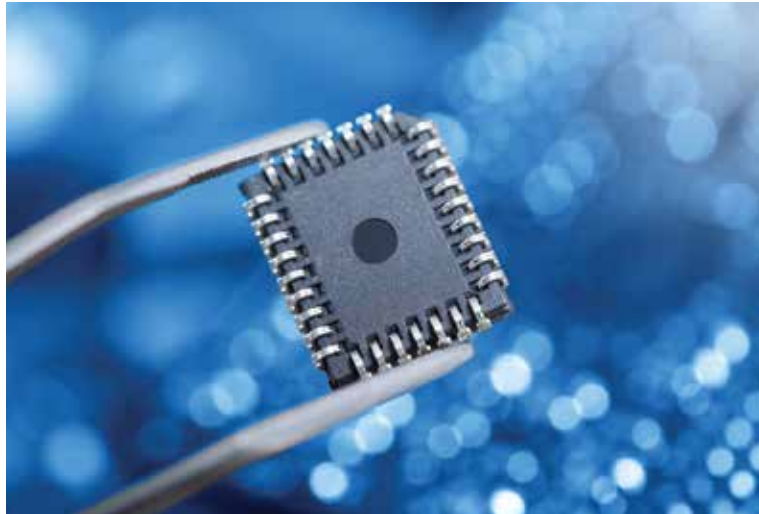
Industries

Microelectronics

Types of Failures

Failures due to airborne molecular contamination (AMC) are classified as:

- Mechanical effects, which include obstruction of cooling airflow, interference of moving or optical parts, and deformation of surfaces.
- Chemical effects, which include corrosion of electrical components, due to dust comprised of sulfur and chlorine-bearing salts.
- Electrical effects, which include impedance changes and electronic circuit conductor bridging.



Critical Importance of Indoor Air Quality (IAQ)

Air quality within high-yield, low-reject semiconductor manufacturing facilities is more important than ever. Particulate and corrosive gaseous contaminants have become a serious problem in these facilities. Contaminants enter the facilities in a variety of ways, including outdoor ventilation systems, adjacent interior areas, and with individuals entering and exiting.

Corrosive Contaminant Risk

Sulfur-bearing gases, such as sulfur dioxide (SO₂) and hydrogen sulfide (H₂S), are the most common gases causing corrosion of electronic equipment. Once introduced in a data center or server room environment, these gaseous contaminants lead to deterioration of copper surfaces and silver solder used on computer circuit boards, leading to intermittent and hard failures. These forms of corrosion can cause failure by either impeding the flow of electricity or forming unintended circuit paths. Elimination of corrosive contaminants is therefore essential in maintaining data center equipment reliability.

Optimize Your Environment

Supplemental real-time monitoring, such as AAF's SAAFShield® Technology, is recommended to enable quick reaction to outdoor events that may introduce corrosive gases into the manufacturing facility. Real-time monitoring is also recommended, in order to track the efficiency of the filters.

Gas-phase filtration is also recommended for these facilities. Blowers at air inlets, fitted with particulate and gas-phase filters, can be used to fill the facility with clean air and pressurize it to prevent contaminated outdoor air from leaking inside. The air in the facility can be recirculated through gas-phase filters to remove contaminants that are generated within.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Corrosion Control, turn to page 55.

For Information on Air Filtration Audit, turn to page 51.

NOTES



Industries

Museums and Historic Storage

Damage To Artifacts and Artwork Can Be Caused By:

- Uncontrolled temperature
- Relative humidity
- Dust and dirt
- Gaseous pollutants, such as ozone and sulfur dioxide

NOTES

**Protecting Precious and Priceless Objects**

Controlling airborne pollutants and gaseous contaminants is fundamental to protecting priceless collections of artifacts, national historical assets and documents, artwork, and literature. In preservation environments, Indoor Air Quality (IAQ) is therefore a primary concern. The pollution levels in this indoor air can be up to five times higher than outdoor levels, and in some cases 100 times higher.

Temperature and humidity, if not controlled properly, speed up the rate of chemical reactions that cause deterioration of sensitive objects. Dust and dirt contamination cause artifacts to discolor. Gaseous pollutants may cause significant and irreversible deterioration of artifacts, metals, historic records, photographs, and marble, through chemical reactions. Poor Indoor Air Quality (IAQ) can also have adverse health effects on employees and visitors.

Optimize Your Environment

Using SAAF™ Tech Tools, AAF experts can enter application specific data or select from a list of predefined applications to configure the exact clean air solution required. Detailed information on contaminants, adsorbers, oxidants, and links to industry information relevant to specific applications is also readily available.

All tests are carried out and correlated to applicable industry standards. The following evaluations are performed to target specific contaminants and provide recommendations and product solutions:

- Particulate contamination assessments
- Gaseous contaminant assessments
- Humidity assessments
- Product life-cycle assessments
- Room integrity verification
- Sealing and HVAC circuit checks

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

Source: *The impact of air pollution on cognitive performance and human capital formation, Victor Levy et al, 2012*



Industries

Pharmaceutical

Extensive Studies Show:

- Lack of proper air filtration is the **#1 cause of poor IAQ**
- Up to **65% of energy spending** at a pharma facility is related to moving air
- There are **175,268 pages on IAQ** in the U.S. Code of Federal Regulations

NOTES



Critical Importance of Indoor Air Quality (IAQ)

Within the pharmaceutical industry, strict requirements on air purity levels are necessary because of the direct effect that airborne contamination has on the quality of the pharmaceutical products. Anything that could come into direct contact with a pharmaceutical product is a potential risk toward contamination. Especially for aseptically prepared parenteral medicine (such as injectables and infusions), no contamination can be allowed, otherwise severe harm or life-threatening health risks to the patient can result.

The Air Inside These Facilities Can Contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

Balancing High Level Protection With Total Cost of Ownership

No clean air is possible without a carefully selected and reliably functioning air filtration system. The performance of installed air filters, whether terminal filters or prefilters, directly determines how effectively harmful contaminants are prevented from entering the airstream in process environments. However, if the air filter selection process does not also consider the lifetime operating costs of a given product, facilities could be exposed to unnecessary risks and expenses.

Air in critical areas should always be supplied at the terminal stage by HEPA filtered unidirectional airflow, preceded by sequential prefiltration steps. Leak-free and high filtration efficiency performance of the HEPA filter is vital for ensuring that air purity is optimized, the pressure differentials between rooms are met, and healthy working conditions are achieved.

Additional Solutions You May Be Interested In:

For Information on TCO, turn to page 52.

For Information on IAQ, turn to page 4.

For Information on Air Filtration Audit, turn to page 51.

For information on MEGAcel® II, turn to page 118.

Sources: *State of the Air 2015*, American Lung Association, 2015; *Database of state indoor air quality laws*, Environmental Law Institute, 2015

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Industries

Pulp & Paper

There Are Several Ways a Plant Can Produce Pulp:

The four primary processes employed in the U.S. and Canada are:

1. Kraft (a chemical process)
2. Sulfite (a chemical process)
3. Mechanical
4. Thermomechanical



NOTES

Contaminant Risk

The primary source for gaseous contamination in pulp and paper mills is the pulping process. In the Kraft pulping process, highly malodorous emissions of reduced sulfur compounds are produced. These compounds are measured as total reduced sulfur (TRS) and include hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. These sulfur compounds are often described as smelling like rotten cabbage. In the sulfite pulping process, sulfur oxides are also emitted in fairly significant concentrations. Other pulping processes, such as the mechanical and thermomechanical methods, generate significantly lower quantities of air emissions.

In addition, steam and electricity-generating units using coal or fuel oil emit fly ash, sulfur oxides, and nitrogen oxides. A secondary source of corrosive gases in the pulping process is during the bleaching step. These bleaching chemicals, which often include lime, are caustic and cause corrosion to occur.

Optimize Your Environment

For particulate filtration, dust collectors (wet and dry), bag houses, and several stages of HVAC-type air filtration products are employed to help keep the wood fiber and associated dust to a minimum. Ensuring that this dust is removed is extremely important to both the paper quality and the maintenance of the pulping equipment and paper production machines.

At a minimum, protection of the control room includes pressurization with purified air. This prevents corrosive gases from infiltrating the control room and causing corrosion problems. Additionally, recirculation air may require cleaning, if the room is a high traffic area or there are other internal sources of contaminants.

Supplemental real-time monitoring, such as AAF's SAAFShield® Technology, is recommended to enable quick reaction to outdoor events that may introduce corrosive gases into control rooms, and to monitor odors.

A thorough air filter audit of your HVAC systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and liability reduction. By conducting this audit, we strive to understand your current state and advise you on how your facility could perform even better, thereby helping you save money, reduce risk, and save time.

Additional Solutions You May Be Interested In:

For Information on Odor Control, turn to page 54.

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.



Industries

Refineries

Types of Failures

Failures due to particulate and contaminant dust are generally classified as:

- Mechanical effects, including obstruction of cooling airflow, interference of moving or optical parts, and deformation of surfaces.
- Chemical effects, including corrosion of electrical components, due to dust comprised of sulfur and chlorine bearing salts.
- Electrical effects, including impedance changes and electronic circuit conductor bridging.

NOTES



Critical Importance of Air Quality

Control rooms are utilized by large-scale refineries to monitor and control plant operations. The control room and network of control equipment are essential to plant operation and enable these facilities to maintain the highest efficiency possible. If the control room malfunctions, it can cost a plant tens of thousands of dollars per hour.

Particulate and corrosive gaseous contaminants have become a serious problem for these control rooms, sometimes resulting in catastrophic failures of equipment. These contaminants enter the control rooms in a variety of ways, including outdoor ventilation systems, adjacent interior areas, and with individuals entering and exiting the room.

Corrosive Contaminant Risk

Sulfur-bearing gases, such as sulfur dioxide (SO₂) and hydrogen sulfide (H₂S), are the most common gases causing corrosion of electronic equipment. Once introduced into a control room, these gaseous contaminants lead to deterioration of copper surfaces and silver solder used on computer circuit boards, leading to intermittent and hard failures. These forms of corrosion can cause failure by impeding the flow of electricity. Elimination of corrosive contaminants is therefore essential in maintaining data center equipment reliability.

In response to these problems, ISA (Instrumentation, Systems, and Automation Society) developed a standard to classify control rooms and process control environments – ISA 71.04. Most equipment manufacturers require that the control room environment meet the ISA G1 - Mild classification to maintain a reliable communication network in industrial environments.

Optimize Your Environment

Protection of an industrial control room includes at a minimum pressurization with purified air. This prevents corrosive gases from infiltrating the control room and causing corrosion problems. Additionally, recirculation air may require cleaning if the room is a high traffic area or there are other internal sources of contaminants.

Supplemental real-time monitoring, such as AAF's SAAFShield® Technology, is recommended to enable quick reaction to outdoor events that may introduce corrosive gases into control rooms. Real-time monitoring is also recommended in control rooms with gas-phase filtration air cleaning systems, in order to track the efficiency of the filters.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.



Industries

Schools and Universities

Extensive Studies Show:

- Students attending schools with poor indoor air quality score **11% lower on standardized tests** than those students attending schools in good condition, according to the U.S. Department of Education's Office of Education Research and Improvement
- A third or more of U.S. schools have **mold, dust, and other indoor air problems** serious enough to provoke respiratory issues like asthma in students and teachers
- An average of one out of every 10 school-age children has asthma, which is a **leading cause of school absenteeism**
- The economic cost of asthma amounts to more than **\$56 billion annually**, including direct medical costs from hospital stays and indirect costs (e.g. lost school and work days)



Critical Importance of Indoor Air Quality (IAQ)

IAQ is a primary concern for both schools and universities, due in part to the age and overall condition of a number of educational buildings. In 2014, the National Center for Education Statistics surveyed a sample of school districts and estimated that the average age of the nation's main school buildings was 55 years old. Additionally, nearly one-fourth of the nation's schools have one or more buildings in need of extensive repair or replacement, and nearly half have been reported to have problems related to IAQ. Students spend more than 1,300 hours in a school building each year and need to be protected.

The Air Inside These Facilities Can Contain:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

The health and comfort of students and teachers are among the many factors that contribute to learning and productivity in the classroom, which in turn affect performance and achievement. In addition, failure to respond promptly and effectively to poor indoor air quality in schools can lead to an increase in long-term health problems, costly repairs, and potential liability problems.

Optimize Your Environment

Quality air filtration system design, operation, and maintenance are critical for providing clean and healthy IAQ in schools. Properly functioning filtration systems clean the air of dirt, dust, pollen, dander, fibers, control odors, and reduce the pollutants that cause most IAQ problems inside school buildings. In addition to improving occupant health and performance, regular HVAC maintenance also saves energy.

Additional Solutions You May Be Interested In:

For Information on IAQ, turn to page 4.

For Information on TCO, turn to page 52.

For Information on Air Filtration Audit, turn to page 51.

NOTES

Sources: *Creating healthy indoor air quality in schools*, U.S. Environmental Protection Agency, www2.epa.gov/iaq-schools; *Asthma Facts*, U.S. Environmental Protection Agency, Indoor Environments Division, Office of Air and Radiation, August, 2015



Industries

Transportation

Poor Intake Air Quality Can:

- Reduce engine performance
- Create higher fuel consumption
- Increase exhaust fumes

NOTES

**Corrosive Contaminant Risk**

For diesel engines, contaminants and particulates in the air such as fumes, dust, and smog can lead to severe damage of engine components. The air that these engines “breathe” needs to be as clean as possible. Poor intake air quality can reduce engine performance, create higher fuel consumption, and increase exhaust fumes.

Optimize Your Environment

Constructed from two layers of glass fiber media, AAF’s AMERKleen™ filter provides an extremely high dust holding capacity, allowing it to remain in service longer than most other intake air filters. With this long service life, low resistance, and high filtration efficiency, the AMERKleen filter provides an excellent filtration solution for the scheduled engine maintenance cycle. This results in extended engine life and reduced life cycle costs.

AAF is one of a few producers of this nonflammable glass fiber media, as well as the prime supplier of the AmerKleen cartridge housing.

**Additional Products & Solutions You May Be Interested In:**

For Information on AMERKleen M80 pads, turn to page 58.

For Information on PerfectPleat® HC M8, turn to page 76.

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Industries

Wastewater Treatment

Corrosive Contaminant Risk

Hydrogen sulfide is potentially dangerous at high concentrations. Electronic corrosion at these plants can occur when corrosive, acidic gases attack sensitive computer controls and other critical electronics that affect the reliability of plant processes.

If Not Controlled, Corrosion Leads To:

- Blocked currents
- Brittle connection points
- Overheated systems
- Costly repairs
- Failed boards
- Plant downtime
- Reduced production efficiency in compressed air systems and increased maintenance costs

**Critical Importance of Air Quality**

Control rooms are utilized by large-scale wastewater treatment plants to monitor and control plant operations. The control room and network of control equipment are essential to plant operation and enable these plants to maintain the highest efficiency possible. If the control room malfunctions, it can cost a plant tens of thousands of dollars per hour.

Particulate and corrosive gaseous contaminants have become a serious problem for these control rooms, sometimes resulting in catastrophic failures of equipment. These contaminants enter the control rooms in a variety of ways, including outdoor ventilation systems, adjacent interior areas, and with individuals entering and exiting the room.

Dangerous Odors

Industrial wastewater treatment generates odors that can be strong, persistent, and a nuisance to employees, residents, businesses, and industries located near the wastewater treatment plant. Strong odors develop at several areas within a wastewater treatment facility, such as headworks, primary clarifiers, pump stations, and sewage sludge areas. Nuisance odors often emerge from the following sources: combined sewer overflow (BTEX, TCE, and other VOCs); industrial sewage (benzene, industrial chemical effluents such as amines, and other VOCs); residential sewage (ammonia, hydrogen sulfide, and mercaptans).

Optimize Your Environment

At a minimum, protection of an industrial control room includes pressurization with purified air. This prevents corrosive gases from infiltrating the control room and causing corrosion problems. Additionally, recirculation air may require cleaning if the room is a high traffic area or there are other internal sources of contaminants.

Supplemental real-time monitoring, such as AAF's SAAFShield® Technology, is recommended to enable quick reaction to outdoor events that may introduce corrosive gases into control rooms, and to monitor odors.

Additional Solutions You May Be Interested In:

For Information on Gas-Phase Environmental, Analytical, and Design Services, turn to page 53.

For Information on Air Filtration Audit, turn to page 51.

NOTES



Solutions

Air Filtration Audit

Extensive Studies Show:

- 34% of American workers feel that **poor IAQ had caused them to miss work**
- 50% or more of **energy spending** is related to moving air
- 80% of Americans rate clean air as a **very important priority** – up from 75% in 2012
- 88% of facility managers say that **deferred maintenance is an issue at their facility**
- The system most affected by deferred maintenance is **HVAC**
- There are **175,268 pages on IAQ** in the U.S. Code of Federal Regulations
- 56% of commercial maintenance teams *actually admit that their IAQ maintenance is not carried out per IAQ guidelines*



Importance of Air Filtration

Air filtration and maintaining proper Indoor Air Quality (IAQ) levels are only a couple of the many different operational functions that companies are responsible for. However, the significant impact of air filter related decisions are often dangerously overlooked. They are also top of mind issues to the general public.

Considering the above, it is essential that Executives and Facility Management teams have a trusted advisor to support them in the optimal selection and operation of their air filtration systems.

Many Companies Turn to AAF Because They Are:

- Worried that their systems are not designed as well as they could be
- Concerned about compliance risks
- Frustrated by a lack of education and collaboration from their current suppliers
- Worried that their Total Cost of Ownership (TCO) might be higher than it needs to be and want a second opinion
- Concerned about productivity and absenteeism issues caused by poor IAQ

Have Similar Concerns? Here is Where We Can Start:

A thorough air filter audit of your HVAC Systems is the first step that AAF takes, in order to provide you with professional guidance and analysis for cost savings and risk reduction. By conducting this audit, we will be able to understand exactly how you compare to the best practices of companies that are similar to you. We strive to understand your current state and identify how you can perform even better.

Our mission is to help you to protect your environment, reduce your business risk, and optimize your clean air related spending. We will always strive to invest our time and expertise to help you improve your business, not just to sell you a product.

5 Benefits You Will Receive From an Air Filter Audit:

1. Analysis of your current state by a team of industry experts
2. Professional guidance and analysis to reduce spend, decrease risk, and save time
3. Valuable and detailed benchmark data
4. Life cycle cost report which will show you where you could be performing even better
5. A standardized list of filters by air handler unit (AHU) and application

While the value of this audit is worth thousands of dollars, it is currently being offered at no charge and could give you significant benefits by helping you save money, reduce risk, and gain time.

NOTES

Sources: *The real cost of poor IAQ*; Gallup Environmental Poll, Gallup, 2015; *Deferred Maintenance*, Facilities.net, 2015; *Database of state indoor air quality laws*, Environmental Law Institute, 2015; *Perceptions in the U.S. building industry of the benefits and costs of improving indoor air quality*, M. Hamilton et al, 2015

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Solutions

Optimizing Total Cost of Ownership

Extensive Studies Show:

- Approximately **50% of a building's energy consumption** goes to the heating, cooling, and moving of air
- 15% - 40% of the **lifetime ownership cost of an air handler unit (AHU)** is directly attributable to the air filters selected
- 34% of American workers feel that **poor IAQ had caused them to miss work**
- For every 1,000 workers, **poor IAQ results in 600 sick days per year**
- 90% of **employees admit to working while feeling unwell**
- Facilities with poor IAQ can expect an overall **daily productivity drop** of around 9% with individual losses **up to 33%**
- Only **0.006"** of surface debris can result in a **16% efficiency loss** for HVAC coils
- Up to **37% more energy is consumed** by AHUs with **dirty coils** vs. clean coils
- There are **175,268 pages** on IAQ in the U.S. Code of Federal Regulations
- 56% of commercial maintenance teams **actually admit** that their **IAQ maintenance is not carried out per IAQ guidelines**



Most Accurate Basis for Determining Value

Total Cost of Ownership (TCO) is a term used to quantify the cost of a purchase across the product's entire lifecycle. Therefore, it offers a more accurate basis for determining the value – Cost vs. ROI – of an investment in air filters and their installation, rather than just considering the purchase price alone. The overall TCO includes direct and indirect expenses, as well as some intangible ones that can have monetary values assigned to them.

The Direct and Indirect Factors Impacting Air Filter TCO Include:

- Energy costs
- Filter resistance
- Effective filter service life (DHC)
- Labor costs to change filters
- Disposal costs
- Cost of the filter
- Worker productivity costs
- Employee and student attentiveness
- Procurement activity costs
- Duct cleaning frequency costs
- AC Coil cleaning frequency costs
- Compliance risk and liability costs

Executives and Facility Management teams need the support of a trusted advisor who can perform Air Filtration Audits and Diagnostics to ensure that the most optimal effective solution is selected and installed in their air filtration systems.

Many Companies Choose AAF's Expertise in TCO Evaluations Because They Value AAF's:

- Technical approach to problem solving
- TCO simulation programs that factor in energy costs, filter costs, maintenance costs, etc.
- Broad range of good, better, best filters in all categories which ensures that the optimal filter is selected for each application
- Factory trained and direct employees who can perform Air Filtration Audits to ensure that the optimal solution is selected and confirm its performance

Worried That Your Total Cost of Ownership Isn't Optimized?

Here is How We Can Help

The purpose of our TCO Diagnostic is to assist you with selection of the best filters for your air handling systems and to understand their sensitivity to operating conditions, in order that you operate your system in the most optimal and effective manner. The resulting TCO Diagnostic report will include additional financial information, such as payback and ROI based on the factors mentioned above.

While the findings from our TCO Diagnostic could save you a significant amount of money, it is currently being offered as a complimentary service to you. The process begins with a simple conversation between you and one of our factory trained representatives.

Sources: Department of Energy, 2006 Buildings Energy Data Book; The real cost of poor IAQ; The effects of indoor air quality on performance and productivity, D.P. Wyon, 2004; 90 percent of people show up to work sick, Staples Employee Study, 2013

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Solutions

Gas-Phase Environmental, Analytical, and Design Services

**SAAF™ Chemical Media
Remaining Life Analysis (RLA)**

SAAF Remaining Life Analysis (RLA) measures chemical media properties to help facilities predict remaining life, replacement schedules, and inventory requirements.

Engineers and end users often ask, "How long will the media last?" or "How frequently should the media be changed?" The answer depends on the application and the gas concentrations in the environment. Various tools can help answer these questions, ranging from air measurements to occupant surveys. AAF recommends Remaining Life Analysis (RLA) for standard SAAF media. RLA assists customers in estimating remaining media life, confirming media activity, optimizing media selection, and controlling costs with timely media replacement.

Gas-phase filtration media include a wide range of materials. Virgin activated carbon, impregnated carbon, and impregnated alumina are the most common. The life of each media depends on multiple factors, such as particle size, activity level, contaminant concentrations, operating temperature, operating RH, time of operation, minimum allowable breakthrough, type of impregnant, and percent impregnation. AAF estimates the impact of these factors on media life by comparing used media properties to those of fresh media.

For each analyzed sample, AAF produces a Remaining Life Analysis Report. The report contains the installation and equipment information, an explanation of the results, recommendations, and a summary table. This data can be logged over time to analyze the RLA trend of a system.

**SAAFShield® Technology - Detecting Unit (DU),
Reading Unit (RU), Communications Module (CM)**

The SAAFShield Technology products work together as a real-time reactivity monitoring system. The information they provide helps facilities avoid the costly consequences of electronic equipment corrosion (failures of data servers, control room equipment, or other critical microelectronics).

The SAAFShield Detecting Unit works together with either the SAAFShield Reading Unit or the SAAFShield Communications Module to display and trend corrosion data over time. The Detecting Unit is the sensing side of the technology. The Detecting Unit is non-powered, providing a low-cost option that can be easily deployed at multiple locations and read periodically with the Reading Unit. Alternatively, constant trending of corrosion rates is possible when connected with a Reading Unit or Communications Module. The Reading Unit can log data on a USB drive to be graphed through the SAAFShield website. The Communications Module transmits data to building management software through a 4-20 mA signal, allowing for facility-wide monitoring.

**SAAF™ Reactivity Monitoring Coupons (RMCs)**

The SAAF Reactivity Monitoring Coupons (RMC's) provide information on the average air reactivity over 30 days. The information they provide helps facilities evaluate area or room conditions in relation to air reactivity and take any needed action to protect their electronics, equipment, processes, artifacts, and historic assets.

RMCs determine environment reactivity through exposure in the environment and subsequent lab analysis. This technology is used to investigate the condition of control rooms or other protected environments housing electronic equipment in industrial facilities, such as pulp and paper mills, petrochemical refineries, and chemical plants. RMCs are also used to investigate the condition of facilities such as data centers, museums and archives, and microelectronic production or storage areas. Additionally, mechanical equipment such as compressors can be affected by reactive gases in the air and can be evaluated with RMCs. Various standards and classification schemes correlate corrosion film amounts to reactivity classifications. Therefore, AAF offers RMC reports in four different formats, each reflecting a different scale for characterizing the overall reactivity level.

SAAF™ Tech Tools

SAAF Tech Tools is a decision-sciences software for configuring clean air products to remove airborne gaseous contaminants. Using SAAF Tech Tools, AAF experts can enter application specific data or select from a list of predefined applications to configure the exact clean air solution required for our customers. Detailed information on contaminants, adsorbers, oxidants, and links to industry information relevant to specific applications is also readily available.

AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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AAF[®]
INTERNATIONAL
BETTER AIR IS OUR BUSINESS[®]

Solutions

Odor Control

Odor Control

Odor control is a significant environmental concern for many types of industries and businesses, including wastewater treatment facilities, nursing homes, hospitals, restaurants, and airports. Industrial wastewater treatment generates odors that can be strong, persistent, and a nuisance to employees, residents, businesses, and industries located near the wastewater treatment plant. Because of the increasing intricacy and massive amount of chemicals used by industries worldwide, odor control is constantly evolving. Hospitals deal with odors from helicopters, as well as waste, which is an issue for nursing homes as well. Aircraft emissions, passenger vehicles, and airport services contribute significantly to the abundance of vaporous pollutants and unpleasant odors found in terminals and control towers. Restaurants must contend with kitchen exhaust and garbage odors.

As one of the world's largest manufacturers of commercial and industrial air filters, AAF makes a wide variety of products for removing and controlling airborne particulates and gaseous contaminants. Because the need for clean air is universal, AAF designs air filter products for use in all types of air filtration systems, regardless of the original manufacturer. The scope of applications is unlimited and ranges from ultra-clean air for electronics and pharmaceutical manufacturing, to preventing the spread of infection in hospitals, to removing odors and harmful gases in occupied spaces. Our team of highly skilled gas-phase professionals, combined with extensive particulate filtration experience, makes AAF uniquely qualified to design total air filtration solutions.

SAAF™ Solutions

AAF has assumed an industry-leading position with the development of its innovative SAAF™ (pronounced as "SAFE") product line, designed to reduce or eliminate harmful gaseous contaminants. In combination with our expertise in airborne particulate filtration, SAAF™ products and solutions allow us to develop unique and effective total filtration solutions to protect people, processes, and equipment.



The SAAF™ product line features:

- Patent-pending chemical media cassettes with superior sealing and energy savings. These cassettes also fit in most legacy units. The housings are designed for quiet operation and durability.
- Complete chemical media line - adsorbents, oxidants, and blends configured by and produced under the supervision of our world-class global research and development teams.
- Environmental measurements related to the ISA Standard S71.04: "Environmental Conditions for Process Measurement and Control Systems. Airborne Contaminants to determine types of contaminants and their relative concentrations."
- RoHS compliant Corrosion Control (ASHRAE TC 9.9 Guideline).
- Comprehensive, industry-leading software — SAAF™ Tech Tools analyzes applications, develops solutions, configures equipment and media, and delivers a complete technical proposal.

No other company offers this combination of experience, expertise, innovation, and capability to combat airborne contaminants, particulate and/or gaseous, and deliver the best clean air solutions.

AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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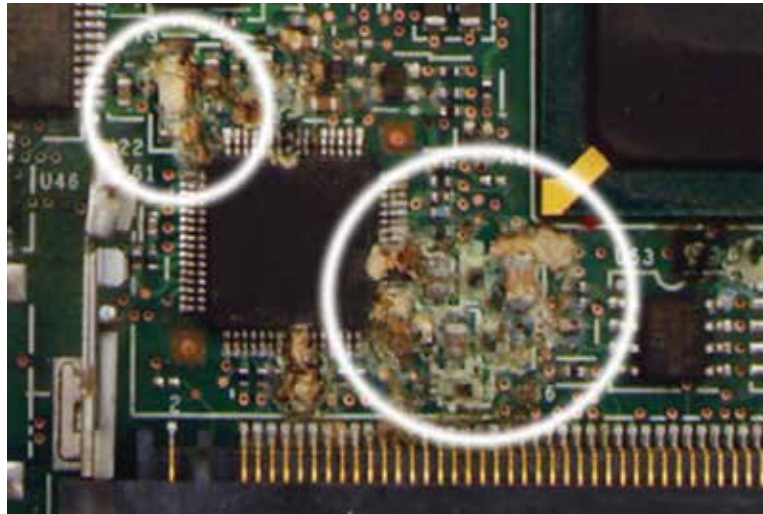


AAF[®]
INTERNATIONAL
BETTER AIR IS OUR BUSINESS[®]

Solutions

Corrosion Control

NOTES



Corrosion Control

Corrosion of electronic equipment can occur when corrosive gases, such as hydrogen sulfide, attack sensitive computer controls and other critical electronics. These gases attack edge connectors, pin connectors, IC plug-in sockets, wire-wrap connections, and other microelectronic components. If corrosive gases are not controlled, their presence leads to blocked currents, brittle connection points, and overheated systems. The results can be failed circuit boards, costly repairs, and ultimately plant downtime.

AAF International understands the need to provide gas-phase and particulate filtration systems for process control environments. Employing such systems can:

- Eliminate process shutdown due to control equipment failures
- Maintain high process efficiency
- Extend circuit board life and reduce replacement cost


SAAF™ Solutions

Protection of an industrial control room includes, at a minimum, pressurization with purified air. This prevents corrosive gases from infiltrating the control room and corroding circuitry. Additionally, recirculation air may require cleaning if the room is a high traffic area, or there are other internal sources of contaminants. AAF's family of SAAF™ products was created to accomplish these filtration goals, as well as monitor the condition of air inside the space.

For example, SAAF™ Deep Bed Scrubbers filter fresh air inlets of HVAC systems to pressurize control rooms with purified air. SAAF™ Recirculation Units recirculate and purify air within control rooms, removing indoor generated contaminants (i.e. those generated from personnel activity, indoor processes, etc.). SAAF™ Pressurization and Recirculation Units draw in both outdoor and room air, providing a purified air stream of mixed outdoor and room air. The outdoor air portion pressurizes the control room and prevents contaminants from infiltrating the space. SAAF™ Reactivity Monitoring Coupons provide a passive method to intermittently monitor air quality within control rooms. SAAFShield® technology provides a real-time method to monitor room air quality and communicate with building management systems.



Media (Pads & Rolls)



AirMat™ Type R
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AmerKlean™ M80 Pads
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FrontLine™ Gold Pads
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FrontLine™ Gold Rolls
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PolyKlean™ White Pads
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PolyKlean™ White Rolls
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PolyKlean™ Blue Pads
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PolyKlean™ Blue Rolls
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PolyKlean™ Gold Pads
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Roll-O-Mat® Green
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Roll-O-Mat® Gold with Scrim
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Media (Pads & Rolls)

AirMat® Type R

Product Overview

- Designed for fibrous particulate collection
- Suitable for installation in AAF Auto-Airmat®



Specifications

Media Type	Synthetic
Special Size Available	No
Antimicrobial Available	No
Max Operating Temperature	350°F (177°C)

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
341-006-040	40 x 1800	39½ x 1800	24.0	16.9

AirMat® and Auto-Airmat® are registered trademarks of AAF International in the U.S. and other countries.

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Media (Pads & Rolls)

AmerKleen™ M80

Product Overview

- Glass fiber pad with progressive density
- Strong resilient design
- Impregnated with gel-like adhesive
- High dust holding capacity
- Disposable
- UL 900 Classification



Product Information

Part Number	TP Part Number	Size	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (±10%)	Cubic Ft.
159-109-880	59-27350-2	9½ x 22¾ x 4	40	14.0	5.8
159-611-880	59-27350-4	16 x 25 x 4	25	16.4	7.0
159-805-880	59-27350-1	20 x 20 x 4	25	16.1	5.6

Additional sizes available upon request.

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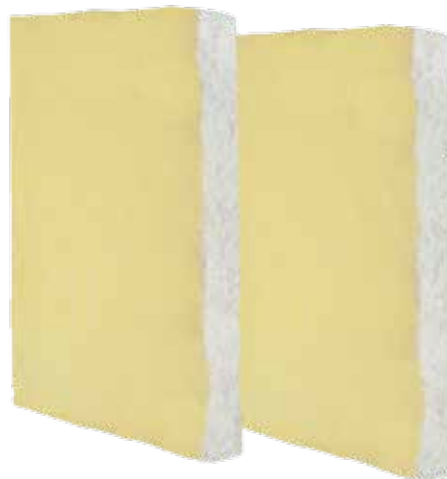


Media (Pads & Rolls)

FrontLine™ Gold Pads

Product Overview

- Heavy-duty industrial grade media
- Very high fiber content
- Heavy application of Viscosine™ adhesive
- Very high compression strength



Specifications

Efficiency	75 - 90 Percent Arrestance
Filter Depth	1", 2"
Media Type	Fiberglass
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
1"					
629-151-319	12 x 24 x 1	12 x 24 x 1	50	7.0	4.9
629-151-500	16 x 20 x 1	16 x 20 x 1	50	7.4	2.1
629-151-600	16 x 25 x 1	16 x 25 x 1	50	9.3	2.6
629-151-700	20 x 20 x 1	20 x 20 x 1	50	9.3	2.6
629-151-800	20 x 25 x 1	20 x 25 x 1	50	11.3	3.3
629-151-863	24 x 24 x 1	24 x 24 x 1	50	12.7	3.9
2"					
629-252-328	12 x 24 x 2	12¼ x 24¼ x 2	40	9.5	4.9
629-252-608	16 x 20 x 2	16¼ x 20¼ x 2	30	6.8	2.1
629-252-611	16 x 25 x 2	16¼ x 25¼ x 2	30	8.5	2.6
629-252-805	20 x 20 x 2	20¼ x 20¼ x 2	30	8.5	2.6
629-252-517	20 x 24 x 2	20¼ x 24¼ x 2	30	10.0	3.3
629-252-813	20 x 25 x 2	20¼ x 25¼ x 2	30	10.3	3.3
629-252-858	24 x 24 x 2	24¼ x 24¼ x 2	30	11.6	3.9

Additional sizes available upon request.

AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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Media (Pads & Rolls)

FrontLine™ Gold Rolls

Product Overview

- Heavy-duty industrial grade media
- Very high fiber content
- Heavy application of Viscosine™ adhesive
- Very high compression strength



Specifications

Efficiency	75 - 90 Percent Arrestance
Filter Depth	1", 2"
Media Type	Fiberglass
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.	Thickness
630-151-080	8" x 85' x 1"	2	6.0	2.1	1"
630-151-090	9" x 85' x 1"	2	6.7	2.1	1"
630-151-100	10" x 85' x 1"	2	7.4	2.1	1"
630-151-120	12" x 85' x 1"	2	8.9	2.9	1"
630-151-140	14" x 85' x 1"	2	10.5	2.9	1"
630-151-160	16" x 85' x 1"	2	11.9	4.6	1"
630-151-200	20" x 85' x 1"	2	14.9	6.4	1"
630-151-240	24" x 85' x 1"	2	17.9	6.4	1"
630-151-250	25" x 85' x 1"	2	18.6	6.4	1"
630-151-260	26" x 85' x 1"	2	19.4	6.4	1"
630-151-300	30" x 85' x 1"	2	22.3	8.8	1"
630-151-360	36" x 85' x 1"	2	26.8	8.8	1"
630-151-400	40" x 85' x 1"	2	29.8	11.4	1"
630-151-480	48" x 85' x 1"	2	35.7	11.4	1"
630-151-600	60" x 85' x 1"	1	24.0	14.0	1"
630-252-120	12" x 85' x 2"	2	13.3	2.9	2"
630-252-160	16" x 85' x 2"	2	17.4	4.9	2"
630-252-180	18" x 85' x 2"	2	19.7	4.9	2"
630-252-200	20" x 85' x 2"	2	21.9	4.9	2"
630-252-220	22" x 85' x 2"	2	24.0	6.1	2"
630-252-240	24" x 85' x 2"	2	26.2	6.4	2"
630-252-250	25" x 85' x 2"	2	27.3	6.4	2"
630-252-300	30" x 85' x 2"	2	32.8	8.8	2"
630-252-360	36" x 85' x 2"	2	39.3	8.8	2"
630-252-480	48" x 85' x 2"	2	52.4	11.4	2"
630-252-600	60" x 85' x 2"	1	34.0	7.3	2"

Additional sizes available upon request.

AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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Media (Pads & Rolls)

PolyKlean™ White Pads

Product Overview

- Light to medium-duty applications
- Durable 100% polyester fibers
- Non-toxic, non-allergenic
- Fully incinerable
- Easy to handle
- ½", 1", and 2" thicknesses



Specifications

Filter Depth	½", 1", 2"
Media Type	Synthetic
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
½"				
358-035-319	12 x 24 x ½	60	6.0	4.0
358-035-500	16 x 20 x ½	60	7.0	4.4
358-035-600	16 x 25 x ½	60	8.7	5.6
358-035-700	20 x 20 x ½	60	8.7	5.6
358-035-782	20 x 24 x ½	60	10.0	6.7
358-035-800	20 x 25 x ½	60	10.0	6.9
358-035-863	24 x 24 x ½	60	12.0	8.0
358-035-870	25 x 25 x ½	60	14.0	9.4
1"				
358-031-319	12 x 24 x 1	40	5.3	4.2
358-031-500	16 x 20 x 1	40	6.0	5.5
358-031-600	16 x 25 x 1	40	7.5	5.6
358-031-700	20 x 20 x 1	40	7.5	5.4
358-031-782	20 x 24 x 1	40	9.5	6.7
358-031-800	20 x 25 x 1	40	9.5	6.9
358-031-863	24 x 24 x 1	40	10.5	8.1
358-031-870	25 x 25 x 1	40	12.5	8.7
2"				
358-032-319	12 x 24 x 2	20	4.0	4.0
358-032-500	16 x 20 x 2	20	4.4	4.4
358-032-600	16 x 25 x 2	20	5.5	5.6
358-032-700	20 x 20 x 2	20	5.5	5.6
358-032-782	20 x 24 x 2	20	7.0	7.0
358-032-800	20 x 25 x 2	20	7.0	6.9
358-032-863	24 x 24 x 2	20	8.0	8.0
358-032-870	25 x 25 x 2	20	10.0	8.7

Additional sizes available upon request.

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Media (Pads & Rolls)

PolyKlean™ White Rolls

Product Overview

- Light to medium-duty applications
- Durable 100% polyester fibers
- Non-toxic, non-allergenic
- Fully incinerable
- Easy to handle
- ½", 1", and 2" thicknesses



Specifications

Filter Depth	½", 1", 2"
Media Type	Synthetic
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.	Thickness
357-035-120	12" x 135'	3	11.2	25.5	½"
357-035-160	16" x 135'	2	10.0	34.0	½"
357-035-200	20" x 135'	2	12.5	28.4	½"
357-035-240	24" x 135'	2	15.0	17.0	½"
357-035-250	25" x 135'	2	15.6	17.7	½"
357-035-300	30" x 135'	1	9.4	21.3	½"
357-035-360	36" x 135'	1	11.2	25.5	½"
357-035-400	40" x 135'	1	12.5	28.4	½"
357-035-480	48" x 135'	1	15.0	34.0	½"
357-035-500	50" x 135'	1	15.6	35.4	½"
357-035-600	60" x 135'	1	18.7	42.5	½"
357-035-960	96" x 135'	1	29.9	47.5	½"
357-031-120	12" x 90'	3	10.5	25.5	1"
357-031-160	16" x 90'	2	9.3	22.7	1"
357-031-200	20" x 90'	2	11.7	28.4	1"
357-031-240	24" x 90'	2	14.0	34.0	1"
357-031-250	25" x 90'	2	14.6	35.4	1"
357-031-300	30" x 90'	1	8.7	21.3	1"
357-031-360	36" x 90'	1	10.5	25.5	1"
357-031-400	40" x 90'	1	11.7	28.4	1"
357-031-480	48" x 90'	1	14.0	34.0	1"
357-031-500	50" x 90'	1	14.6	35.4	1"
357-032-160	16" x 75'	2	12.5	29.6	2"
357-032-200	20" x 75'	2	15.6	37.0	2"
357-032-240	24" x 75'	2	18.8	44.4	2"
357-032-250	25" x 75'	2	19.6	46.3	2"
357-032-300	30" x 75'	1	11.7	33.3	2"
357-032-360	36" x 75'	1	14.1	33.3	2"
357-032-400	40" x 75'	1	15.6	37.0	2"
357-032-480	48" x 75'	1	18.8	44.4	2"
357-032-500	50" x 75'	1	19.6	55.6	2"

Additional sizes available upon request.

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BETTER AIR IS OUR BUSINESS®

Media (Pads & Rolls)

PolyKlean™ Blue Pads

Product Overview

- Medium to heavy-duty applications
- Durable 100% polyester fibers
- Non-toxic, non-allergenic
- Fully incinerable
- Easy to handle
- ½", 1", and 2" thicknesses



Specifications

Filter Depth	½", 1", 2"
Media Type	Synthetic
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
½"				
358-015-319	12 x 24 x ½	60	6.5	4.0
358-015-500	16 x 20 x ½	60	7.4	4.3
358-015-600	16 x 25 x ½	60	9.1	5.6
358-015-700	20 x 20 x ½	60	9.1	5.6
358-015-782	20 x 24 x ½	60	11.0	6.7
358-015-800	20 x 25 x ½	60	11.0	7.0
358-015-863	24 x 24 x ½	60	13.0	7.7
1"				
358-011-319	12 x 24 x 1	40	6.3	4.0
358-011-500	16 x 20 x 1	40	6.3	4.3
358-011-600	16 x 25 x 1	40	7.9	5.4
358-011-700	20 x 20 x 1	40	7.9	5.4
358-011-782	20 x 24 x 1	40	10.0	6.7
358-011-800	20 x 25 x 1	40	10.0	6.7
358-011-863	24 x 24 x 1	40	11.0	7.7
2"				
358-012-319	12 x 24 x 2	20	5.3	4.0
358-012-500	16 x 20 x 2	20	5.3	4.3
358-012-600	16 x 25 x 2	20	6.6	5.4
358-012-700	20 x 20 x 2	20	6.6	5.4
358-012-782	20 x 24 x 2	20	8.0	6.7
358-012-800	20 x 25 x 2	20	9.0	7.0
358-012-863	24 x 24 x 2	20	9.0	8.1

Additional sizes available upon request.

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Media (Pads & Rolls)

PolyKlean™ Blue Rolls

Product Overview

- Medium to heavy-duty applications
- Durable 100% polyester fibers
- Non-toxic, non-allergenic
- Fully incinerable
- Easy to handle
- ½", 1", and 2" thicknesses



Specifications

Filter Depth	½", 1", 2"
Media Type	Synthetic
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Sq. Ft. per Roll	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.	Thickness
357-015-120	12" x 135'	135	3	11.1	25.5	½"
357-015-140	14" x 135'	158	2	8.6	19.9	½"
357-015-160	16" x 135'	180	2	9.9	22.7	½"
357-015-200	20" x 135'	225	2	12.4	28.4	½"
357-015-240	24" x 135'	270	2	14.9	34.0	½"
357-015-250	25" x 135'	281	2	15.6	35.4	½"
357-015-300	30" x 135'	338	1	9.3	21.3	½"
357-015-360	36" x 135'	405	1	11.8	25.5	½"
357-015-400	40" x 135'	450	1	12.4	28.4	½"
357-015-480	48" x 135'	540	1	14.9	34.0	½"
357-015-500	50" x 135'	563	1	15.5	35.4	½"
357-011-160	16" x 90'	120	2	10.0	22.7	1"
357-011-200	20" x 90'	150	2	12.4	28.4	1"
357-011-240	24" x 90'	180	2	14.9	34.0	1"
357-011-250	25" x 90'	188	2	15.0	35.4	1"
357-011-300	30" x 90'	225	1	9.0	21.3	1"
357-011-360	36" x 90'	270	1	10.8	25.5	1"
357-011-400	40" x 90'	300	1	12.0	28.4	1"
357-011-480	48" x 90'	360	1	14.4	34.0	1"
357-011-500	50" x 90'	375	1	15.0	35.4	1"
357-011-600	60" x 90'	450	1	18.0	42.5	1"
357-012-120	12" x 75'	75	3	12.6	33.3	2"
357-012-160	16" x 75'	100	2	11.2	29.6	2"
357-012-200	20" x 75'	125	2	14.0	37.0	2"
357-012-240	24" x 75'	150	2	16.8	44.4	2"
357-012-250	25" x 75'	157	2	17.6	46.3	2"
357-012-300	30" x 75'	188	1	8.6	27.8	2"
357-012-360	36" x 75'	226	1	10.4	33.3	2"
357-012-400	40" x 75'	251	1	10.5	37.0	2"
357-012-480	48" x 75'	301	1	13.8	44.4	2"

Additional sizes available upon request.

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BETTER AIR IS OUR BUSINESS®

Media (Pads & Rolls)

PolyKlean™ Gold Pads with Antimicrobial

Product Overview

- Heavy-duty industrial-grade performance
- Durable 100% polyester fibers
- Non-toxic, non-allergenic
- Fully incinerable
- Easy to handle
- ½", 1", and 2" thicknesses



Specifications

Filter Depth	½", 1", 2"
Media Type	Synthetic
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
1"				
358-051-319	12 x 24 x 1	40	8.2	4.0
358-051-500	16 x 20 x 1	40	8.2	4.5
358-051-600	16 x 25 x 1	40	10.3	5.6
358-051-700	20 x 20 x 1	40	10.3	5.6
358-051-782	20 x 24 x 1	40	13.0	7.0
358-051-800	20 x 25 x 1	40	13.0	7.0
358-051-863	24 x 24 x 1	40	14.3	8.0
358-051-870	25 x 25 x 1	40	17.6	8.7
2"				
358-052-319	12 x 24 x 2	20	6.9	2.1
358-052-500	16 x 20 x 2	20	6.9	4.5
358-052-600	16 x 25 x 2	20	8.6	5.6
358-052-700	20 x 20 x 2	20	8.6	5.6
358-052-782	20 x 24 x 2	20	10.4	6.7
358-052-800	20 x 25 x 2	20	11.7	7.0
358-052-863	24 x 24 x 2	20	11.7	1.1
358-052-870	25 x 25 x 2	20	14.3	9.4

Additional sizes available upon request.

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Media (Pads & Rolls)

Roll-O-Mat® Green

Product Overview

- Available in widths and on cores for all manufacturers' roll filters
- Medium application of Viscosine™ adhesive
- Available in ½" and 1" thicknesses
- 100% polyester fibers
- 65' long rolls



Specifications

Efficiency	70 to 85 Percent Arrestance
Filter Depth	2"
Media Type	Fiberglass
Antimicrobial Available	No
Air Filtration Certification	UL 900, ULC-S111

Product Information

Part Number	Filter Size	Media Core Dimensions (Length x I.D.)	Nominal Roll Size (Media Only)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
870-222-300	22	22¼" x 1½"	22½" x 65'	1	13.0	2.3
870-248-300	25	24⅞" x 1½"	25¼" x 65'	1	13.7	2.7
870-318-300	32	31⅞" x 1½"	33" x 65'	1	15.6	3.3
870-327-300	33 or 3'	32¾" x 1½"	33" x 65'	1	15.8	3.3
870-385-300	39	38½" x 1½"	38¾" x 65'	1	17.4	4.0
870-398-300	40	39⅞" x 1½"	40¼" x 65'	1	18.0	4.0
870-447-300	45 or 4'	44¾" x 1½"	45" x 65'	1	20.1	4.5
870-567-300	57 or 5'	56¾" x 1½"	57" x 65'	1	23.3	5.6
870-687-300	69 or 6'	68¾" x 1½"	69" x 65'	1	26.6	6.7

Additional sizes available upon request.

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Media (Pads & Rolls)

Roll-O-Mat® Gold with Scrim

Product Overview

- Available in widths and on cores for all manufacturers' roll filters
- 2" thick media of continuous filament fiberglass
- Heavy application of Viscosine™ adhesive
- 65' long rolls



Specifications

Efficiency	70 to 85 Percent Arrestance
Filter Depth	2"
Media Type	Fiberglass
Antimicrobial Available	No
Air Filtration Certification	UL 900, ULC-S111

Product Information

Part Number	Filter Size	Media Core Dimensions (Length x I.D.)	Nominal Roll Size (Media Only)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
800-205-100	21	24½" x 1⅝"	22¼" x 65'	1	16.0	2.3
800-222-100	22	22¼" x 1⅝"	24" x 65'	1	16.0	2.3
800-248-100	25	24⅞" x 1⅝"	26⅞" x 65'	1	16.0	2.7
800-318-100	32	31⅞" x 1⅝"	34" x 65'	1	20.7	3.3
800-327-100	33 or 3'	32¾" x 1⅝"	34¾" x 65'	1	22.7	3.3
800-385-100	39	38½" x 1⅝"	40⅝" x 65'	1	26.0	4.0
800-398-100	40	39⅞" x 1⅝"	42⅞" x 65'	1	26.9	4.0
800-447-100	45 or 4'	44¾" x 1⅝"	47¼" x 65'	1	27.6	4.5
800-567-100	57 or 5'	56¾" x 1⅝"	59¼" x 65'	1	33.2	5.6
800-687-100	69 or 6'	68¾" x 1⅝"	71½" x 65'	1	37.4	6.7

Additional sizes available upon request.

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Panel Filters



StrataDensity® Panel Filters
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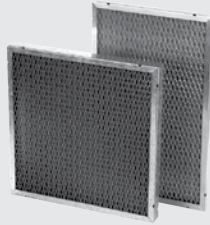
HeavyDuty™ Panel Filters
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Panel Filters

StrataDensity® Panel Filters

Product Overview

- Sturdy and economical
- Higher arrestance and dust-holding capacity than typical fiberglass panel filters
- Premium-grade AAF manufactured fiberglass media
- Compression-resistant glass fibers



PANEL FILTERS

Specifications

Filter Depth	1", 2"
Media Type	Fiberglass
Frame Material	Paper Board
Special Size Available	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
220-319-051	12 x 24 x 1	11 ⁷ / ₈ x 23 ⁵ / ₈ x ³ / ₄	12	3.7	1.9
220-500-051	16 x 20 x 1	15 ⁷ / ₈ x 19 ⁵ / ₈ x ³ / ₄	12	3.9	2.1
220-600-051	16 x 25 x 1	15 ⁷ / ₈ x 24 ⁵ / ₈ x ³ / ₄	12	5.0	2.6
220-700-051	20 x 20 x 1	19 ⁵ / ₈ x 19 ⁵ / ₈ x ³ / ₄	12	4.8	2.6
220-782-051	20 x 24 x 1	19 ⁵ / ₈ x 23 ⁵ / ₈ x ³ / ₄	12	6.0	3.1
220-800-051	20 x 25 x 1	19 ⁵ / ₈ x 24 ⁵ / ₈ x ³ / ₄	12	5.3	3.2
220-863-051	24 x 24 x 1	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x ³ / ₄	12	7.5	3.6
220-767-051	24 x 24 x 1 Full	23 ⁷ / ₈ x 23 ⁷ / ₈ x ³ / ₄	12	7.7	4.0
2"					
198-319-052	12 x 24 x 2	11 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	6.8	3.7
198-500-052	16 x 20 x 2	15 ⁷ / ₈ x 19 ⁵ / ₈ x 1 ³ / ₄	12	6.6	4.2
198-600-052	16 x 25 x 2	15 ⁷ / ₈ x 24 ⁵ / ₈ x 1 ³ / ₄	12	7.9	5.2
198-700-052	20 x 20 x 2	19 ⁵ / ₈ x 19 ⁵ / ₈ x 1 ³ / ₄	12	7.4	5.1
198-782-052	20 x 24 x 2	19 ⁵ / ₈ x 23 ⁵ / ₈ x 1 ³ / ₄	12	9.8	6.1
198-800-052	20 x 25 x 2	19 ⁵ / ₈ x 24 ⁵ / ₈ x 1 ³ / ₄	12	8.9	6.4
198-863-052	24 x 24 x 2	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	9.2	7.2

Additional sizes available upon request.

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Panel Filters

HeavyDuty™ Panel Filters

Product Overview

- Sturdy and economical
- Higher arrestance and dust holding capacity than typical fiberglass panel filters
- Woven glass retainer provides additional strength while maintaining a metal-free product, making the filter safer to handle
- Premium-grade AAF manufactured fiberglass media
- Compression-resistant glass fibers



Specifications

Filter Depth	1", 2"
Media Type	Fiberglass
Frame Material	Paper Board
Special Size Available	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
221-319-151	12 x 24 x 1	11 ⁷ / ₁₆ x 23 ³ / ₁₆ x ³ / ₄	12	3.7	1.9
221-500-151	16 x 20 x 1	15 ⁷ / ₁₆ x 19 ⁵ / ₁₆ x ³ / ₄	12	3.9	2.1
221-600-151	16 x 25 x 1	15 ⁷ / ₁₆ x 24 ⁵ / ₁₆ x ³ / ₄	12	5.0	2.6
221-700-151	20 x 20 x 1	19 ⁵ / ₁₆ x 19 ⁵ / ₁₆ x ³ / ₄	12	4.8	2.6
221-782-151	20 x 24 x 1	19 ⁵ / ₁₆ x 23 ³ / ₁₆ x ³ / ₄	12	6.0	3.1
221-800-151	20 x 25 x 1	19 ⁵ / ₁₆ x 24 ⁵ / ₁₆ x ³ / ₄	12	5.3	3.2
221-863-151	24 x 24 x 1	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x ³ / ₄	12	7.5	3.6
221-767-151	24 x 24 x 1 Full	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x ³ / ₄	12	7.7	4.0
2"					
221-319-152	12 x 24 x 2	11 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	6.8	3.8
221-500-152	16 x 20 x 2	15 ⁷ / ₁₆ x 19 ⁵ / ₁₆ x 1 ³ / ₄	12	6.6	4.2
221-600-152	16 x 25 x 2	15 ⁷ / ₁₆ x 24 ⁵ / ₁₆ x 1 ³ / ₄	12	7.9	5.2
221-700-152	20 x 20 x 2	19 ⁵ / ₁₆ x 19 ⁵ / ₁₆ x 1 ³ / ₄	12	7.4	5.1
221-782-152	20 x 24 x 2	19 ⁵ / ₁₆ x 23 ³ / ₁₆ x 1 ³ / ₄	12	9.8	6.5
221-800-152	20 x 25 x 2	19 ⁵ / ₁₆ x 24 ⁵ / ₁₆ x 1 ³ / ₄	12	8.9	6.4
221-863-152	24 x 24 x 2	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	9.2	9.4

Additional sizes available upon request.

PANEL FILTERS

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BETTER AIR IS OUR BUSINESS®

Panel Filters

5700™

Product Overview

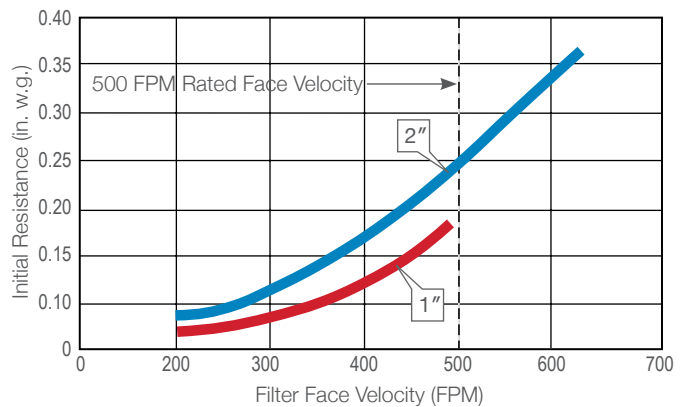
- Extremely low initial resistance combined with high arrestance
- High loft media increases dust-holding capacity
- Excellent primary filter to protect heating and cooling coils, fans and ductwork
- Directly interchangeable with disposable panel filters, media pads in metal frames, or permanent filters
- MERV 7



Specifications

Efficiency	MERV 7
Filter Depth	1", 2"
Media Type	Fiberglass
Frame Material	Paper Board
Special Size Available	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Cut Construction (2") Standard Sizes					
205-319-652	12 x 24 x 2	11 ³ / ₁₆ x 23 ³ / ₁₆ x 1 ³ / ₄	12	11.0	3.7
205-500-652	16 x 20 x 2	15 ³ / ₁₆ x 19 ³ / ₁₆ x 1 ³ / ₄	12	11.3	4.4
205-600-652	16 x 25 x 2	15 ³ / ₁₆ x 24 ³ / ₁₆ x 1 ³ / ₄	12	14.3	5.2
205-700-652	20 x 20 x 2	19 ³ / ₁₆ x 19 ³ / ₁₆ x 1 ³ / ₄	12	14.3	5.2
205-782-652	20 x 24 x 2	19 ³ / ₁₆ x 23 ³ / ₁₆ x 1 ³ / ₄	12	16.0	6.2
205-800-652	20 x 25 x 2	19 ³ / ₁₆ x 24 ³ / ₁₆ x 1 ³ / ₄	12	16.3	6.5
205-863-652	24 x 24 x 2	23 ³ / ₁₆ x 23 ³ / ₁₆ x 1 ³ / ₄	12	19.7	9.4
Bottlecap Construction (1") Standard Sizes					
205-500-551	16 x 20 x 1	15 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ⁵ / ₁₆	12	9.0	2.3
205-600-551	16 x 25 x 1	15 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ⁵ / ₁₆	12	10.5	2.9
205-700-551	20 x 20 x 1	19 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ⁵ / ₁₆	12	9.3	2.9
205-800-551	20 x 25 x 1	19 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ⁵ / ₁₆	12	12.3	4.9
205-863-551	24 x 24 x 1	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ⁵ / ₁₆	12	13.3	4.1
Bottlecap Construction (2") Standard Sizes					
205-319-552	12 x 24 x 2	11 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	11.0	3.7
205-500-552	16 x 20 x 2	15 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ³ / ₄	12	11.3	4.2
205-600-552	16 x 25 x 2	15 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ³ / ₄	12	14.3	5.2
205-700-552	20 x 20 x 2	19 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ³ / ₄	12	14.3	5.2
205-782-552	20 x 24 x 2	19 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	16.0	6.5
205-800-552	20 x 25 x 2	19 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ³ / ₄	12	16.3	6.5
205-863-552	24 x 24 x 2	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	19.7	9.4

Additional sizes available upon request.

PANEL FILTERS

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Panel Filters

AmerSeal® Ring and Link Panels

Product Overview

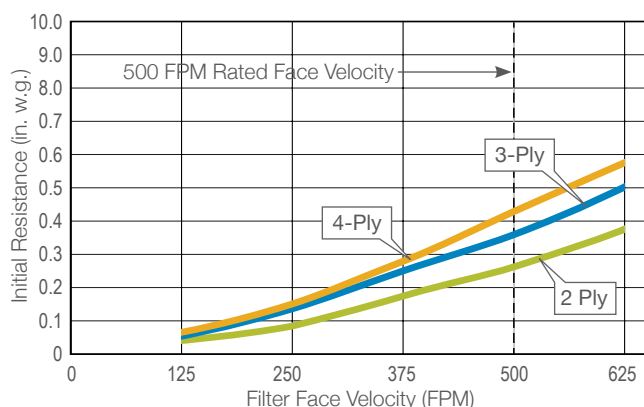
- Leak-free, no dirty air bypass
- Saves on shipping and storage costs
- Self-sealing, internal wire frame design provides fast and easy installation, requiring no clips or latches
- Moisture-resistant, polyester media
- Available with antimicrobial
- MERV 8



Specifications

Frame Material	Paper Board
Efficiency	MERV 8
Max Operating Temperature	175°F (79°C)
Special Size Available	Yes
Antimicrobial Available	Yes
Filter Depth	1", 2"
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Green (2-Ply) Part Number	Cubic Ft.	Blue (3-Ply) Part Number	Cubic Ft.	Gold (4-Ply) Part Number	Cubic Ft. (H x L)	Nominal Size Inches (H x L)	Actual Size ¹ Inches Box	Std. Pkg. Qty.
523-200-200	2.0	523-200-300	3.0	523-200-400	3.4	10 x 20	9¼ x 19¼	24
523-319-200	2.8	523-319-300	2.8	523-319-400	2.8	12 x 24	11¼ x 23¼	24
523-500-200	2.2	523-500-300	4.8	523-500-400	4.8	16 x 20	15¼ x 19¼	24
523-600-200	5.8	523-600-300	3.3	523-600-400	3.3	16 x 25	15¼ x 24¼	24
523-700-200	3.3	523-700-300	5.9	523-700-400	5.9	20 x 20	19¼ x 19¼	24
523-782-200	4.7	523-782-300	4.7	523-782-400	4.7	20 x 24	19¼ x 23¼	24
523-800-200	4.7	523-800-300	4.7	523-800-400	4.7	20 x 25	19¼ x 24¼	24
523-803-200	7.4	523-803-300	14.6	523-803-400	14.0	20 x 48	19¼ x 47¼	24
523-863-200	4.9	523-863-300	8.8	523-863-400	8.8	24 x 24	23¼ x 23¼	24
523-870-200	4.9	523-870-300	8.7	523-870-400	8.8	25 x 25	24¼ x 24¼	24

¹The actual size is the size of the internal wire ring
Additional sizes available upon request.

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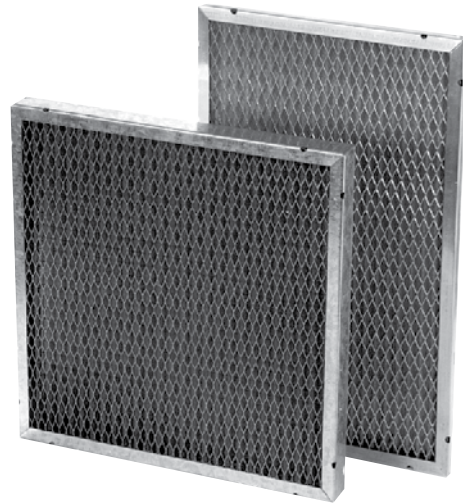


Panel Filters

Permanent Metal Air Filters

Product Overview

- Low maintenance
- Ideally suited for high moisture and high temperature conditions (Up to 350°F)
- Lightweight construction makes filters easy to handle
- Designed with drain holes to ensure removal of excess water
- Frame made from aluminum, galvanized, or stainless steel



PANEL FILTERS

Specifications

Filter Depth	1", 2"
Media Type	Metal
Frame Material	Aluminum, Galvanized Steel, Stainless Steel
Special Size Available	Yes
Max Operating Temperature	350°F (177°C)

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
½"					
316-005-500	16 x 20 x ½	15½ x 19½ x 7/16	12	11.3	0.0
316-005-600	16 x 25 x ½	15½ x 24½ x 7/16	12	13.3	0.0
316-005-700	20 x 20 x ½	19½ x 19½ x 7/16	12	13.6	0.0
316-005-800	20 x 25 x ½	19½ x 24½ x 7/16	12	15.3	0.0
316-005-863	24 x 24 x ½	23½ x 23½ x 7/16	12	18.0	0.0
1"					
316-001-500	16 x 20 x 1	15½ x 19½ x 7/8	12	16.1	0.0
316-001-600	16 x 25 x 1	15½ x 24½ x 7/8	12	19.0	0.0
316-001-700	20 x 20 x 1	19½ x 19½ x 7/8	12	19.4	0.0
316-001-782	20 x 24 x 1	19½ x 23½ x 7/8	12	20.9	0.0
316-001-800	20 x 25 x 1	19½ x 24½ x 7/8	12	21.8	0.0
316-001-863	24 x 24 x 1	23½ x 23½ x 7/16	12	25.7	0.0
2"					
316-002-319	12 x 24 x 2	11½ x 23½ x 1¼	12	18.2	0.0
316-002-500	16 x 20 x 2	15½ x 19½ x 1¼	6	9.8	2.2
316-002-600	16 x 25 x 2	15½ x 24½ x 1¼	6	12.0	2.8
316-002-700	20 x 20 x 2	19½ x 19½ x 1¼	6	12.2	0.0
316-002-782	20 x 24 x 2	19½ x 23½ x 1¼	6	12.6	0.0
316-002-800	20 x 25 x 2	19½ x 24½ x 1¼	6	12.8	3.5
316-002-863	24 x 24 x 2	23½ x 23½ x 1¼	6	15.4	1.1
4"					
316-004-319	12 x 24 x 4	11½ x 23½ x 3½	6	18.2	4.0
316-004-500	16 x 20 x 4	15½ x 19½ x 3½	3	19.7	2.2
316-004-600	16 x 25 x 4	15½ x 24½ x 3½	3	24.0	2.8
316-004-700	20 x 20 x 4	19½ x 19½ x 3½	3	24.5	0.1
316-004-782	20 x 24 x 4	19½ x 23½ x 3½	3	25.2	0.0
316-004-800	20 x 25 x 4	19½ x 24½ x 3½	3	25.7	0.0

Product information listed is for aluminum version. Additional sizes available upon request. Also available in galvanized steel and stainless steel.

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Pleated Filters


PLEATED FILTERS



PerfectPleat® SC M8
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PerfectPleat® HC M8
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PerfectPleat® ULTRA
(with Antimicrobial) Page 77



AmAir® 300X
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MEGApleat® M8
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MEGApleat® M11
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MEGApleat® M13
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Air Demon®
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AmAir® HT
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Pleated Filters

PerfectPleat® SC M8

Product Overview

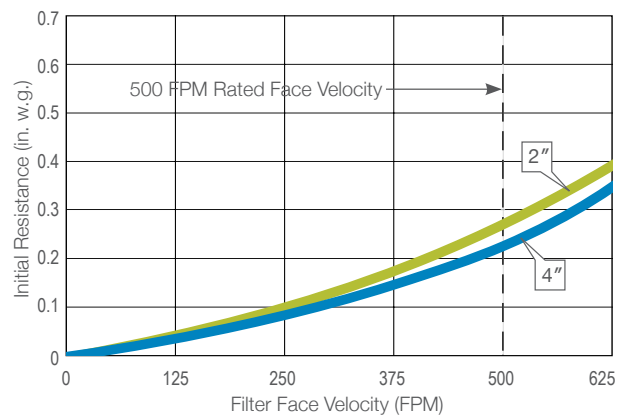
- Low initial resistance
- Mechanical efficiency – does not rely on electret charge technology
- Self-supporting DuraFlex® media made from virgin fiber; no wire support needed
- Consistent media with controlled fiber size and blend
- Environmentally friendly – no metal, fully incinerable
- Available in 2" and 4" models
- MERV 8



Specifications

Efficiency	MERV 8
Filter Depth	2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
2"					
172-112-319	12 x 24 x 2	11 ⁵ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	8.3	3.8
172-112-500	16 x 20 x 2	15 ¹ / ₂ x 19 ¹ / ₂ x 1 ³ / ₄	12	8.7	4.2
172-112-600	16 x 25 x 2	15 ¹ / ₂ x 24 ¹ / ₂ x 1 ³ / ₄	12	10.4	5.2
172-112-700	20 x 20 x 2	19 ¹ / ₂ x 19 ¹ / ₂ x 1 ³ / ₄	12	9.4	5.2
172-112-782	20 x 24 x 2	19 ⁵ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	12.4	6.3
172-112-800	20 x 25 x 2	19 ¹ / ₂ x 24 ¹ / ₂ x 1 ³ / ₄	12	11.6	6.5
172-112-863	24 x 24 x 2	23 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	13.0	7.5
4"					
179-480-319	12 x 24 x 4	11 ⁵ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	6.5	4.0
179-480-500	16 x 20 x 4	15 ⁵ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	7.3	5.2
179-480-600	16 x 25 x 4	15 ⁵ / ₈ x 24 ³ / ₈ x 3 ³ / ₄	6	9.1	5.3
179-480-700	20 x 20 x 4	19 ⁵ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	9.1	5.5
179-480-800	20 x 25 x 4	19 ⁵ / ₈ x 24 ³ / ₈ x 3 ³ / ₄	6	11.4	6.6
179-480-859	24 x 20 x 4	23 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	10.9	6.6
179-480-863	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	13.1	7.9

Additional sizes available upon request.

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Pleated Filters

PerfectPleat® HC M8

Product Overview

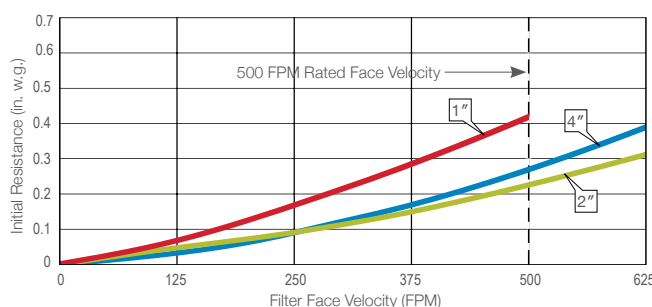
- Low initial resistance
- Mechanical efficiency – does not rely on electret charge technology
- Self-supporting DuraFlex® media made from virgin fiber; no wire support needed
- Consistent media with controlled fiber size and blend
- Environmentally friendly – no metal, fully incinerable
- Available in 1", 2", and 4" models
- MERV 8



Specifications

Efficiency	MERV 8
Filter Depth	1", 2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



PLEATED FILTERS

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
173-319-011	12 x 24 x 1	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	5.3	1.9
173-500-011	16 x 20 x 1	15 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x $\frac{3}{4}$	12	6.2	2.1
173-600-011	16 x 25 x 1	15 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x $\frac{3}{4}$	12	7.6	2.6
173-700-011	20 x 20 x 1	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x $\frac{3}{4}$	12	7.4	2.6
173-782-011	20 x 24 x 1	19 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	9.1	3.2
173-800-011	20 x 25 x 1	19 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x $\frac{3}{4}$	12	9.5	3.2
173-863-011	24 x 24 x 1	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	10.9	3.6
2"					
170-112-319	12 x 24 x 2	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	8.2	3.8
170-112-500	16 x 20 x 2	15 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	9.3	4.2
170-112-600	16 x 25 x 2	15 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	12.2	5.2
170-112-700	20 x 20 x 2	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	11.8	5.2
170-112-782	20 x 24 x 2	19 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	14.0	6.5
170-112-800	20 x 25 x 2	19 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	14.2	6.5
170-112-863	24 x 24 x 2	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	16.9	7.3
4"					
179-411-319	12 x 24 x 4	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	9.0	4.0
179-411-500	16 x 20 x 4	15 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	9.4	5.2
179-411-600	16 x 25 x 4	15 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	11.0	5.3
179-411-700	20 x 20 x 4	19 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	11.9	5.5
179-411-800	20 x 25 x 4	19 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	14.9	6.6
179-411-859	24 x 20 x 4	23 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	14.3	6.6
179-411-863	24 x 24 x 4	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	17.3	7.9

Additional sizes available upon request.

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Pleated Filters

PerfectPleat® ULTRA

Product Overview

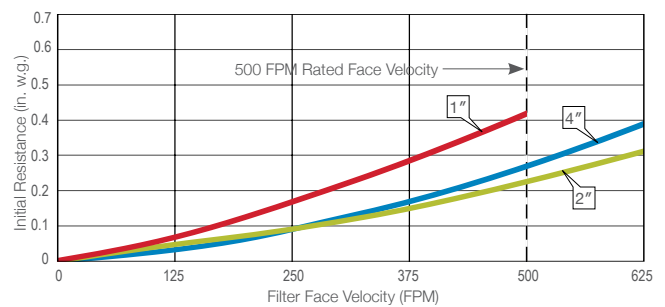
- Incorporates antimicrobial to support optimal Indoor Air Quality (IAQ)
- Low initial resistance
- Mechanical efficiency – does not rely on electret charge technology
- Self-supporting DuraFlex® media made from virgin fiber; no wire support needed
- Consistent media with controlled fiber size and blend
- Environmentally friendly – no metal, fully incinerable
- Available in 1", 2", and 4" models
- MERV 8



Specifications

Efficiency	MERV 8
Filter Depth	1", 2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
176-319-001	12 x 24 x 1	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	6.6	1.9
176-500-001	16 x 20 x 1	15 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x $\frac{3}{4}$	12	5.3	2.1
176-600-001	16 x 25 x 1	15 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x $\frac{3}{4}$	12	6.6	2.6
176-700-001	20 x 20 x 1	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x $\frac{3}{4}$	12	6.6	2.6
176-800-001	20 x 25 x 1	19 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x $\frac{3}{4}$	12	8.2	3.2
176-863-001	24 x 24 x 1	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	9.4	3.6
2"					
175-102-319	12 x 24 x 2	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	8.3	3.8
175-102-500	16 x 20 x 2	15 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	8.7	4.2
175-102-600	16 x 25 x 2	15 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	10.4	5.2
175-102-700	20 x 20 x 2	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	9.4	5.2
175-102-782	20 x 24 x 2	19 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	12.4	6.5
175-102-800	20 x 25 x 2	19 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x 1 $\frac{3}{4}$	12	11.6	6.5
175-102-863	24 x 24 x 2	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	13.0	7.5
4"					
179-402-319	12 x 24 x 4	11 $\frac{1}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	6.9	4.0
179-402-500	16 x 20 x 4	15 $\frac{1}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	7.6	5.2
179-402-600	16 x 25 x 4	15 $\frac{1}{8}$ x 24 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	9.5	5.3
179-402-700	20 x 20 x 4	19 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	9.5	5.5
179-402-800	20 x 25 x 4	19 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	12.0	6.6
179-402-859	24 x 20 x 4	23 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	11.5	6.6
179-402-863	24 x 24 x 4	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	13.8	7.9

Additional sizes available upon request.

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Pleated Filters

AmAir® 300X

Product Overview

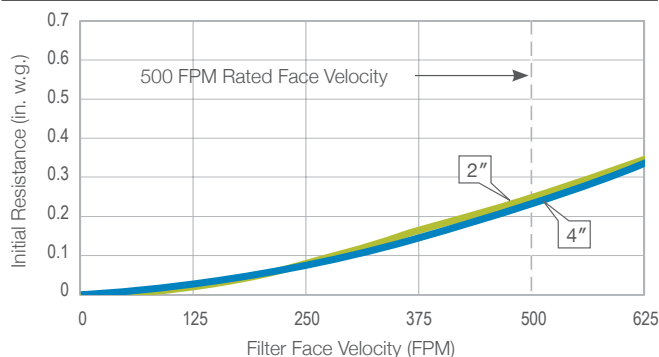
- Expanded metal pleat support grid
- High loft media increases dust holding capacity
- Excellent primary filter to prevent dust build-up on heating and cooling coils, fans, and ductwork
- Excellent prefilter for higher efficiency filters
- Directly interchangeable with disposable panel filters, media pads in metal frames, or permanent filters used in built-up filter banks and side access systems. No modifications are necessary to frames or latches
- 4" filters have pleat stabilizers to ensure uniform spacing and increased rigidity
- MERV 7



Specifications

Filter Depth	1", 2", 4"
Efficiency	MERV 7
Media Type	Cotton/Poly
Frame Material	Beverage Board
Max Operating Temperature	200°F (93°C)
Antimicrobial Available	No
Single Header	No
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



PLEATED FILTERS

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
140-101-319	12 x 24 x 1	11 ⁵ / ₈ x 23 ³ / ₈ x ⁷ / ₈	24	16.0	3.7
140-101-500	16 x 20 x 1	15 ⁵ / ₈ x 19 ³ / ₈ x ⁷ / ₈	24	16.0	4.4
140-101-600	16 x 25 x 1	15 ⁵ / ₈ x 24 ³ / ₈ x ⁷ / ₈	24	19.0	5.2
140-101-700	20 x 20 x 1	19 ⁵ / ₈ x 19 ³ / ₈ x ⁷ / ₈	24	18.0	5.2
140-101-800	20 x 25 x 1	19 ⁵ / ₈ x 24 ³ / ₈ x ⁷ / ₈	12	11.0	3.4
140-101-863	24 x 24 x 1	23 ⁵ / ₈ x 23 ³ / ₈ x ⁷ / ₈	12	13.5	4.0
2"					
140-102-319	12 x 24 x 2	11 ⁵ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	11.5	3.7
140-102-500	16 x 20 x 2	15 ⁵ / ₈ x 19 ³ / ₈ x 1 ³ / ₄	12	12.0	4.4
140-102-600	16 x 25 x 2	15 ⁵ / ₈ x 24 ³ / ₈ x 1 ³ / ₄	12	13.0	5.2
140-102-700	20 x 20 x 2	19 ⁵ / ₈ x 19 ³ / ₈ x 1 ³ / ₄	12	13.0	5.2
140-102-782	20 x 24 x 2	19 ⁵ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	17.2	6.2
140-102-800	20 x 25 x 2	19 ⁵ / ₈ x 24 ³ / ₈ x 1 ³ / ₄	12	16.0	6.5
140-102-863	24 x 24 x 2	23 ⁵ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	18.0	7.5
4"					
140-104-319	12 x 24 x 4	11 ⁵ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	10.5	4.0
140-104-500	16 x 20 x 4	15 ⁵ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	10.5	5.2
140-104-600	16 x 25 x 4	15 ⁵ / ₈ x 24 ³ / ₈ x 3 ³ / ₄	6	12.0	5.3
140-104-700	20 x 20 x 4	19 ⁵ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	12.5	5.5
140-104-800	20 x 25 x 4	19 ¹ / ₂ x 24 ¹ / ₂ x 3 ³ / ₄	6	15.0	6.6
140-104-859	24 x 20 x 4	23 ⁵ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	15.0	6.6
140-104-863	24 x 24 x 4	23 ⁵ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	15.0	7.9

Additional sizes available upon request.

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Pleated Filters

MEGApleat® M8

Product Overview

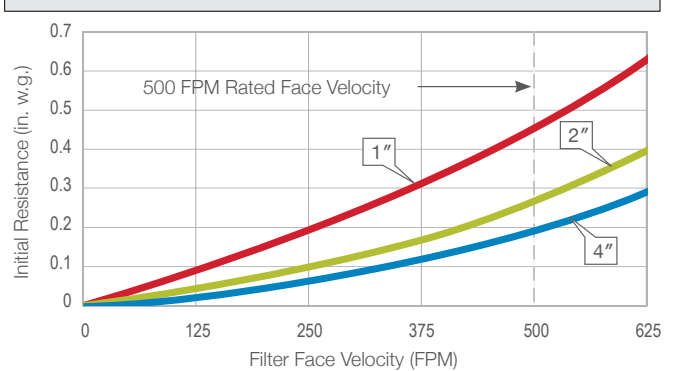
- Low operating resistance saves energy
- Highest dust holding capacity (DHC) = Longest life
- Highest breach strength = Strongest construction
- Guaranteed consistent performance – independent, third party testing
- Patent-pending filter design
- Heavy-duty, galvanized expanded metal support grid – no rust
- Moisture-resistant adhesive
- Available in 1", 2", and 4" models
- MERV 8



Specifications

Efficiency	MERV 8
Filter Depth	1", 2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	No
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	200°F (93°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
148-801-319	12 x 24 x 1	11 ³ / ₈ x 23 ³ / ₈ x ³ / ₄	12	7.1	3.7
148-801-500	16 x 20 x 1	15 ¹ / ₂ x 19 ¹ / ₂ x ³ / ₄	12	7.9	1.9
148-801-600	16 x 25 x 1	15 ¹ / ₂ x 24 ¹ / ₂ x ³ / ₄	12	9.8	2.4
148-801-700	20 x 20 x 1	19 ¹ / ₂ x 19 ¹ / ₂ x ³ / ₄	12	10.0	2.3
148-801-800	20 x 25 x 1	19 ¹ / ₂ x 24 ¹ / ₂ x ³ / ₄	12	12.3	3.0
148-801-863	24 x 24 x 1	23 ³ / ₈ x 23 ³ / ₈ x ³ / ₄	12	14.2	4.0
2"					
148-802-319	12 x 24 x 2	11 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	11.7	3.6
148-802-500	16 x 20 x 2	15 ¹ / ₂ x 19 ¹ / ₂ x 1 ³ / ₄	12	13.0	4.0
148-802-600	16 x 25 x 2	15 ¹ / ₂ x 24 ¹ / ₂ x 1 ³ / ₄	12	16.3	5.0
148-802-700	20 x 20 x 2	19 ¹ / ₂ x 19 ¹ / ₂ x 1 ³ / ₄	12	15.0	4.5
148-802-782	20 x 24 x 2	19 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	19.5	5.9
148-802-800	20 x 25 x 2	19 ³ / ₈ x 24 ¹ / ₂ x 1 ³ / ₄	12	20.3	6.2
148-802-863	24 x 24 x 2	23 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	23.4	7.1
4"					
148-804-319	12 x 24 x 4	11 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	11.8	3.7
148-804-500	16 x 20 x 4	15 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	13.2	5.2
148-804-600	16 x 25 x 4	15 ³ / ₈ x 24 ³ / ₈ x 3 ³ / ₄	6	16.4	5.2
148-804-700	20 x 20 x 4	19 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	16.4	5.2
148-804-800	20 x 25 x 4	19 ¹ / ₂ x 24 ¹ / ₂ x 3 ³ / ₄	6	20.6	6.5
148-804-859	24 x 20 x 4	23 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	20.7	6.2
148-804-863	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	23.7	7.5

Additional sizes available upon request.

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Pleated Filters

MEGApleat® M11

Product Overview

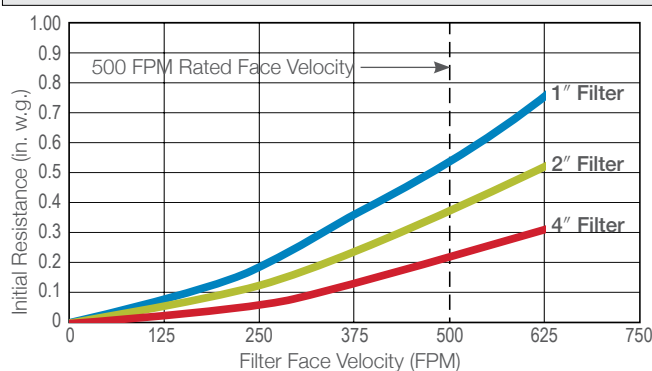
- High efficiency - MERV 11
- Premium performance and construction
- Synthetic, electrostatically charged media with high dust holding capacity
- Excellent as a final filter or prefilter



Specifications

Efficiency	MERV 11
Filter Depth	1", 2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	200°F (93°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
141-301-319	12 x 24 x 1	11 ³ / ₈ x 23 ³ / ₈ x ³ / ₄	12	16.0	3.7
141-301-500	16 x 20 x 1	15 ³ / ₈ x 19 ³ / ₈ x ³ / ₄	12	16.0	4.4
141-301-600	16 x 25 x 1	15 ³ / ₈ x 24 ³ / ₈ x ³ / ₄	12	19.0	5.2
141-301-700	20 x 20 x 1	19 ³ / ₈ x 19 ³ / ₈ x ³ / ₄	12	18.0	5.2
141-301-800	20 x 25 x 1	19 ³ / ₈ x 24 ³ / ₈ x ³ / ₄	12	11.0	3.4
141-301-863	24 x 24 x 1	23 ³ / ₈ x 23 ³ / ₈ x ³ / ₄	12	13.5	4.0
2"					
141-302-319	12 x 24 x 2	11 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	11.5	3.7
141-302-500	16 x 20 x 2	15 ³ / ₈ x 19 ³ / ₈ x 1 ³ / ₄	12	12.0	4.4
141-302-600	16 x 25 x 2	15 ³ / ₈ x 24 ³ / ₈ x 1 ³ / ₄	12	13.0	5.2
141-302-700	20 x 20 x 2	19 ³ / ₈ x 19 ³ / ₈ x 1 ³ / ₄	12	13.0	5.2
141-302-782	20 x 24 x 2	19 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	17.2	7.5
141-302-800	20 x 25 x 2	19 ³ / ₈ x 24 ³ / ₈ x 1 ³ / ₄	12	16.0	6.5
141-302-863	24 x 24 x 2	23 ³ / ₈ x 23 ³ / ₈ x 1 ³ / ₄	12	18.0	7.5
4"					
141-304-319	12 x 24 x 4	11 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	10.5	4.0
141-304-500	16 x 20 x 4	15 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	10.5	5.2
141-304-600	16 x 25 x 4	15 ³ / ₈ x 24 ³ / ₈ x 3 ³ / ₄	6	12.0	5.3
141-304-700	20 x 20 x 4	19 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	12.5	5.5
141-304-800	20 x 25 x 4	19 ¹ / ₂ x 24 ¹ / ₂ x 3 ³ / ₄	6	15.0	6.6
141-304-859	24 x 20 x 4	23 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	6	15.0	6.6
141-304-863	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	6	15.0	7.9

Additional sizes available upon request.

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Pleated Filters

MEGApleat® M13

Product Overview

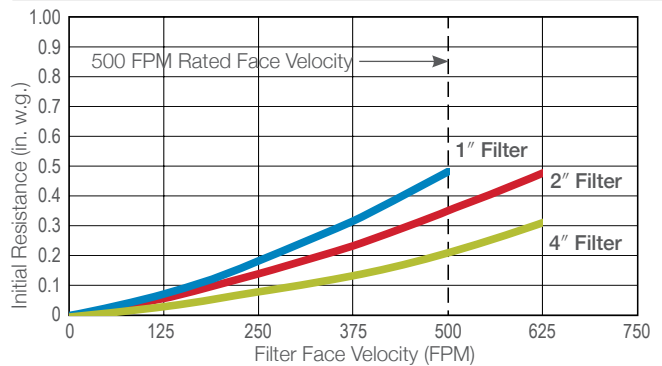
- High efficiency - MERV 13
- Meets efficiency standards for achieving points toward LEED Project Certification
- Premium performance and construction
- Synthetic, electrostatically charged media with high dust holding capacity
- Excellent as a final filter or prefilter



Specifications

Efficiency	MERV 13
Filter Depth	1", 2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	200°F (93°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"					
141-601-319	12 x 24 x 1	11 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	16.0	3.7
141-601-500	16 x 20 x 1	15 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x $\frac{3}{4}$	12	16.0	4.4
141-601-600	16 x 25 x 1	15 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x $\frac{3}{4}$	12	19.0	5.2
141-601-700	20 x 20 x 1	19 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x $\frac{3}{4}$	12	18.0	5.2
141-601-800	20 x 25 x 1	19 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x $\frac{3}{4}$	12	11.0	3.4
141-601-863	24 x 24 x 1	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x $\frac{3}{4}$	12	13.5	4.0
2"					
141-602-319	12 x 24 x 2	11 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	11.5	3.7
141-602-500	16 x 20 x 2	15 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	12.0	4.4
141-602-600	16 x 25 x 2	15 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	13.0	5.2
141-602-700	20 x 20 x 2	19 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	13.0	5.2
141-602-782	20 x 24 x 2	19 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	17.2	6.2
141-602-800	20 x 25 x 2	19 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	16.0	6.5
141-602-863	24 x 24 x 2	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 1 $\frac{3}{4}$	12	18.0	7.5
4"					
141-604-319	12 x 24 x 4	11 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	10.5	4.0
141-604-500	16 x 20 x 4	15 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	10.5	5.2
141-604-600	16 x 25 x 4	15 $\frac{3}{8}$ x 24 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	12.0	5.3
141-604-700	20 x 20 x 4	19 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	12.5	5.5
141-604-800	20 x 25 x 4	19 $\frac{1}{2}$ x 24 $\frac{1}{2}$ x 3 $\frac{3}{4}$	6	15.0	6.6
141-604-859	24 x 20 x 4	23 $\frac{3}{8}$ x 19 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	15.0	6.6
141-604-863	24 x 24 x 4	23 $\frac{3}{8}$ x 23 $\frac{3}{8}$ x 3 $\frac{3}{4}$	6	15.0	7.9

Additional sizes available upon request.

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Pleated Filters

Air Demon®

Product Overview

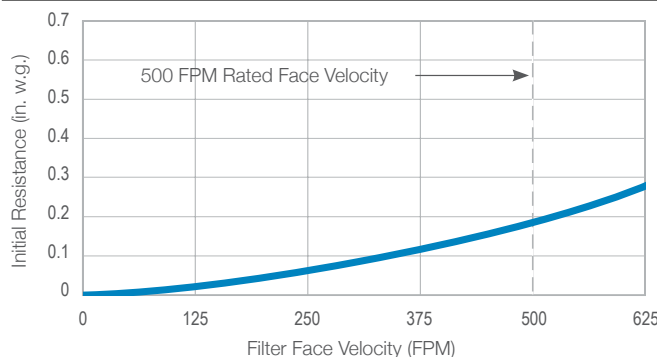
- Low initial resistance
- High-efficiency MERV 11 media
- Captures microscopic airborne particles
- Ideal for both commercial and residential applications
- At least 33% more airflow than any other 4"-5" filter, resulting in lower energy costs



Specifications

Efficiency	MERV 11
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	No
Antimicrobial Available	No
Filter Depth	4", 5"
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
142-304-340	12½ x 20 x 4¾	12⅝ x 19⅞ x 4¾	3	4.8	2.1
142-304-600	16 x 25 x 4¾	15⅞ x 24¾ x 4¾	3	6.6	3.4
142-304-700	20 x 20 x 4¾	19⅝ x 19⅞ x 4¾	3	7.1	3.3
142-304-800	20 x 25 x 4¾	19⅞ x 24⅝ x 4¾	3	9.4	4.1
142-305-800	20 x 25 x 5	19¾ x 24¼ x 5	3	9.4	4.7

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BETTER AIR IS OUR BUSINESS®

Pleated Filters

AmAir® HT

Product Overview

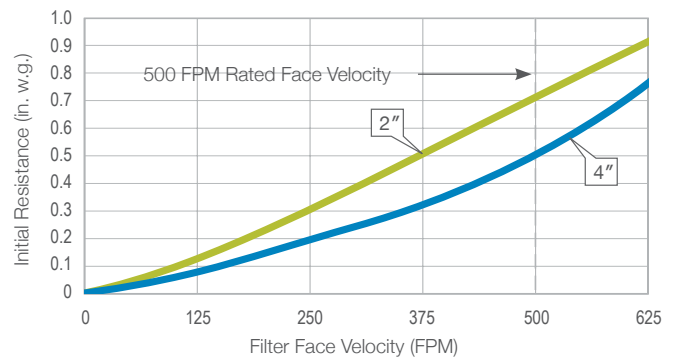
- Rated at 500°F
- Ultra-fine high loft microglass media
- Aluminized steel U-channel frame
- Available in 2" and 4" depths
- MERV 8



Specifications

Efficiency	MERV 8
Filter Depth	2", 4"
Media Type	Synthetic
Frame Material	Beverage Board
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	500°F (260°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
2"					
147-002-319	12 x 24 x 2	11 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	12	29.7	4.3
147-002-500	16 x 20 x 2	15 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ³ / ₄	12	30.8	4.5
147-002-600	16 x 25 x 2	15 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ³ / ₄	12	36.6	5.6
147-002-700	20 x 20 x 2	19 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 1 ³ / ₄	12	35.7	5.6
147-002-782	20 x 24 x 2	19 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	6	22.9	3.6
147-002-800	20 x 25 x 2	19 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 1 ³ / ₄	6	23.6	3.8
147-002-863	24 x 24 x 2	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 1 ³ / ₄	6	26.2	4.3
4"					
147-004-319	12 x 24 x 4	11 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 3 ³ / ₄	6	23.4	4.3
147-004-500	16 x 20 x 4	15 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 3 ³ / ₄	6	23.9	4.5
147-004-600	16 x 25 x 4	15 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 3 ³ / ₄	6	28.3	5.6
147-004-700	20 x 20 x 4	19 ⁷ / ₁₆ x 19 ⁷ / ₁₆ x 3 ³ / ₄	6	27.9	5.6
147-004-782	20 x 24 x 4	19 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 3 ³ / ₄	3	17.7	3.8
147-004-800	20 x 25 x 4	19 ⁷ / ₁₆ x 24 ⁷ / ₁₆ x 3 ³ / ₄	3	18.2	3.8
147-004-863	24 x 24 x 4	23 ⁷ / ₁₆ x 23 ⁷ / ₁₆ x 3 ³ / ₄	3	20.0	4.3

Additional sizes available upon request.

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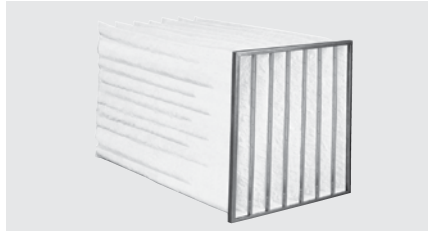
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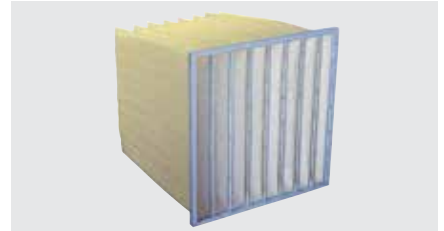
Bag Filters



AmerSeal® Cube Filters
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DriPak 2000®
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Bag Filters

AmerSeal® Cube Filters

Product Overview

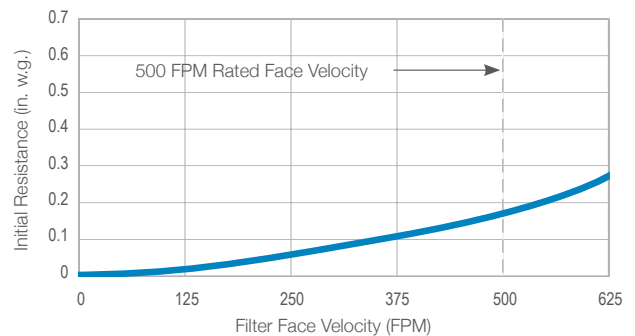
- Extremely low pressure drop with MERV 8 efficiency
- High dust holding capacity for long service life
- Self-sealing design and tapered pockets provide fast, easy installation
- Requires no clips or latches
- Moisture-resistant polyester media
- Available with header



Specifications

Efficiency	MERV 8
Filter Depth	10", 15", 20"
Media Type	Synthetic
Special Size Available	No
Single Header	Yes
Max Operating Temperature	150°F (66°C)

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Rated Airflow Capacity (SCFM)	Std. Pkg. Quantity per Box	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
8 Lbs/Carton Truck					
521-500-304	16 x 20 x 10	875	4	8	2.2
521-600-304	16 x 25 x 10	1,100	4	8	3.3
25 Lbs/Carton UPS (Oversized)					
521-700-304	20 x 20 x 10	1,100	4	25	3.3
521-782-304	20 x 24 x 10	1,325	4	25	4.7
521-800-304	20 x 25 x 10	1,375	4	25	4.7
521-863-304	24 x 24 x 10	1,600	4	25	4.9
10 Lbs/Carton Truck					
521-500-305	16 x 20 x 15	1,100	4	10	2.5
521-600-305	16 x 25 x 15	1,375	4	10	3.3
25 Lbs/Carton UPS (Oversized)					
521-700-305	20 x 20 x 15	1,375	4	25	3.3
521-782-305	20 x 24 x 15	1,650	4	25	4.7
521-800-305	20 x 25 x 15	1,725	4	25	4.7
521-863-305	24 x 24 x 15	2,000	4	25	4.9
13 Lbs/Carton Truck					
521-500-306	16 x 20 x 20	1,375	3	13	2.5
521-600-306	16 x 25 x 20	1,725	3	13	3.3
25 Lbs/Carton UPS (Oversized)					
521-700-306	20 x 20 x 20	1,725	3	25	3.3
521-782-306	20 x 24 x 20	2,075	3	25	4.7
521-800-306	20 x 25 x 20	2,150	3	25	8.3
521-863-306	24 x 24 x 20	2,500	3	25	4.9

Product information listed above is for the two-pocket no header configuration. Single pocket, single header, and additional sizes available upon request.

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Bag Filters

DriPak®

Product Overview

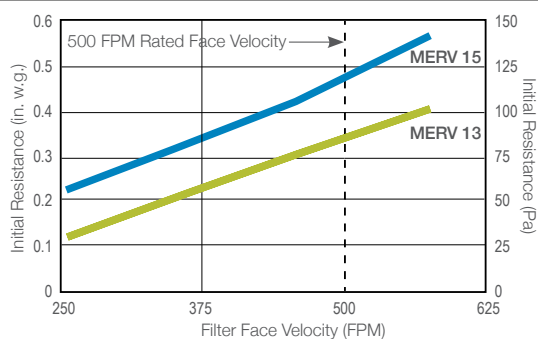
- Micro-fine glass fiber media
- Low resistance and high dust holding capacity
- Available in two efficiencies, MERV 15 and MERV 13
- Engineered for performance reliability



Specifications

Efficiency	MERV 15, MERV 13
Filter Depth	12" -36"
Media Type	Fiberglass
Frame Material	Galvanized Steel
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	150°F (66°C)

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Number of Pockets	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
MERV 15							
729-116-210	24 x 24 x 21	6	46	1,500	4	18.0	5.6
729-135-210	20 x 24 x 21	5	39	1,250	4	16.0	5.6
729-123-210	12 x 24 x 21	3	23	750	4	11.0	2.9
729-118-210	24 x 24 x 21	8	60	2,000	4	22.0	6.1
729-136-210	24 x 20 x 21	6	41	1,250	4	17.0	6.2
729-124-210	12 x 24 x 21	4	30	1,000	4	14.0	2.9
MERV 13							
728-116-210	24 x 24 x 21	6	46	1,500	4	19.0	5.6
728-135-210	20 x 24 x 21	5	39	1,250	4	17.0	5.6
728-123-210	12 x 24 x 21	3	23	750	4	12.0	2.9
728-118-210	24 x 24 x 21	8	60	2,000	4	23.0	6.1
728-136-210	24 x 20 x 21	6	41	1,250	4	18.0	6.2
728-124-210	12 x 24 x 21	4	30	1,000	4	15.0	2.9

Additional sizes, pocket qualities, and depths are available upon request.

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Bag Filters

DriPak® 2000

Product Overview

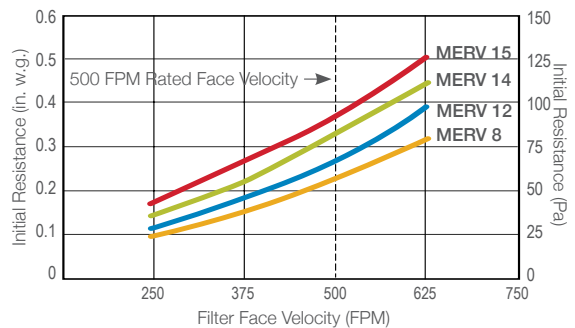
- High-loft, layered, meltblown synthetic media is non-shedding, water-resistant, and improves performance
- Ultrasonically-welded pocket configuration that guarantees complete pocket inflation and eliminates crowding or leakage
- Meltblown synthetic media is stronger than fiberglass
- Ultrasonically-welded pocket spacers and edges
- Available with antimicrobial



Specifications

Efficiency	MERV 15, MERV 14, MERV 12, MERV 8
Filter Depth	12"-36"
Media Type	Synthetic
Frame Material	Galvanized Steel
Antimicrobial Available	Optional
Max Operating Temperature	200°F (93°C)

Initial Resistance vs. Filter Face Velocity



MERV 15, 14 & 12 based on 24" x 24" x 30" - 8 pocket filter
 MERV 8 based on 24" x 24" x 19" - 6 pocket filter

Product Information

Part Number	Nominal Size Inches (W x H x D)	Number of Pockets	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
MERV 15							
709-116-210	24 x 24 x 21	6	45	1,500	4	22.0	5.3
709-135-210	20 x 24 x 21	5	37	1,250	4	19.0	4.9
709-123-210	12 x 24 x 21	3	22	750	4	13.0	2.1
709-118-210	24 x 24 x 21	8	60	2,000	4	32.0	4.5
709-136-210	20 x 24 x 21	6	40	1,250	4	19.0	6.2
709-124-210	12 x 24 x 21	4	30	1,000	4	18.0	2.9
MERV 14							
708-116-210	24 x 24 x 21	6	45	1,500	4	22.0	5.3
708-135-210	20 x 24 x 21	5	37	1,250	4	19.0	4.9
708-123-210	12 x 24 x 21	3	22	750	4	13.0	2.1
708-118-210	24 x 24 x 21	8	60	2,000	4	27.0	4.5
708-136-210	20 x 24 x 21	6	40	1,250	4	19.0	6.2
708-124-210	12 x 24 x 21	4	30	1,000	4	15.0	2.9
MERV 12							
706-116-210	24 x 24 x 21	6	45	1,500	4	22.0	5.3
706-135-210	20 x 24 x 21	5	37	1,250	4	19.0	4.9
706-123-210	12 x 24 x 21	3	22	750	4	13.0	2.1
706-118-210	24 x 24 x 21	8	60	2,000	4	27.0	4.5
706-136-210	24 x 20 x 21	6	40	1,250	4	19.0	6.2
706-124-210	12 x 24 x 21	4	30	1,000	4	15.0	2.9
MERV 8							
704-116-210	24 x 24 x 21	6	45	1,500	4	22.0	5.3
704-135-210	20 x 24 x 21	5	37	1,250	4	19.0	4.9
704-123-210	12 x 24 x 21	3	22	750	4	13.0	2.1
704-118-210	24 x 24 x 21	8	60	2,000	4	27.0	4.5
704-136-210	24 x 20 x 21	6	40	1,250	4	19.0	6.2
704-124-210	12 x 24 x 21	4	30	1,000	4	15.0	2.9

Additional sizes, pocket quantities, and depths are available upon request

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BAG FILTERS

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Box Filters



VariCel® RF
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VariCel® RF NH
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VariCel® II
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VariCel® 2+ SC
(Standard Capacity) Page 92



VariCel® 2+ HC
(High Capacity) Page 93



VariCel®
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BioCel® I
Page 95



VariCel® M-Pak
Page 96



BioCel® M-Pak
Page 97



VariCel® VXL
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VariCel® VXLS
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BioCel® VXL
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BOX FILTERS

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BETTER AIR IS OUR BUSINESS®

Box Filters

VariCel® RF

Product Overview

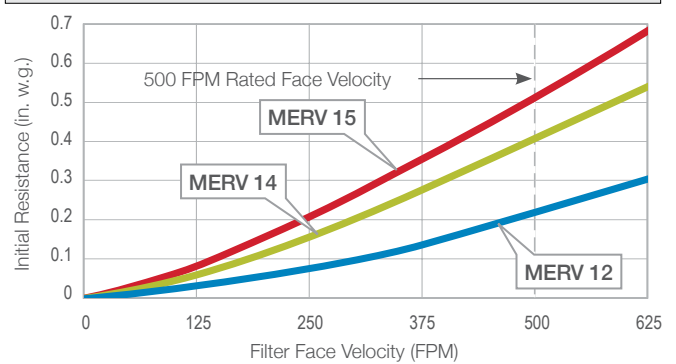
- Designed for improved performance and durability
- Layered synthetic media with plastic pleat spacers on both sides
- Heavy-duty expanded metal media support grid
- Ideal for Variable Air Volume (VAV) systems



Specifications

Efficiency	MERV 15, MERV 14, MERV 12, MERV 11
Filter Depth	12"
Media Type	Synthetic
Frame Material	Galvanized Steel
Separator Style	Plastic
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	200°F (93°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15 Rated Filter Face Velocity: 500 FPM						
3011079-001	24 x 24 x 12	62	2,000	1	24.0	4.3
3011079-002	24 x 20 x 12	52	1,660	1	21.0	3.6
3011079-003	20 x 20 x 12	41	1,400	1	18.0	3.0
3011079-004	24 x 12 x 12*	31	1,000	1	13.0	3.6
MERV 14 Rated Filter Face Velocity: 500 FPM						
3011079-005	24 x 24 x 12	62	2,000	1	24.0	4.3
3011079-006	24 x 20 x 12	52	1,660	1	21.0	3.6
3011079-007	20 x 20 x 12	41	1,400	1	18.0	3.0
3011079-008	24 x 12 x 12	31	1,000	1	13.0	2.2
MERV 12 Rated Filter Face Velocity: 500 FPM						
3011079-009	24 x 24 x 12	62	2,000	1	24.0	3.6
3011079-010	24 x 20 x 12	52	1,660	1	21.0	3.6
3011079-011	20 x 20 x 12	41	1,400	1	18.0	3.0
3011079-012	24 x 12 x 12	31	1,000	1	13.0	3.6
MERV 11 Rated Filter Face Velocity: 500 FPM						
3011079-013	24 x 24 x 12	62	2,000	1	24.0	4.3
3011079-014	24 x 20 x 12	52	1,660	1	21.0	3.6
3011079-015	20 x 20 x 12	41	1,400	1	18.0	3.0
3011079-016	24 x 12 x 12	31	1,000	1	13.0	2.2

Product information listed above is for single header configuration. This product is also available in double header and reverse flow configurations. Additional sizes available upon request.

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BOX FILTERS

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Box Filters

VariCel® RF NH

Product Overview

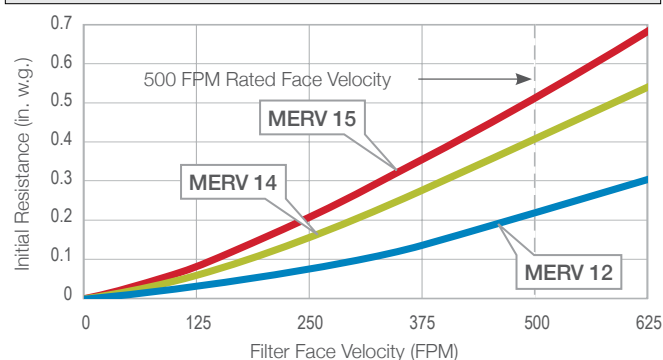
- Metal cell sides and a layered synthetic media pack deliver superior dust holding, moisture resistance, and overall performance
- Meltblown synthetic media is stronger than fiberglass, and is non-shedding and water-resistant
- Designed for improved performance and durability
- Layered synthetic media with plastic pleat spacers on both sides
- Box style - no header construction
- Heavy-duty expanded metal media support grid
- Ideal for Variable Air Volume (VAV) systems



Specifications

Efficiency	MERV 15, MERV 14, MERV 12, MERV 11
Filter Depth	12"
Media Type	Synthetic
Frame Material	Galvanized Steel
Separator Style	Plastic
Special Size Available	No
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	200°F (93°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15 Rated Filter Face Velocity: 500 FPM						
3085230-001	24 x 24 x 12	62	2,000	1	14.0	4.7
3085230-002	24 x 20 x 12	52	1,660	1	11.6	3.9
3085230-003	20 x 20 x 12	41	1,400	1	10.0	2.8
3085230-004	24 x 12 x 12	31	1,000	1	6.8	2.4
MERV 14 Rated Filter Face Velocity: 500 FPM						
3085230-005	24 x 24 x 12	62	2,000	1	14.0	4.7
3085230-006	24 x 20 x 12	52	1,660	1	11.6	3.9
3085230-007	20 x 20 x 12	41	1,400	1	10.0	2.8
3085230-008	24 x 12 x 12	31	1,000	1	6.8	2.4
MERV 12 Rated Filter Face Velocity: 500 FPM						
3085230-009	24 x 24 x 12	62	2,000	1	14.0	4.7
3085230-010	24 x 20 x 12	52	1,660	1	11.6	4.0
3085230-011	20 x 20 x 12	41	1,400	1	10.0	2.8
3085230-012	24 x 12 x 12	31	1,000	1	6.8	2.4
MERV 11 Rated Filter Face Velocity: 500 FPM						
3085230-013	24 x 24 x 12	62	2,000	1	14.0	4.7
3085230-014	24 x 20 x 12	52	1,660	1	11.6	3.9
3085230-015	20 x 20 x 12	41	1,400	1	10.0	2.8
3085230-016	24 x 12 x 12	31	1,000	1	6.8	2.4

Additional sizes available upon request.

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BOX FILTERS

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Box Filters

VariCel® II

Product Overview

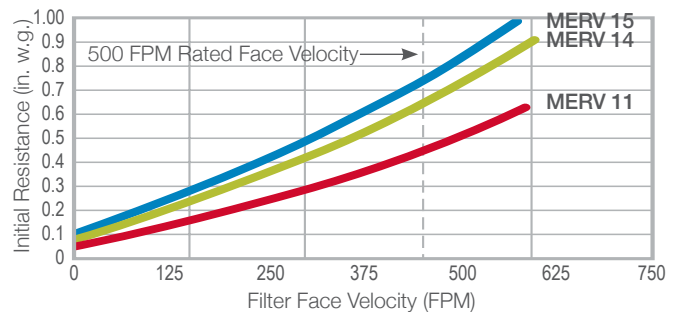
- True high-efficiency filters – only 4" -thick media pack
- Slim-line, mini-pleat design lowers operating costs
- Engineered for a variety of applications
- Easy disposal
- Available with antimicrobial
- Available in three efficiencies: MERV 15, MERV 14, and MERV 11



Specifications

Efficiency	MERV 15, MERV 14, MERV 11
Filter Depth	4"
Media Type	Fiberglass
Frame Material	Beverage Board
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	Yes
Single Header	No
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity (NH Model)



Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15 Rated Filter Face Velocity: 500 FPM						
332-528-008	24 x 24 x 4	119	2,000	4	26.0	6.4
332-528-006	20 x 24 x 4	99	1,650	4	21.0	6.4
332-528-005	20 x 20 x 4	82	1,400	4	18.0	4.6
332-528-001	12 x 24 x 4	58	1,000	4	13.0	3.2
MERV 14 Rated Filter Face Velocity: 500 FPM						
332-510-008	24 x 24 x 4	119	2,000	4	26.0	6.4
332-510-006	20 x 24 x 4	99	1,650	4	21.0	6.4
332-510-005	20 x 20 x 4	82	1,400	4	18.0	16.0
332-510-001	12 x 24 x 4	58	1,000	4	13.0	3.2
MERV 11 Rated Filter Face Velocity: 500 FPM						
332-502-008	24 x 24 x 4	119	2,000	4	26.0	6.4
332-502-006	20 x 24 x 4	99	1,650	4	21.0	6.4
332-502-005	20 x 20 x 4	82	1,400	4	18.0	4.6
332-502-001	12 x 24 x 4	58	1,000	4	13.0	3.2

Additional sizes available upon request.

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BOX FILTERS

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Box Filters

VariCel® 2+SC

Product Overview

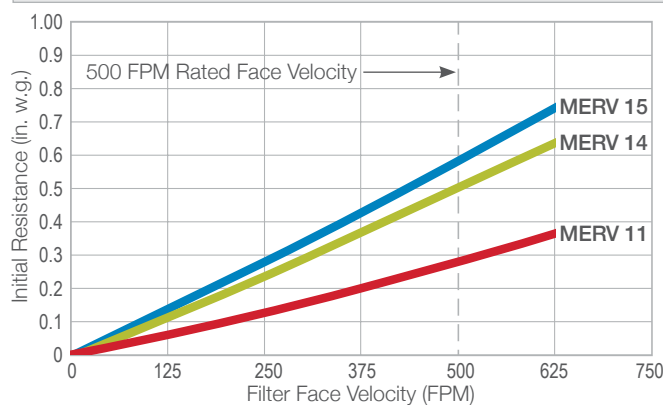
- AAF's exclusive Impress® pleating technology delivers longer life and the lowest initial resistance
- Holds up in harsh environments
- Engineered for a variety of applications
- Slim-line packaging reduces shipping costs and storage space
- Easy handling, installation, removal, and disposal
- Available in three efficiencies: MERV 15, MERV 14, and MERV 11



Specifications

Efficiency	MERV 15, MERV 14, MERV 11
Filter Depth	4"
Media Type	Synthetic
Frame Material	Plastic
Separator Style	Embossed
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity (NH Model)



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15 Rated Filter Face Velocity: 500 FPM						
3102036-908	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	2,000	4	21.0	6.1
3102036-906	20 x 24 x 4	19 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,650	4	17.5	5.2
3102036-905	20 x 20 x 4	19 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	1,400	4	14.6	4.3
3102036-901	12 x 24 x 4	11 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,000	4	14.2	3.2
MERV 14 Rated Filter Face Velocity: 500 FPM						
3102036-808	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	2,000	4	21.0	6.1
3102036-806	20 x 24 x 4	19 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,650	4	17.5	5.2
3102036-805	20 x 20 x 4	19 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	1,400	4	14.6	4.3
3102036-801	12 x 24 x 4	11 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,000	4	14.2	3.2
MERV 11 Rated Filter Face Velocity: 500 FPM						
3102036-608	24 x 24 x 4	23 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	2,000	4	21.0	6.1
3102036-606	20 x 24 x 4	19 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,650	4	17.5	5.2
3102036-605	20 x 20 x 4	19 ³ / ₈ x 19 ³ / ₈ x 3 ³ / ₄	1,400	4	14.6	4.3
3102036-601	12 x 24 x 4	11 ³ / ₈ x 23 ³ / ₈ x 3 ³ / ₄	1,000	4	14.2	3.2

Product information listed above is for box style configuration. This product is also available in single header and reverse flow configurations. Additional sizes available upon request.

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BETTER AIR IS OUR BUSINESS®

Box Filters

VariCel® 2+HC

Product Overview

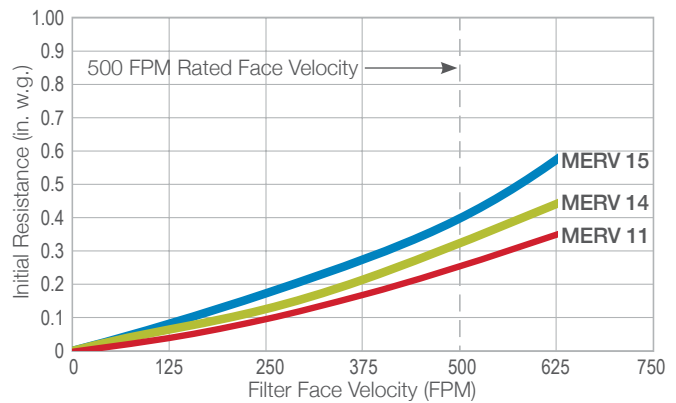
- AAF's exclusive Impress® pleating technology delivers longer life and the lowest initial resistance
- Most energy-efficient 4" filter available
- Engineered for a variety of applications
- Easy handling, installation, removal, and disposal
- Slim-line packaging reduces shipping costs and storage space
- Available in three efficiencies: MERV 15, MERV 14, and MERV 11



Specifications

Efficiency	MERV 15, MERV 14, MERV 11
Filter Depth	4"
Media Type	Synthetic
Frame Material	Plastic
Separator Style	Embossed
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	150°F (66°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity (NH Model)



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15 Rated Filter Face Velocity: 500 FPM						
3102040-908	24 x 24 x 4	23¾ x 23¾ x 3¾	2,000	4	21.0	6.1
3102040-906	20 x 24 x 4	19¾ x 23¾ x 3¾	1,650	4	17.5	5.2
3102040-905	20 x 20 x 4	19¾ x 19¾ x 3¾	1,400	4	14.6	4.3
3102040-901	12 x 24 x 4	11¾ x 23¾ x 3¾	1,000	4	14.2	3.2
MERV 14 Rated Filter Face Velocity: 500 FPM						
3102040-808	24 x 24 x 4	23¾ x 23¾ x 3¾	2,000	4	21.0	6.1
3102040-806	20 x 24 x 4	19¾ x 23¾ x 3¾	1,650	4	17.5	5.2
3102040-805	20 x 20 x 4	19¾ x 19¾ x 3¾	1,400	4	14.6	4.3
3102040-801	12 x 24 x 4	11¾ x 23¾ x 3¾	1,000	4	14.2	3.2
MERV 11 Rated Filter Face Velocity: 500 FPM						
3102040-608	24 x 24 x 4	23¾ x 23¾ x 3¾	2,000	4	21.0	6.1
3102040-606	20 x 24 x 4	19¾ x 23¾ x 3¾	1,650	4	17.5	5.2
3102040-605	20 x 20 x 4	19¾ x 19¾ x 3¾	1,400	4	14.6	4.3
3102040-601	12 x 24 x 4	11¾ x 23¾ x 3¾	1,000	4	14.2	3.2

Product information listed above is for box style configuration. This product is also available in single header and reverse flow configurations. Additional sizes available upon request.

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BOX FILTERS

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Box Filters

VariCel®

Product Overview

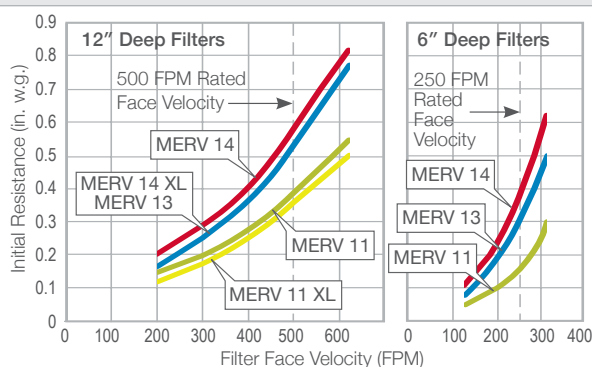
- Dual-density media reduces operating costs
- Excellent performance in difficult operating conditions
- Designed to improve Indoor Air Quality
- Water-resistant media ideal for installations in humid areas, or where exposed to moisture
- MERV 14, MERV 13, and MERV 11 efficiencies
- MERV 14 and MERV 11 available with antimicrobial
- MERV 14 and MERV 13 meet LEED® Project Certification efficiency requirements



Specifications

Efficiency	MERV 14, MERV 13, MERV 11
Filter Depth	6", 12"
Media Type	Fiberglass
Frame Material	Galvanized Steel
Separator Style	Aluminum
Special Size Available	No
Antimicrobial Available	Yes
Single Header	Yes
Max Operating Temperature	350°F (177°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Single Header Standard Sizes						
This product is also available in double header and reverse flow configurations.						
MERV 14 Rated Filter Face Velocity: 500 FPM						
331-946-148	24 x 24 x 12	125	2,000	1	19.0	4.7
331-946-189	20 x 24 x 12	103	1,650	1	16.5	3.6
331-946-136	20 x 20 x 12	84	1,400	1	14.0	3.0
331-946-150	12 x 24 x 12	57	1,000	1	11.5	2.2
MERV 14 Rated Filter Face Velocity: 250 FPM						
331-946-147	24 x 24 x 6	60	1,000	2	21.0	4.7
331-946-188	20 x 24 x 6	49	825	2	18.5	4.0
331-946-135	20 x 20 x 6	40	700	2	16.5	3.3
331-946-149	12 x 24 x 6	27	500	2	13.5	2.4
MERV 13 Rated Filter Face Velocity: 500 FPM						
331-765-148	24 x 24 x 12	105	2,000	1	18.0	4.3
331-765-189	20 x 24 x 12	86	1,650	1	15.5	3.6
331-765-136	20 x 20 x 12	70	1,400	1	13.0	3.0
331-765-150	12 x 24 x 12	47	1,000	1	10.5	2.2
MERV 13 Rated Filter Face Velocity: 250 FPM						
331-765-147	24 x 24 x 6	50	1,000	2	19.5	4.7
331-765-188	20 x 24 x 6	41	825	2	17.0	4.0
331-765-135	20 x 20 x 6	33	700	2	15.0	3.3
331-765-149	12 x 24 x 6	22	500	2	12.0	2.4
MERV 11 Rated Filter Face Velocity: 500 FPM						
331-953-148	24 x 24 x 12	105	2,000	1	18.0	4.3
331-953-189	20 x 24 x 12	86	1,650	1	15.5	3.6
331-953-136	20 x 20 x 12	70	1,400	1	13.0	3.0
331-953-150	12 x 24 x 12	47	1,000	1	10.5	2.2
MERV 11 Rated Filter Face Velocity: 250 FPM						
331-953-147	24 x 24 x 6	50	1,000	2	19.5	4.7
331-953-188	20 x 24 x 6	41	825	2	17.0	4.0
331-953-135	20 x 20 x 6	33	700	2	15.0	3.3
331-953-149	12 x 24 x 6	22	500	2	12.0	2.4

BOX FILTERS

Additional sizes available upon request.

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Box Filters

BioCel® I

Product Overview

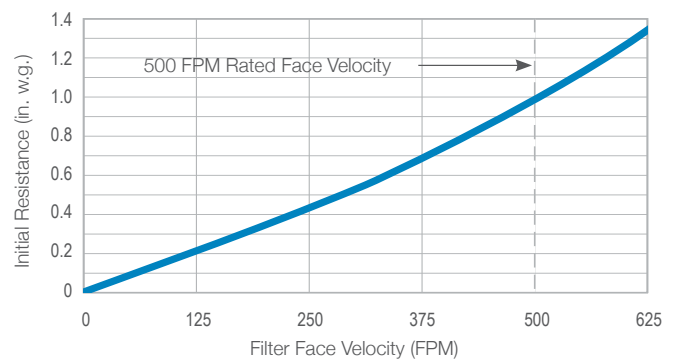
- Rigid all-metal construction and water-resistant media in a supported pleat-type configuration
- Can be used in systems with difficult operating conditions, including:
 - Variable air volume
 - Turbulent airflow
 - Repeated fan shutdown
 - High temperature
 - High humidity
 - Intermittent exposure to water, such as sea coast installations



Specifications

Efficiency	MERV 16
Filter Depth	6", 12"
Media Type	Fiberglass
Frame Material	Galvanized Steel
Separator Style	Aluminum
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	350°F (177°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Drawing Number	Nominal Size Inches (W x H x D)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Single Header MERV 16 Standard Sizes						
Rated Filter Face Velocity: 500 FPM						
510-532-014	105-1357532-14	24 x 24 x 12	2,000	1	20.0	4.3
510-532-012	105-1357532-12	24 x 20 x 12	1,650	1	17.0	3.6
510-532-016	105-1357532-16	12 x 24 x 12	1,000	1	12.0	2.2
Rated Filter Face Velocity: 250 FPM						
510-532-013	105-1357532-13	24 x 24 x 6	1,000	2	22.0	4.7
510-532-011	105-1357532-11	24 x 20 x 6	825	2	19.5	2.0
510-532-015	105-1357532-15	12 x 24 x 6	500	2	14.0	2.4
Double Header MERV 16 Standard Sizes						
Rated Filter Face Velocity: 500 FPM						
511-631-001	105-1357631-1	24 x 24 x 12	2,000	1	21.5	4.3
511-631-007	105-1357631-7	24 x 24 x 12 ¹	2,000	1	21.5	4.3
511-631-003	105-1357631-3	20 x 24 x 12	1,650	1	18.5	3.6
511-631-002	105-1357631-2	12 x 24 x 12	1,000	1	13.0	2.2
Rated Filter Face Velocity: 250 FPM						
511-631-004	105-1357631-4	24 x 24 x 6	1,000	2	24.0	4.7
511-631-008	105-1357631-8	24 x 24 x 6 ¹	1,000	2	24.0	4.7
511-631-006	105-1357631-6	20 x 24 x 6	825	2	21.5	2.0
511-631-005	105-1357631-5	12 x 24 x 6	500	2	15.5	2.4

¹Actual face dimensions are 24" x 24".
Additional sizes available upon request.

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BOX FILTERS

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Box Filters

VariCel® M-Pak

Product Overview

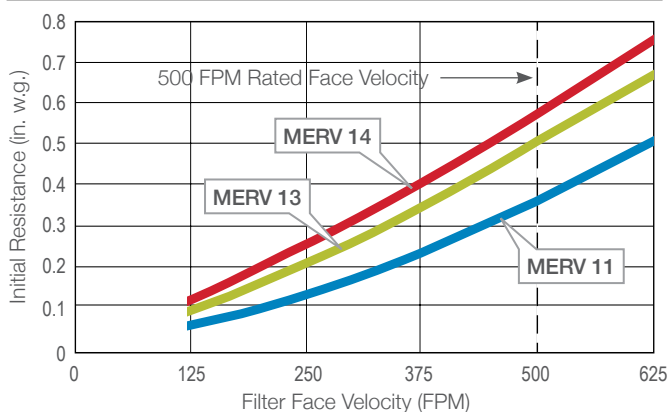
- Delivers comparable efficiency, pressure drop, and overall performance in half the footprint with a “Midi” media pack design
- 6”-deep (nominal) filter with the same media area as a 12”-deep (nominal) filter
- Space-saving design - reduces freight, storage, and handling costs
- Sturdy high impact polystyrene cell sides enclose a fixed media pack
- Fully incinerable
- MERV 14, MERV 13, and MERV 11 efficiencies
- MERV 14 and 11 models available with antimicrobial
- MERV 13 and higher meet LEED® Project Certification efficiency requirements



Specifications

Efficiency	MERV 14, MERV 13, MERV 11
Filter Depth	6”
Media Type	Fiberglass
Frame Material	Plastic
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	Yes
Single Header	Yes
Max Operating Temperature	176°F (80°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Filters are rated at 500 FPM filter face velocity. Recommended final resistance for all VariCel® M-Pak filters is 1.5" w.g.

Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 14 Rated Filter Face Velocity: 500 FPM						
3014883-008	24 x 24 x 6	125	2,000	2	19.0	4.4
3014883-006	20 x 24 x 6	103	1,660	2	16.5	3.7
3014883-005	20 x 20 x 6	84	1,400	2	14.0	3.1
3014883-001	12 x 24 x 6	57	1,000	2	11.5	2.2
MERV 13 Rated Filter Face Velocity: 500 FPM						
3014883-016	24 x 24 x 6	105	2,000	2	18.0	4.4
3014883-014	20 x 24 x 6	86	1,660	2	15.5	3.7
3014883-013	20 x 20 x 6	70	1,400	2	13.0	3.1
3014883-009	12 x 24 x 6	47	1,000	2	10.5	2.2
MERV 11 Rated Filter Face Velocity: 500 FPM						
3014883-024	24 x 24 x 6	105	2,000	2	18.0	4.4
3014883-022	20 x 24 x 6	86	1,660	2	15.5	3.1
3014883-021	20 x 20 x 6	70	1,400	2	13.0	3.1
3014883-017	12 x 24 x 6	47	1,000	2	10.5	2.2

Additional sizes and reverse flow configuration available upon request.

BOX FILTERS

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BETTER AIR IS OUR BUSINESS®

Box Filters

BioCel® M-Pak

Product Overview

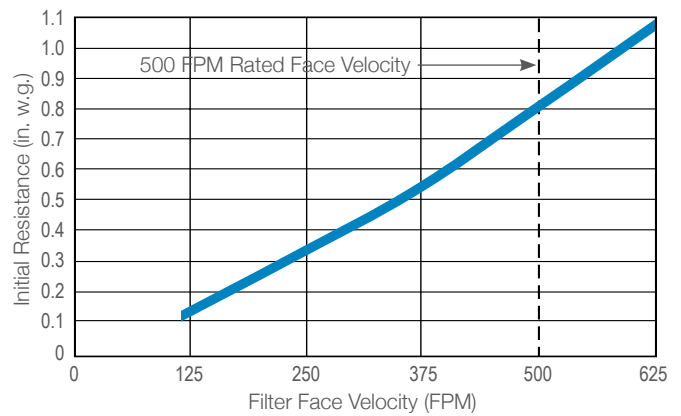
- Space-saving design reduces freight, storage, and handling costs
- 6"-depth filter with the same media area and performance as 12"-deep filters
- Sturdy high impact polystyrene cell sides enclose a fixed media pack
- Fully incinerable
- MERV 16



Specifications

Efficiency	MERV 16
Filter Depth	6"
Media Type	Fiberglass
Frame Material	Plastic
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	176°F (80°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Filters are rated at 500 FPM filter face velocity. Recommended final resistance for all BioCel® M-Pak filters is 2" w.g.

Product Information

Part Number	Nominal Size Inches (W x H x D)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Single Header MERV 16 Standard Sizes					
Rated Filter Face Velocity: 500 FPM					
3016953-007	24 x 24 x 6	2,000	2	20.0	4.4
3016953-006	20 x 25 x 6	1,750	2	18.2	3.9
3016953-005	20 x 24 x 6	1,650	2	17.5	3.7
3016953-004	20 x 20 x 6	1,400	2	15.0	3.1
3016953-003	16 x 25 x 6	1,400	2	15.0	3.1
3016953-002	16 x 20 x 6	1,100	2	13.0	1.4
3016953-001	12 x 24 x 6	1,000	2	12.0	2.2

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Box Filters

VariCel® VXL

Product Overview

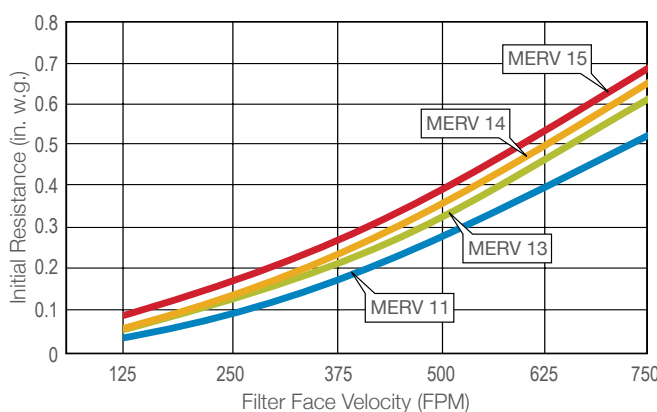
- 50% more media area provides greater airflow capacity and low resistance
- Maximum dust holding capacity extends the life of the filter, minimizing operating costs
- Available in MERV 15, MERV 14, MERV 13, and MERV 11 efficiencies
- Excellent performance in difficult operating conditions
- Can be used in high velocity systems, operating at up to 750 FPM
- Lightweight and easy to install
- Single and double header models
- MERV 15 and MERV 14 available with antimicrobial
- MERV 13 and higher meet LEED® Project Certification efficiency requirements



Specifications

Efficiency	MERV 15, MERV 14, MERV 13, MERV 11
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Plastic
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	Yes
Single Header	Yes
Max Operating Temperature	176°F (80°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Maximum recommended final resistance for all VariCel® VXL filters is 2 in. w.g.

Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15						
3018413-037	20 x 20 x 12	137	1,400	1	11.8	3.3
3018413-001	24 x 12 x 12	88	1,000	1	9.0	2.2
3018413-002	24 x 20 x 12	161	1,650	1	14.5	3.6
3018413-003	24 x 24 x 12	197	2,000	1	17.0	4.3
MERV 14 (95%)						
3018413-039	20 x 20 x 12	137	1,400	1	11.8	3.3
3018413-004	24 x 12 x 12	88	1,000	1	9.0	2.0
3018413-005	24 x 20 x 12	161	1,650	1	14.5	3.6
3018413-006	24 x 24 x 12	197	2,000	1	17.0	4.3
MERV 13 (80%)						
3018413-041	20 x 20 x 12	137	1,400	1	11.8	3.3
3018413-007	24 x 12 x 12	88	1,000	1	9.0	2.2
3018413-008	24 x 20 x 12	161	1,650	1	14.5	3.6
3018413-009	24 x 24 x 12	197	2,000	1	17.0	4.3
MERV 11 (70%)						
3018413-043	20 x 20 x 12	137	1,400	1	11.8	3.3
3018413-010	24 x 12 x 12	88	1,000	1	9.0	2.2
3018413-011	24 x 20 x 12	161	1,650	1	14.5	3.6
3018413-012	24 x 24 x 12	197	2,000	1	17.0	4.3

This product is also available in double header and with antimicrobial configurations.

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Box Filters

VariCel® VXLs

Product Overview

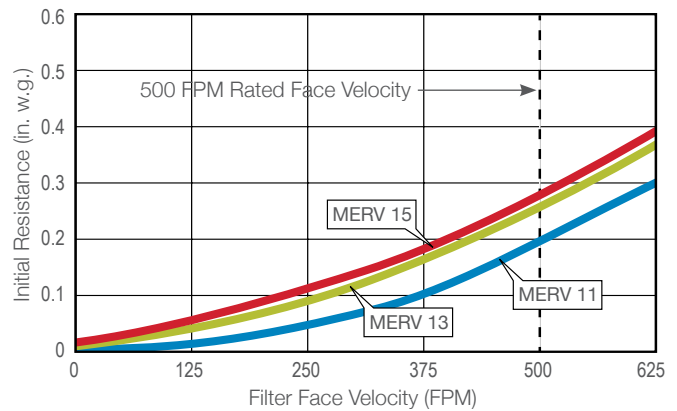
- Delivers superior air quality in difficult operating conditions with turbulent airflow, repeated fan shut-down, or high humidity
- Available in MERV 15, MERV 13, and MERV 11 efficiencies
- Lightweight and easy to install
- MERV 13 and higher meet LEED® Project Certification efficiency requirements



Specifications

Efficiency	MERV 15, MERV 13, MERV 11
Filter Depth	12"
Media Type	Synthetic
Frame Material	Plastic
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	No
Single Header	Yes
Max Operating Temperature	176°F (80°C)
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MERV 15						
3081858-001	24 x 12 x 12	65	1,000	1	8.5	2.4
3081858-002	24 x 20 x 12	120	1,650	1	14.2	3.9
3081858-003	24 x 24 x 12	145	2,000	1	18.0	4.3
MERV 13						
3081858-004	24 x 12 x 12	65	1,000	1	8.5	2.4
3081858-005	24 x 20 x 12	120	1,650	1	14.2	3.9
3081858-006	24 x 24 x 12	145	2,000	1	18.0	4.3
MERV 11						
3081858-007	24 x 12 x 12	65	1,000	1	8.5	2.4
3081858-008	24 x 20 x 12	120	1,650	1	14.2	3.6
3081858-009	24 x 24 x 12	145	2,000	1	18.0	4.3

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Box Filters

BioCel® VXL

Product Overview

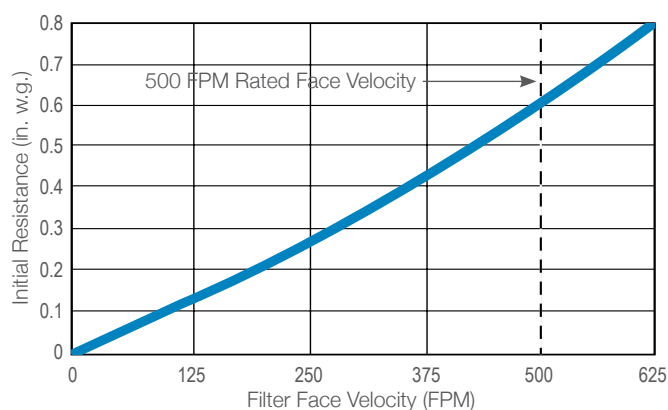
- Engineered to meet the exacting requirements of precision manufacturing operations and laboratories
- Fills the gap between ASHRAE grade high-efficiency filters and ultra-high efficiency HEPA filters
- MERV 16 (ASHRAE Standard 52.2); H10 (EN1882)
- Low initial pressure drop of .60 in. w.g. @ 500 FPM
- 200 square feet of media area
- High impact polystyrene (HIPS) cell sides
- Fully incinerable



Specifications

Efficiency	MERV 16
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Plastic
Separator Style	Gluebead
Special Size Available	No
Antimicrobial Available	Yes
Single Header	Yes
Max Operating Temperature	176°F (80°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Recommended final resistance for all BioCel® VXL filters is 1.5 in. w.g.

Product Information

Part Number	Nominal Size Inches (W x H x D)	Gross Media Area (sq. ft.)	Rated Airflow Capacity (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Single Header MERV 16 Standard Sizes						
No Gaskets						
3027026-001	24 x 12 x 12	88	1,000	1	9.0	2.0
3027026-002	24 x 20 x 12	161	1,650	1	14.5	3.6
3027026-003	24 x 24 x 12	197	2,000	1	17.0	4.0
Gasketing on the Air Leaving Side						
3027026-007	24 x 12 x 12	88	1,000	1	9.0	2.2
3027026-008	24 x 20 x 12	161	1,650	1	14.5	3.6
3027026-009	24 x 24 x 12	197	2,000	1	17.0	4.3
Double Header MERV 16 Standard Sizes						
No Gaskets						
3027026-004	24 x 12 x 12	88	1,000	1	9.0	2.2
3027026-005	24 x 20 x 12	161	1,650	1	14.5	3.6
3027026-006	24 x 24 x 12	197	2,000	1	17.0	4.3
Gasketing on the Air Leaving Side						
3027026-010	24 x 12 x 12	88	1,000	1	9.0	2.4
3027026-011	24 x 20 x 12	161	1,650	1	14.5	3.6
3027026-012	24 x 24 x 12	197	2,000	1	17.0	4.3

BOX FILTERS

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HEPA & ULPA Filters



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AstroCel® I HTP
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AstroPak®
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AstroCel® II (Gasket Seal)
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AstroCel® II (Gel Seal)
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AstroCel® III
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HEPA & ULPA Filters

AstroCel® I Style Code

1. FACE SIZE (Inches) H x W x D

12	8 x 8 x 5 ¹ / ₈	
13	12 x 12 x 5 ¹ / ₈	
14	24 x 24 x 5 ¹ / ₈	
15	24 x 24 x 11 ¹ / ₂	
16	24 x 30 x 11 ¹ / ₂	
17	24 x 48 x 5 ¹ / ₈	
18	24 x 72 x 5 ¹ / ₈	
19	SPECIAL SIZE	
31	12 x 12 x 11 ¹ / ₂	
32	12 x 24 x 11 ¹ / ₂	
33	15 ³ / ₈ x 19 ³ / ₈ x 5 ¹ / ₈	
34	15 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	
35	20 ⁷ / ₈ x 20 ⁷ / ₈ x 5 ¹ / ₈	
36	20 ⁷ / ₈ x 20 ⁷ / ₈ x 11 ¹ / ₂	
37	20 ⁷ / ₈ x 44 ⁷ / ₈ x 5 ¹ / ₈	
38	23 ¹ / ₄ x 23 ¹ / ₄ x 5 ¹ / ₈	
41	23 ³ / ₈ x 23 ³ / ₈ x 5 ¹ / ₈	
42	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	
43	24 x 12 x 5 ¹ / ₈	
44	24 x 12 x 11 ¹ / ₂	
45	24 x 30 x 5 ¹ / ₈	
46	24 x 36 x 5 ¹ / ₈	
47	24 x 60 x 5 ¹ / ₈	
48	24 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	
51	30 x 30 x 5 ¹ / ₈	
52	30 x 36 x 5 ¹ / ₈	
53	30 x 48 x 5 ¹ / ₈	
54	30 x 60 x 5 ¹ / ₈	
55	30 x 72 x 5 ¹ / ₈	
56	36 x 24 x 5 ¹ / ₈	
57	36 x 30 x 5 ¹ / ₈	
58	36 x 36 x 5 ¹ / ₈	
61	36 x 60 x 5 ¹ / ₈	
62	36 x 72 x 5 ¹ / ₈	
63	23 ¹ / ₄ x 47 ¹ / ₄ x 5 ¹ / ₈	
64	30 x 24 x 5 ¹ / ₈	
65	36 x 48 x 5 ¹ / ₈	
66	12 x 24 x 5 ¹ / ₈	
67	23 ¹ / ₄ x 41 ¹ / ₄ x 5 ¹ / ₈	
68	23 ¹ / ₄ x 29 ¹ / ₄ x 5 ¹ / ₈	
69	23 ¹ / ₄ x 35 ¹ / ₄ x 5 ¹ / ₈	
91	11 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	
92	23 ³ / ₈ x 11 ³ / ₈ x 11 ¹ / ₂	

2. MEDIA WATERPROOF MICROGLASS FIBER

		°T Limit
A	99.97% or 99.99%	1000°F
D	BioCel 95%	1000°F
E	99.999%	1000°F
N	Radiation resistant 99.97%	1000°F
Z	SPECIAL MEDIA	-
I	Antimicrobial Treated	

3. CELL SIDES

METAL GEL SEAL		°T Limit
10	Galvanized Steel	
16	304 Stainless Steel	
19	Anodized Extruded Aluminum	
METAL WITH DOUBLE BOX FLANGE		
20	Galvanized Steel	
26	304 Stainless Steel	
29	Mill Finish Aluminum	
EXTRUDED ALUMINUM BOX STYLE		
40	Alum "C" Channel 5-7/8" Deep	
WOOD		
71	Plywood	200°F
72	Fire Retardant Plywood	200°F
73	Particle Board	200°F
74	Fire Retardant Particle Board	200°F
75	Plywood, w/groove for Gel Seal	200°F
76	Fire Retardant Plywood, w/groove for Gel Seal	200°F
99	SPECIAL CELL SIDES	

4. SEPARATORS

H	High Capacity Aluminum	
J	Aluminum	
V	Vinyl Coated Aluminum	250°F
W	High Capacity Vinyl Coated Aluminum	250°F
Z	SPECIAL SEPARATORS	

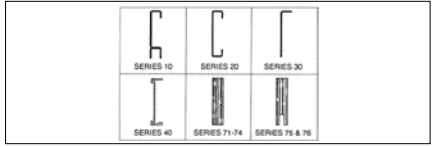
5. BOND MATERIAL

1	Fire Retardant Polyurethane	200°F
2	Polyurethane (40 Series only)	200°F
4	White Silicone	400°F
5	Red Silicone	500°F
9	SPECIAL BOND	

6. GASKET/SEAL MATERIAL

F	Fluid Seal trough @ 3/4" deep, includes Silicone Sealant	
L	Aluminum Skirt @ .063" thick	
P	None	
T	Neoprene Sponge, RE-43-E1 Grade (1/4"x3/4" w/butt joints)	175°F
U	Poron (1/4"x3/4" w/dovetail joints)	
V	Poron (1/4"x3/4" w/butt joints)	
Y	Silicone (1/4"x3/4" w/butt joints)	500°F
Z	SPECIAL GASKET MATERIAL	

General Notes: The purpose of this style codes for identification of components used in standard AstroCel I HEPA filters. Because of inherent compatibility limitations, the style code should not be used to arbitrarily "build" a filter with random components. First dimension of filter is height, or direction of separators.



7. GASKET LOCATION

0	No Gaskets
1	Gasket - Air Entering Side
2	Gasket - Air Leaving Side (or skirt oneface, or gel sealant installed in trough)
3	Gasket Both Faces
4	SPECIAL REQUIREMENTS
5	Extractor Clips (Gel sealant installed in trough)

8. ACCEPTANCE LEVEL

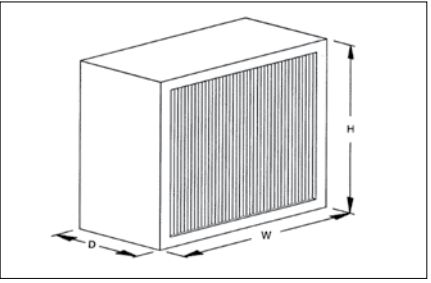
A	99.97% on PAO	(A)
B	99.97% PAO - Shroud tested at 100% and 20% flow - no media patching is permitted (military)	(A,N)
E	SPECIAL INSPECTION REQUIRED	
F	BioCel only - 95% on 0.3 mm	(D)
G	99.99% on 0.3 mm PSL	(A)
H	Scan Tested (99.99%)	(A)
J	99.999% on 0.3 mm PSL	(E)
K	Scan Tested (99.999%)	(E)
M	Scan Tested @ 99.9995% on .10 to .20 mm ambient particles + scan tested	(E)
R	99.99% PAO	(A)
S	Cold PAO hand scan (99.99%)	(A)

Note: Letter in parentheses indicates the media type identified in Section 2.

9. FACEGUARD LOCATION & UL 586 LABEL

0	No Faceguard, no UL Label
1	Faceguard upstream side only
2	Faceguard downstream side only
3	Faceguard both sides, no UL Label
4	SPECIAL (e.g. faceguard must be located with respect to gasket)
5	No faceguard, U.L Label
8	Faceguards both sides, UL Label

Note: Standard Faceguards: Flattened expanded galvanized metal for std-cap filters and 4x4 mesh galv. hardware cloth for hi-cap filters.



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HEPA & ULPA Filters

AstroCel® I

Product Overview

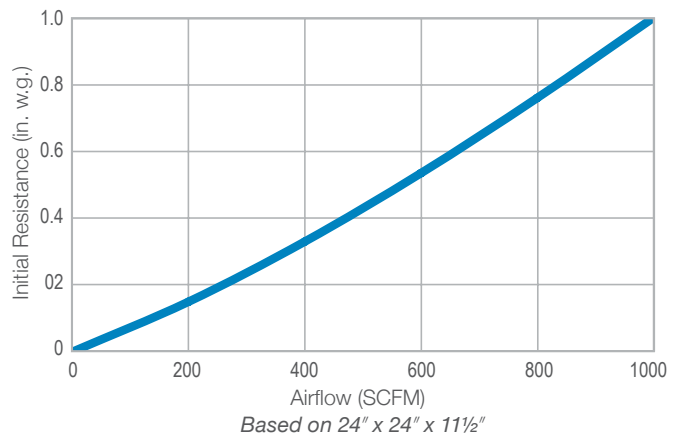
- Individually tested for certified performance
- Available in a variety of cell sides and efficiencies
- Available in gasket and gel seal



Specifications

Efficiency	HEPA ULPA
Filter Depth	6", 12"
Media Type	Fiberglass
Frame Material	Wood, Metal
Separator Style	Aluminum
Special Size Available	Yes
Antimicrobial Available	Optional
Single Header	No
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Style Code	Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.0" w.g.	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Efficiency
GALVANIZED STEEL - ONE GASKET Rated Filter Face Velocity: 260 FPM							
560-205-105	15A20J1T2A5	24 x 24 x 11½	1,050	1	40.0	4.5	99.97%
560-205-103	42A20J1T2A5	23¾ x 23¾ x 11½	1,000	1	40.0	4.3	99.97%
560-205-106	16A20J1T2A5	24 x 30 x 11½	1,350	1	45.0	5.6	99.97%
ALUMINUM - ONE GASKET Rated Filter Face Velocity: 260 FPM							
560-295-105	15A29J1T2A5	24 x 24 x 11½	1,050	1	40.0	4.5	99.97%
560-295-103	42A29J1T2A5	23¾ x 23¾ x 11½	1,000	1	40.0	4.3	99.97%
GALVANIZED STEEL - ONE GASKET Rated Filter Face Velocity: 260 FPM							
566-205-205	15A20J1T2G5	24 x 24 x 11½	1,050	1	40.0	4.0	99.99%
566-205-203	42A20J1T2G5	23¾ x 23¾ x 11½	1,000	1	40.0	4.3	99.99%
566-205-206	16A20J1T2G5	24 x 30 x 11½	1,350	1	45.0	5.8	99.99%
ALUMINUM - ONE GASKET Rated Filter Face Velocity: 260 FPM							
566-295-205	15A29J1T2G5	24 x 24 x 11½	1,050	1	40.0	4.5	99.99%
566-295-206	16A29J1T2G5	24 x 30 x 11½	1,350	1	45.0	5.6	99.99%

Additional sizes and gasket options available upon request. Also available with wood cell sides and with antimicrobial.

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HEPA & ULPA Filters

AstroCel® I HCX

Product Overview

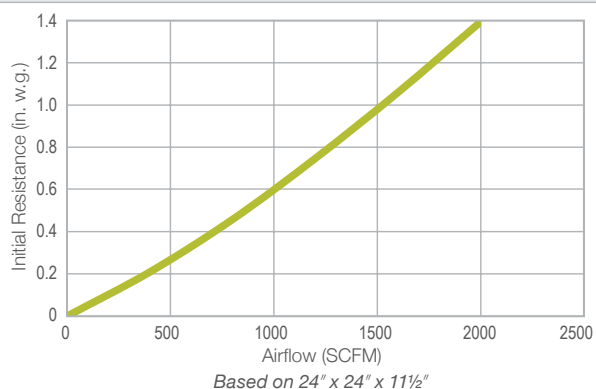
- Individually tested for certified performance
- Available in a variety of cell sides and efficiencies
- High capacity option for higher airflow (500 FPM)
- Available in gasket and gel seal



Specifications

Efficiency	HEPA ULPA
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Wood, Metal
Separator Style	Aluminum
Special Size Available	Yes
Antimicrobial Available	Optional
Single Header	No
Max Operating Temperature	175°F (79°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Style Code	Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.4" w.g.	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Efficiency
STAINLESS STEEL - ONE GASKET							
550-265-005	15A26H1T2A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-265-004	44A26H1T2A0	24 x 12 x 11½	1,000	2	46.0	2.4	99.97%
ALUMINUM - ONE GASKET							
550-295-005	15A29H1T2A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-295-004	44A29H1T2A0	24 x 12 x 11½	1,000	2	46.0	2.4	99.97%
GALVANIZED STEEL - ONE GASKET							
550-205-005	15A20H1T2A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-205-004	44A20H1T2A0	24 x 12 x 11½	1,000	2	46.0	4.5	99.97%
STAINLESS STEEL - NO GASKET							
550-265-205	15A26H1P0A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-265-204	44A26H1P0A0	24 x 12 x 11½	1,000	2	46.0	0.1	99.97%
ALUMINUM - NO GASKET							
550-295-205	15A29H1P0A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-295-204	44A29H1P0A0	24 x 12 x 11½	1,000	2	46.0	#N/A	99.97%
GALVANIZED STEEL - NO GASKET							
550-205-205	15A20H1P0A0	24 x 24 x 11½	2,000	1	42.0	4.5	99.97%
550-205-204	44A20H1P0A0	24 x 12 x 11½	1,000	2	46.0	2.4	99.97%
STAINLESS STEEL - ONE GASKET							
557-265-305	15A26H1T2H0	24 x 24 x 11½	2,000	1	42.0	4.5	99.99%
557-265-304	44A26H1T2H0	24 x 12 x 11½	1,000	2	46.0	4.0	99.99%
ALUMINUM - ONE GASKET							
557-295-305	15A29H1T2H0	24 x 24 x 11½	2,000	1	42.0	4.5	99.99%
557-295-304	44A29H1T2H0	24 x 12 x 11½	1,000	2	46.0	2.4	99.99%
GALVANIZED STEEL - ONE GASKET							
557-205-305	15A20H1T2H0	24 x 24 x 11½	2,000	1	42.0	4.5	99.99%
557-205-304	44A20H1T2H0	24 x 12 x 11½	1,000	2	46.0	2.4	99.99%
GALVANIZED STEEL - NO GASKET							
557-205-405	15A20H1P0H0	24 x 24 x 11½	2,000	1	42.0	4.5	99.99%
557-205-404	44A20H1P0H0	24 x 12 x 11½	1,000	2	46.0	2.4	99.99%

Additional sizes and gasket options available upon request. Also available in stainless steel and aluminum with no gasket.

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BETTER AIR IS OUR BUSINESS®

HEPA & ULPA Filters

AstroCel® I HT (400°, 500°)

Product Overview

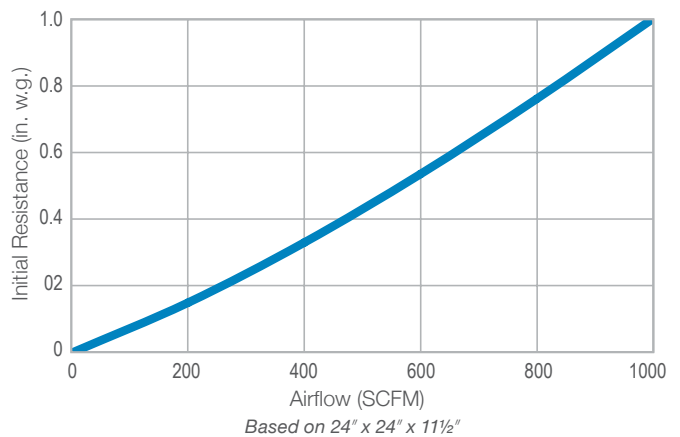
- Individually tested for certified performance
- Available in a variety of metal cell sides and efficiencies
- High temperature models available up to 500°F
- High capacity option for higher airflow (500 FPM)
- Available in gasket seal



Specifications

Efficiency	HEPA ULPA
Filter Depth	6", 12"
Media Type	Fiberglass
Frame Material	Metal
Separator Style	Aluminum
Special Size Available	Yes
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	500°F (260°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Style Code	Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.0" w.g.	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Type	Efficiency
400°F (204°C) 26 STAINLESS STEEL - ONE GASKET - WHITE RTV BOND								
560-264-005	15A26J4Y2A0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-400	99.97%
400°F (204°C) 29 ALUMINUM - ONE GASKET - WHITE RTV BOND								
560-294-005	15A29J4Y2A0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-400	99.97%
500°F (260°C) 26 STAINLESS STEEL - ONE GASKET - RED RTV BOND								
560-266-005	15A26J5Y2A0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-500	99.97%
500°F (260°C) 29 ALUMINUM - ONE GASKET - RED RTV BOND								
560-296-005	15A29J5Y2A0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-500	99.97%
400°F (204°C) 26 STAINLESS STEEL - ONE GASKET - WHITE RTV BOND								
567-264-005	15A26J4Y2H0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-400	99.99%
400°F (204°C) 29 ALUMINUM - ONE GASKET - WHITE RTV BOND								
567-294-005	15A29J4Y2H0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-400	99.99%
500°F (260°C) 26 STAINLESS STEEL - ONE GASKET - RED RTV BOND								
567-266-005	15A26J5Y2H0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-500	99.99%
500°F (260°C) 29 ALUMINUM - ONE GASKET - RED RTV BOND								
567-296-005	15A29J5Y2H0	24 x 24 x 11½	1,050	1	40.0	5.3	HT-500	99.99%

Additional sizes available upon request.

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HEPA & ULPA Filters

AstroCel® I HT (750°)

Product Overview

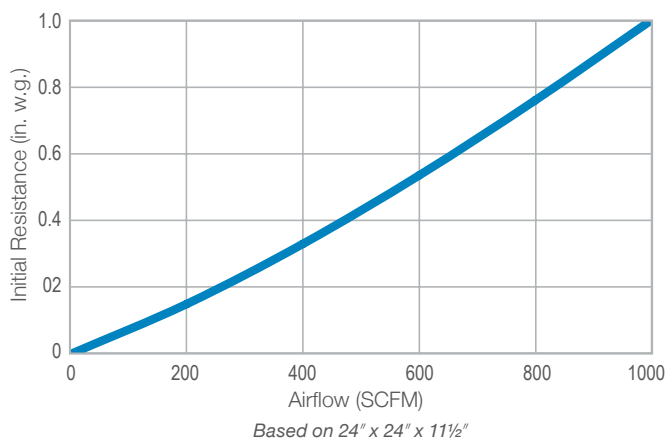
- Individually tested for certified performance
- 99.97% efficiency
- High temperature up to 750°F
- High capacity option for higher airflow (500 FPM)
- Available in gasket seal



Specifications

Efficiency	HEPA ULPA
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Metal
Separator Style	Aluminum
Special Size Available	Yes
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	750°F (399°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Reference Drawing	Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.0" w.g.	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Efficiency
750°F (399°C) STAINLESS STEEL - ONE GASKET - BLACK CEMENT BOND Rated Filter Face Velocity: 260 FPM							
560-614-001	1602614-1	24 x 24 x 11½	1,050	1	40.0	5.3	99.97%

*The HT-750 AstroCel I is constructed with box type stainless steel cell sides. Additional sizes available upon request.

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HEPA & ULPA Filters

Astrocel® I HTP

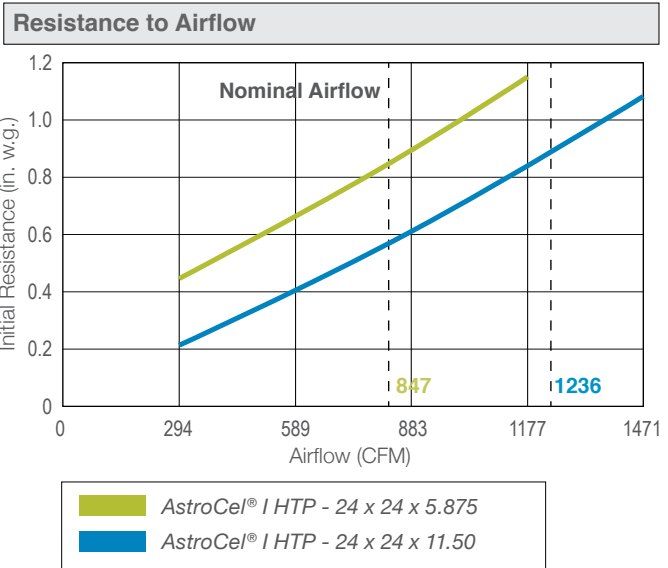
Product Overview

- Designed to withstand the intense thermal stress of repeated heating and cooling
- Elastic fiberglass sealant eliminates cracking, shedding, and leaking seen in competitive filters with ceramic sealant
- Stainless steel separators reduce particle shedding versus competitive aluminum separators
- Maximum continuous operating temperature of 662°F (350°C); Up to 752°F (400°C) for up to one hour
- Robust design leads to better durability and longer life



Specifications

Efficiency	HEPA
Filter Depth	6", 12"
Media Type	Fiberglass
Frame Material	Stainless Steel
Separator Style	Steel
Special Size Available	Yes
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	752°F (385°C)



Tests performed under ambient conditions (68°F).

Product Information

Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.0" w.g.	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
24 x 24 x 5½	847	1	29	2.4
24 x 24 x 11½	1236	1	48	4.5

Additional sizes and part number information available upon request.

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HEPA & ULPA Filters

AstroPak®

Product Overview

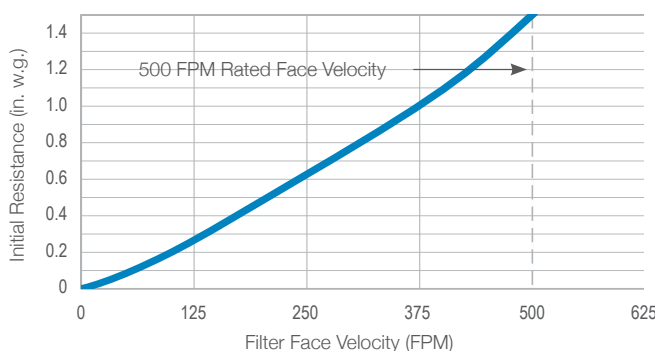
- Individually tested for certified performance
- Hot-melt separator-style glass media pack
- No metal in airstream
- Particle board frame
- Gasket seal
- 99.97% on 0.3 micron particles



Specifications

Efficiency	HEPA
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Wood
Separator Style	Hot Melt
Special Size Available	No
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	175°F (79°C)

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Actual Size Inches (W x H x D)	Rated Airflow (SCFM)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
MODEL 1000 with Gaskets on the Air Leaving Side					
3024635-001	24 x 24 x 11½	1000 @ 1.1" w.g.	1	30.0	4.5
MODEL 1000 with Gaskets on the Air Entering Side					
3024635-002	24 x 24 x 11½	1000 @ 1.1" w.g.	1	30.0	4.5
MODEL 2000 HIGH CAPACITY with Gaskets on the Air Leaving Side					
3024619-001	24 x 24 x 11½	2000 @ 1.5" w.g.	1	35.0	4.5
MODEL 2000 HIGH CAPACITY with Gaskets on the Air Entering Side					
3024619-002	24 x 24 x 11½	2000 @ 1.5" w.g.	1	35.0	4.5

Additional sizes available upon request.

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HEPA & ULPA Filters

Astrocel® II Style Code

1. FACE SIZE (Inches) H x W x D

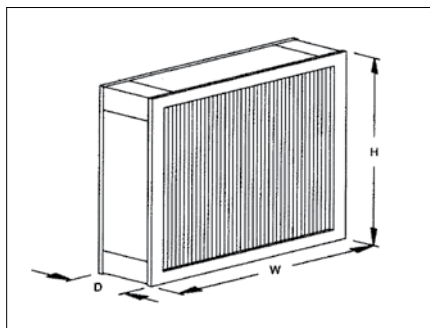
12	8 x 8	43	24 x 12
13	12 x 12	45	24 x 30
14	24 x 24	46	24 x 36
17	24 x 48	47	24 x 60
18	24 x 72	51	30 x 30
21	23 x 47	52	30 x 36
22	23 x 41	53	30 x 48
23	23 x 23	54	30 x 60
24	23½ x 47½	55	30 x 72
26	23½ x 23½	58	36 x 36
27	21½ x 19½	61	36 x 60
28	21½ x 43½	62	36 x 72
29	SPECIAL SIZE	63	23¼ x 47¼
33	15½ x 19½	65	36 x 48
35	20½ x 20½	67	23¼ x 41¼
37	20½ x 44½	68	23¼ x 29¼
38	23¼ x 23¼	69	23¼ x 35¼
41	23½ x 23½		

2. MEDIA (WATERPROOF MICROGLASS FIBER)

		°T Limit
A	99.97% or 99.99%	1000°F
D	BioCel 95%	1000°F
E	ULPA 99.999% or 99.9995%	1000°F
Z	SPECIAL MEDIA	-

3. CELL SIDES

40 Series (2", 3", 4" Deep Media Pack)	
40	"C" Channel (5½" overall depth)
50 Series (2", 3" Deep Media Pack)	
55	Gel Seal (3¾" overall depth with Gel Seal) (Pharmagel)
57	¾" Knife edge (4¼" overall depth)
59	Gasket Seal (3¾" overall depth)
60 Series (2", 3", 4" Deep Media Pack)	
65	Gel Seal (4¾" overall depth) with Gel Seal - Pharmagel)
67	¾" Knife edge (5¼" overall depth)
68	2¼" Knife edge (6¾" overall depth)
69	Gasket Seal (4¾" overall depth)



3. CELL SIDES

80 Series (2" Deep Media Pack)	
85	Gel Seal (2¾" overall depth) with Gel Seal - Pharmagel)
86	304 Stainless Steel (2¾" overall depth)
87	¾" Knife Edge (3¼" overall depth)
89	Gasket Seal (2¾" overall depth)
99	SPECIAL

NOTE: All cell sides are extruded anodized aluminum unless otherwise noted.

4. PACK DEPTH (Ribbon Separators)

A	2" Media Pack
G	2½" Media Pack
B	3" Media Pack
C	3¼" Media Pack
D	3½" Media Pack
E	3¾" Media Pack
F	4" Media Pack
X	SPECIAL DEPTH

5. BOND MATERIAL

		°T Limit
2	Polyurethane Elastomer	200°F
9	SPECIAL BOND	

6. GASKET MATERIAL

P	None	
T	Neoprene sponge, SCE-43 Grade	225°F
U	Poron (¼" x ¾" w/dovetail joints)	
V	Poron (¼" x ¾" w/butt joints)	
Z	SPECIAL GASKET MATERIAL	

Note: Standard gasket is ¼" x ¾" with butt joints

7. GASKET LOCATION

0	No gaskets required
1	Upstream only
2	Downstream only
3	Both faces
4	SPECIAL REQUIREMENT

8. ACCEPTANCE LEVEL

A	99.97% on PAO	(A)
E	SPECIAL INSPECTION REQUIRED	
F	BioCel only - 95% on 0.3 mm	(D)
G	99.99% on 0.3 mm PSL	(A)
H	Scan Tested (99.99%)	(A)
J	99.999% on 0.3 mm PSL	(E)
K	Scan Tested (99.999%)	(E)
M	Scan Tested @ 99.9995% on .10 to .20 mm ambient particles + scan tested at 100 FPM	(E)
P	Autoscan (99.9995% on MPPS, PSL)	
R	99.99% PAO	(A)
S	Cold PAO hand scan (99.99%)	(A)

Note: Letter in parentheses indicates the media type identified in Section 2.

9. FACEGUARD LOCATION & UL 586 LABEL

0	No Faceguard, no UL Label
1	Faceguard upstream side only
2	Faceguard downstream side only
3	Faceguard both sides, no UL Label
4	SPECIAL FACEGUARDS
5	UL Label no faceguard
6	UL Label w/upstream faceguard
7	UL Label w/downstream faceguard
8	UL Label w/two faceguards

Note: Standard faceguard is flattened expanded metal painted white.

General Notes: The purpose of this style code is for identification of components used in standard catalogued AstroCel® II HEPA filters. Because of inherent compatibility limitations, the style code should not be used to arbitrarily "build" a filter incorporating random components. First dimension of filter is height, or direction of separators.

	2" Pack Depth Series 80	3" Pack Depth series 50	4" Pack Depth Series 60	Series 40
Gel Seal	2¾ 85	3¾ 55	4¾ 65	
¾" Knife Edge	3¼ 87	4¼ 57	5¼ 67	
Channel Type (Gasket Seal)	2¾ 89	3¾ 59	4¾ 69	5¾ 40
2 ¼" Knife Edge	4¾ 88		6¾ 68	
304 Stainless Steel	2¾ 86			

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HEPA & ULPA Filters

AstroCel® II (Gasket Seal)

Product Overview

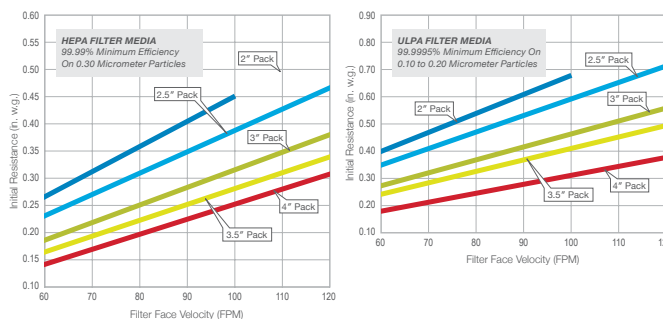
- Individually tested for certified performance
- Reduces operating costs with lowest possible pressure drop from microglass media
- Gasket seal design
- Available with media ribbon or hot melt separators
- Available in a range of efficiencies
- Lightweight and compact



Specifications

Efficiency	HEPA ULPA
Media Type	Fiberglass
Frame Material	Aluminum
Separator Style	Hot Melt
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Filter Depth	Various
Air Filter Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Style Code	Nominal Size (Feet)	Actual Size Inches (H x W x D)	Rated Airflow (SCFM) 100 FPM	Std. Pkg. Qty	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Cell Sides	Media Pack
99.99% Scanned (H)									
577-890-004	43A89A2T2H0	2 x 1	24 x 12 x 2¾	165	1	18.0	0.7	2¾ (89)	2" (A)
577-890-005	14A89A2T2H0	2 x 2	24 x 24 x 2¾	350	1	21.0	1.4	2¾ (89)	2" (A)
577-890-007	46A89A2T2H0	2 x 3	24 x 36 x 2¾	540	1	24.0	2.0	2¾ (89)	2" (A)
577-890-008	17A89A2T2H0	2 x 4	24 x 48 x 2¾	725	1	28.0	2.7	2¾ (89)	2" (A)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-890-004	43E89A2T2M0	2 x 1	24 x 12 x 2¾	165	1	18.0	#N/A	2¾ (89)	2" (A)
579-890-005	14E89A2T2M0	2 x 2	24 x 24 x 2¾	350	1	21.0	1.4	2¾ (89)	2" (A)
579-890-007	46E89A2T2M0	2 x 3	24 x 36 x 2¾	540	1	24.0	3.3	2¾ (89)	2" (A)
579-890-008	17E89A2T2M0	2 x 4	24 x 48 x 2¾	725	1	28.0	2.7	2¾ (89)	2" (A)
99.99% Efficient on 0.3 micron - Scan Tested (H)									
577-590-004	43A59B2T2H0	2 x 1	24 x 12 x 3¾	165	1	19.0	0.9	3¾ (59)	3" (B)
577-590-005	14A59B2T2H0	2 x 2	24 x 24 x 3¾	350	1	24.0	1.7	3¾ (59)	3" (B)
577-590-007	46A59B2T2H0	2 x 3	24 x 36 x 3¾	540	1	26.0	1.7	3¾ (59)	3" (B)
577-590-008	17A59B2T2H0	2 x 4	24 x 48 x 3¾	725	1	31.0	3.4	3¾ (59)	3" (B)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-590-004	43E59B2T2M0	2 x 1	24 x 12 x 3¾	165	1	19.0	#N/A	3¾ (59)	3" (B)
579-590-005	14E59B2T2M0	2 x 2	24 x 24 x 3¾	350	1	24.0	1.7	3¾ (59)	3" (B)
579-590-007	46E59B2T2M0	2 x 3	24 x 36 x 3¾	540	1	26.0	#N/A	3¾ (59)	3" (B)
579-590-008	17E59B2T2M0	2 x 4	24 x 48 x 3¾	725	1	31.0	3.4	3¾ (59)	3" (B)
99.99% Efficient on 0.3 micron - Scan Tested (H)									
577-690-004	43A69F2T2H0	2 x 1	24 x 12 x 4¾	165	1	20.0	1.2	4¾ (69)	4" (F)
577-690-005	14A69F2T2H0	2 x 2	24 x 24 x 4¾	350	1	26.0	2.1	4¾ (69)	4" (F)
577-690-007	46A69F2T2H0	2 x 3	24 x 36 x 4¾	540	1	30.0	3.1	4¾ (69)	4" (F)
577-690-008	17A69F2T2H0	2 x 4	24 x 48 x 4¾	725	1	36.0	4.1	4¾ (69)	4" (F)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-690-004	43E69F2T2M0	2 x 1	24 x 12 x 4¾	165	1	20.0	#N/A	4¾ (69)	4" (F)
579-690-005	14E69F2T2M0	2 x 2	24 x 24 x 4¾	350	1	26.0	2.1	4¾ (69)	4" (F)
579-690-007	46E69F2T2M0	2 x 3	24 x 36 x 4¾	540	1	30.0	#N/A	4¾ (69)	4" (F)
579-690-008	17E69F2T2M0	2 x 4	24 x 48 x 4¾	725	1	36.0	4.1	4¾ (69)	4" (F)

Additional sizes available upon request.

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HEPA & ULPA Filters

AstroCel® II (Knife-Edge)

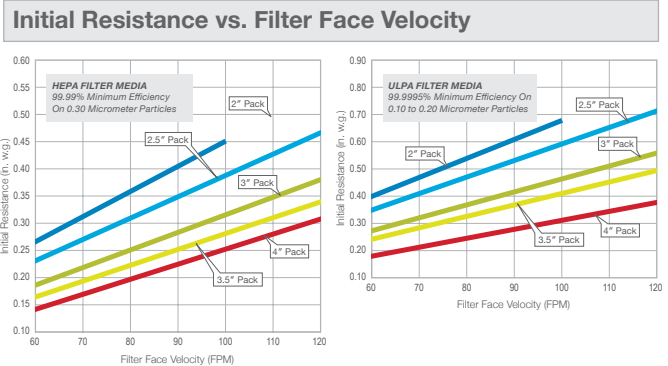
Product Overview

- Individually tested for certified performance
- Reduces operating costs with lowest possible pressure drop from microglass media
- Knife-edge design
- Available with media ribbon or hot melt separators
- Available in a range of efficiencies
- Lightweight and compact



Specifications

Efficiency	HEPA ULPA
Media Type	Fiberglass
Frame Material	Aluminum
Separator Style	Hot Melt
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Filter Depth	Various
Air Filter Certification	UL 900



Product Information

Part Number	Style Code	Nominal Size (Feet)	Actual Size Inches (H x W x D)	Rated Airflow (SCFM) 100 FPM	Std. Pkg. Qty	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.	Cell Sides	Media Pack
99.99% Efficient on 0.3 micron - Scan Tested (H)									
577-870-023	23A87A2POH0	2 x 2	23 x 23 x 3¼	320	1	16.0	#N/A	3¼" (87)	2" (A)
577-870-022	22A87A2POH0	2 x 3.5	23 x 41 x 3¼	600	1	26.0	#N/A	3¼" (87)	2" (A)
577-870-021	21A87A2POH0	2 x 4	23 x 47 x 3¼	695	1	30.0	2.8	3¼" (87)	2" (A)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-870-023	23E87A2POM0	2 x 2	23 x 23 x 3¼	320	1	16.0	#N/A	3¼" (87)	2" (A)
579-870-022	22E87A2POM0	2 x 3.5	23 x 41 x 3¼	600	1	26.0	#N/A	3¼" (87)	2" (A)
579-870-021	21E87A2POM0	2 x 4	23 x 47 x 3¼	695	1	30.0	2.8	3¼" (87)	2" (A)
99.99% Efficient on 0.3 micron - Scan Tested (H)									
577-570-023	23A57B2POH0	2 x 2	23 x 23 x 4¼	320	1	18.0	#N/A	4¼" (57)	3" (A)
577-570-022	22A57B2POH0	2 x 3.5	23 x 41 x 4¼	600	1	30.0	#N/A	4¼" (57)	3" (A)
577-570-021	21A57B2POH0	2 x 4	23 x 47 x 4¼	695	1	32.0	2.8	4¼" (57)	3" (A)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-570-023	23E57B2POM0	2 x 2	23 x 23 x 4¼	320	1	18.0	#N/A	4¼" (57)	3" (A)
579-570-022	22E57B2POM0	2 x 3.5	23 x 41 x 4¼	600	1	30.0	#N/A	4¼" (57)	3" (A)
579-570-021	21E57B2POM0	2 x 4	23 x 47 x 4¼	695	1	32.0	#N/A	4¼" (57)	3" (A)
99.99% Efficient on 0.3 micron - Scan Tested (H)									
577-670-023	23A67F2POH0	2 x 2	23 x 23 x 5½	320	1	20.0	2.1	5½" (67)	4" (F)
577-670-022	22A67F2POH0	2 x 3.5	23 x 41 x 5½	600	1	32.0	#N/A	5½" (67)	4" (F)
577-670-021	21A67F2POH0	2 x 4	23 x 47 x 5½	695	1	36.0	4.2	5½" (67)	4" (F)
99.9995% on 0.1 to 0.2 micron - Laser Tested and Scan Tested (M)									
579-670-023	23E67F2POM0	2 x 2	23 x 23 x 5½	320	1	20.0	#N/A	5½" (67)	4" (F)
579-670-022	22E67F2POM0	2 x 3.5	23 x 41 x 5½	600	1	32.0	#N/A	5½" (67)	4" (F)
579-670-021	21E67F2POM0	2 x 4	23 x 47 x 5½	695	1	36.0	#N/A	5½" (67)	4" (F)

Additional sizes available upon request.

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HEPA & ULPA Filters

AstroCel® II (Gel Seal)

Product Overview

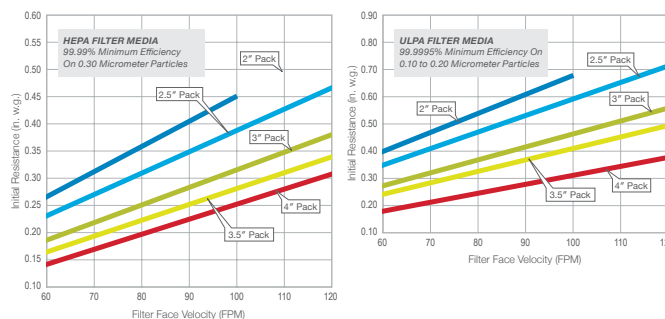
- Individually tested for certified performance
- Reduces operating costs with lowest possible pressure drop from microglass media
- Gel seal design
- Available with media ribbon or hot melt separators
- Available in a range of efficiencies
- Lightweight and compact



Specifications

Efficiency	HEPA ULPA
Media Type	Fiberglass
Frame Material	Aluminum
Separator Style	Hot Melt
Special Size Available	Yes
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Filter Depth	Various
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Style Code	Nominal Size (Feet)	Actual Size Inches (H x W x D)	Rated Airflow (SCFM) 100 FPM	Std. Pkg. Qty	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
99.9995% on 0.1 to 0.2 micron - Scan Tested - 2" Deep Pack							
579-850-027	27E85A2P0M0	2 x 2	21½ x 19¾ x 2¾	235	1	15.0	1.0
579-850-028	28E85A2P0M0	2 x 4	21½ x 43¾ x 2¾	550	1	20.0	6.4
99.99% on 0.3 micron - Scan Tested - 3" Deep Pack							
577-550-027	27A55B2P0H0	2 x 2	21½ x 19¾ x 3¾	235	1	18.0	1.3
577-550-028	28A55B2P0H0	2 x 4	21½ x 43¾ x 3¾	550	1	23.0	2.9
99.9995% on 0.1 to 0.2 micron - Scan Tested - 3" Deep Pack							
579-550-027	27E55B2P0M0	2 x 2	21½ x 19¾ x 3¾	235	1	18.0	#N/A
579-550-028	28E55B2P0M0	2 x 4	21½ x 43¾ x 3¾	550	1	23.0	2.9
99.99% on 0.3 micron - Scan Tested - 4" Deep Pack							
577-650-027	27A65F2P0H0	2 x 2	21½ x 19¾ x 4¾	235	1	20.0	1.6
577-650-028	28A65F2P0H0	2 x 4	21½ x 43¾ x 4¾	550	1	25.0	3.5
99.9995% on 0.1 to 0.2 micron - Scan Tested - 4" Deep Pack							
579-650-027	27E65F2P0M0	2 x 2	21½ x 19¾ x 4¾	235	1	20.0	0.6
579-650-028	28E65F2P0M0	2 x 4	21½ x 43¾ x 4¾	550	1	25.0	3.5
99.99% - Scan Tested - 2" Deep Pack							
577-850-027	27A85A2P0H0	2 x 2	21½ x 19¾ x 2¾	235	1	15.0	1.1
577-850-028	28A85A2P0H0	2 x 4	21½ x 43¾ x 2¾	550	1	20.0	2.3

Additional sizes available upon request.

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HEPA & ULPA Filters

AstroCel® III

Product Overview

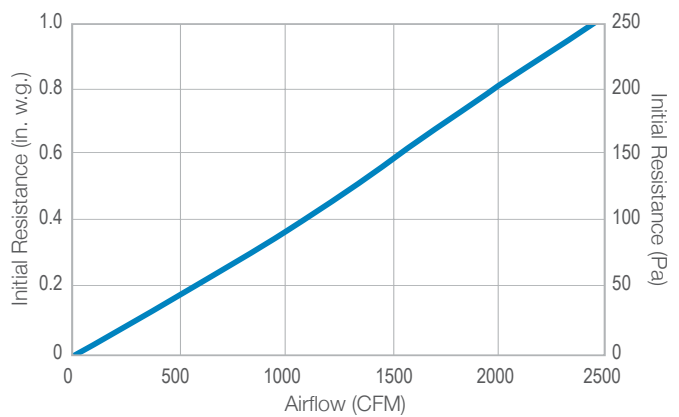
- Ideal for demanding operating conditions in critical applications
- Longer service life — 436 square feet of media — means fewer changeouts
- Low energy consumption and lower operating costs
- High-capacity operation with minimal resistance to airflow
- Chemical-resistant anodized aluminum frame provides superior strength
- One-piece polyurethane gasket seal and gel seal designs available



Specifications

Efficiency	HEPA
Filter Depth	12"
Media Type	Fiberglass
Frame Material	Aluminum
Special Size Available	No
Antimicrobial Available	No
Single Header	No
Separator Style	Sticky String
Max Operating Temperature	200°F (93°C)
Air Filter Certification	UL 900

Initial Resistance vs. Airflow Capacity



Based on 24" x 24" x 11½" gasket seal filter

Product Information

Part Number	Actual Size Inches (W x H x D)	Rated SCFM @ 1.0" w.g.	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Gasket Seal Filters					
3015302-001	24 x 24 x 11½	2,400	1	42.0	4.5
3015302-002	24 x 12 x 11½	1,125	1	30.0	2.8
3015302-003	23¾ x 23¾ x 11½	2,270	1	41.0	5.0
3015302-004	23¾ x 11¾ x 11½	1,065	1	29.0	2.7
Gel Seal Filters, without Extractor Clips					
3047388-005	24 x 24 x 11½	2,220	1	42.0	5.3
3047388-006	24 x 12 x 11½	1,025	1	30.0	2.8
3047388-007	23¾ x 23¾ x 11½	2,170	1	41.0	5.0
3047388-008	23¾ x 11¾ x 11½	1,020	1	29.0	2.7
Gel Seal Filters, with Extractor Clips					
3047388-001	24 x 24 x 11½	2,220	1	42.0	5.3
3047388-002	24 x 12 x 11½	1,025	1	30.0	2.8
3047388-003	23¾ x 23¾ x 11½	2,170	1	41.0	5.0
3047388-004	23¾ x 11¾ x 11½	1,020	1	29.0	2.7

Additional sizes available upon request.

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HEPA & ULPA Filters

MEGAcel®

Product Overview

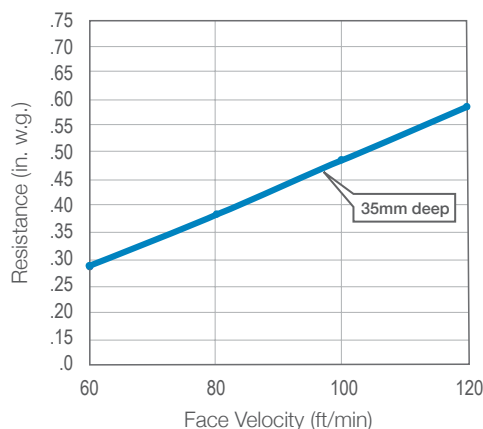
- Lowest initial resistance available
- Negligible off-gassing properties (no boron)
- AAF's high tensile strength ePTFE media is up to 8x stronger than microglass
- Highly resistant to corrosive environments (acids, alkalis, and organic substances)
- Gasket seal, gel seal, and knife-edge designs available
- Lightweight anodized aluminum frame
- 99.99995% on MPPS



Specifications

Efficiency	ULPA
Media Type	ePTFE
Frame Material	Aluminum
Separator Style	Hot Melt
Special Size Available	Yes
Antimicrobial Available	No
Single Header	No
Max Operating Temperature	150°F (66°C)
Filter Depth	Various
Air Filtration Certification	UL 900

Resistance vs Velocity Typical Performance



Product Information

Actual Size Inches (W x H x D)	Rated Airflow (SCFM) 1.0" w.g.	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
24 x 24 x 2¾	350	1	21	1.4
24 x 48 x 2¾	720	1	28	2.7

Additional sizes available upon request.

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HEPA & ULPA Filters

MEGAcel® I Style Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size	Filter Depth	Bond	Media	Accept Level	Gasket	Gasket Location	Separator	Face guard	Cell Sides
(1) SIZE:						(2) DEPTH:			
Example	H x W	Fraction Notation for sizes:				A = 11.5"			
E24A24A	(24" x 24")	A = 0	B = 1/8	C = 1/4	D = 3/8	Z = Special			
E12A24A	(12" x 24")	E = 1/2	F = 5/8	G = 3/4	H = 7/8				
(Max height of filter = 24")		J = 1/16	K = 3/16	L = 5/16	M = 7/16				
		N = 9/16	P = 11/16	Q = 13/16	R = 15/16				
(3) BOND:		(4) MEDIA:			(5) ACCEPTANCE LEVEL:				
1 = Polyurethane		P = ePTFE (H13)			13 = 99.99% Scan Tested				
9 = Special		Z = Special			99 = Special				
(6) GASKET:		(7) GASKET LOCATION:			(8) SEPARATOR:		(9) FACEGUARD:		
E = EPDM (Dovetail)		0 = No Gasket			H = Aluminum		0 = No Faceguard		
F = Fluid Seal Trough		1 = Air Entering Side			W = Vinyl Coated Alum		1 = Upstream		
P = None		2 = Air Leaving Side			T = Tapered Aluminum		2 = Downstream		
T = Neoprene (Dovetail)		3 = Both Sides			Z = Special		3 = Both Sides		
U = Poron (Dovetail)		5 = Extractor Clips					4 = Special		
V = Poron		9 = Special							
Z = Special									
(10) CELL CONSTRUCTION AND CONFIGURATION:									
AA = Galvanized Steel - Gel Seal					Example: E16D20FA1P13T2H0BA equates to:				
AB = 304 SS - Gel Seal					E16D20F = 16% x 20% (H x W)				
AC = 409 SS - Gel Seal					A = 11½" Deep				
AD = Aluminum - Gel Seal					1 = Polyurethane Bond				
BA = Galvanized Steel - Gasket Seal, Double Box Flange					P = ePTFE Media				
BB = 304 SS - Gasket Seal, Double Box Flange					13 = 99.99% Scanned				
BC = 409 SS - Gasket Seal, Double Box Flange					T = Neoprene Gasket				
BD = Aluminum - Gasket Seal, Double Box Flange					2 = Air Leaving Side (Gasket)				
ZZ = Special					H = Aluminum Separator				
					0 = No Faceguard				
					BA = Galv. Steel Cell Sides, Double Box Flange				
FILTER PROFILES									
Gasket Seal				Gel Seal					

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HEPA & ULPA Filters

MEGAcel® I

Product Overview

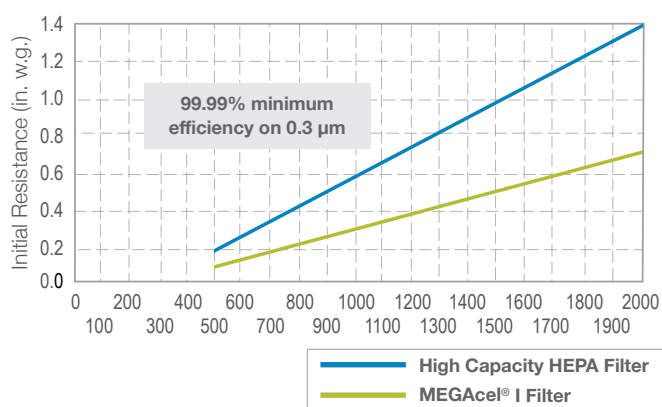
- Lowest initial resistance – Up to 50% lower
- AAF's high tensile strength ePTFE media is up to 84x stronger than micro fiberglass
- Highly resistant to corrosive environments (acids, alkalis, and organic substances)
- Negligible off-gassing properties (boron, sodium, potassium, silicon)
- Withstands pressure up to 20 in. w.g. (5,000 Pa)
- 99.99% minimum efficiency @ 0.3 µm



Specifications

Efficiency	HEPA
Filter Depth	12"
Frame Material	Metal
Separator Style	Aluminum
Max Operating Temperature	150°F (66°C)
Special Size Available	Yes
Single Header	No
Antimicrobial Available	No
Media Type	ePTFE
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Actual Size Inches (W x H x D)	Style Code	Rated Airflow (SCFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
Gasket Seal - Gasket on Air Leaving Side Only						
3057197-001	24 x 24 x 11½	E24A24AA1P13E2T0BA	2,000	1	46.0	4.5
3057197-002	24 x 12 x 11½	E24A12AA1P13E2T0BA	925	2	64.0	2.4
3057197-003	12 x 24 x 11½	E12A24AA1P13E2T0BA	825	1	36.0	2.4
3057197-004	23¾ x 23¾ x 11½	E23D23DA1P13E2T0BA	1,900	1	45.0	4.3
3057197-010	11¾ x 23¾ x 11½	E11D23DA1P13E2T0BA	750	1	36.0	2.2
Gasket Seal - Gaskets on Both Air Entering and Air Leaving Sides						
3057197-006	24 x 24 x 11½	E24A24AA1P13E3T0BA	2,000	1	46.0	4.3
3057197-007	24 x 12 x 11½	E24A12AA1P13E3T0BA	925	1	36.0	2.2
3057197-008	12 x 24 x 11½	E12A24AA1P13E3T0BA	825	1	36.0	2.2
3057197-009	23¾ x 23¾ x 11½	E23D23DA1P13E3T0BA	1,900	1	45.0	4.3
3057197-011	11¾ x 23¾ x 11½	E11D23DA1P13E3T0BA	750	1	36.0	2.2
Gel Seal Filters						
3057197-005	24 x 24 x 11½	E24A24AA1P13F2T0AA	2,000	1	46.0	4.3

Additional sizes and configurations available upon request.



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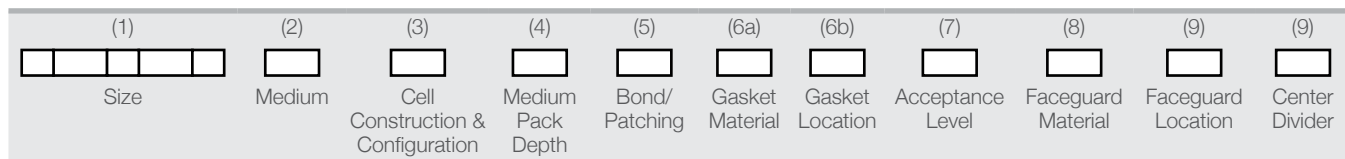
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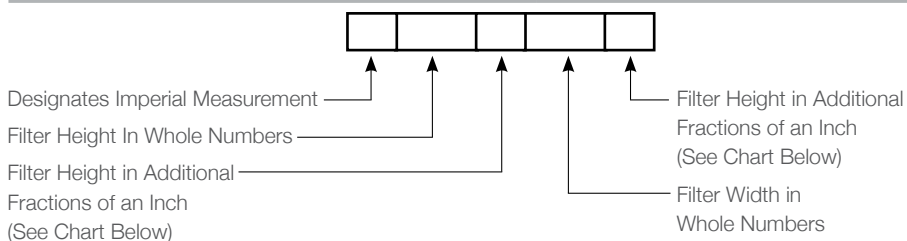


HEPA & ULPA Filters

MEGAcel® II Style Code



(1) SIZE: [All Dimensions are in Inches, for filter Depth see (3) below]



Examples:



23³/₈ High x 35⁷/₈ Wide



12 High x 24¹/₂ Wide

Fractional Notation for Imperial Sizes:

A = 0	B = 1/8	C = 1/4	D = 3/8	E = 1/2	F = 5/8	G = 3/4	H = 7/8
J = 1/16	K = 3/16	L = 5/16	M = 7/16	N = 9/16	P = 11/16	Q = 13/16	R = 15/16

(2) MEDIUM: (Waterproof, Fire-Retardant Glass Fiber)

B - 99.99% HEPA ePTFE PAO COMPATABLE

Z - Special

(3) CELL CONSTRUCTION & CONFIGURATION: (Extruded Anodized Aluminum Unless Otherwise Noted)

40 Series

40 - 'C' Channel (5⁷/₈" Overall Depth)

80 Series

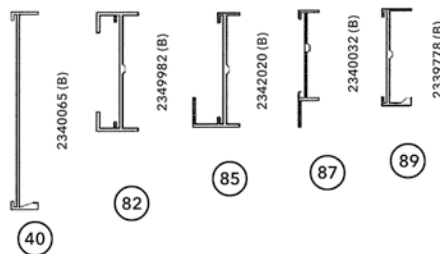
82 - 'C' Channel (3¹/₁₆" Overall Depth)

85 - 'C' Channel (2⁷/₈" Overall Depth)(Fluid Seal)

87 - 3/4" Knife-Edge (3¹/₄" Overall Depth)

89 - 'C' Channel (2³/₄" Overall Depth)

99 - Special Configuration



(4) PACK DEPTH: (Depth/Separators)

K - 50mm Hot Melt/Polyolefin

X - Special

(5) BOND/PATCHING:

2 - Polyurethane Bond, Patching Per Iest RP-CC 001 with Silicone Caulk

4 - Polyurethane Bond, Patching Per Iest RP-CC 001 with Non-Silicone Material

6 - Polyurethane Bond, No Patching Allowed

9 - Special Bond And/Or Special Patching

(6a) GASKET MATERIAL: Style - The Standard Style will be 1/4" Thickness, 3/4" Wide w/Butt Joints (Unless Otherwise Noted)

B-Polyurethane Gel Seal, F-Silicone Gel Seal, P-Non, R-Neoprene (Dovetail), T-Neoprene, U-Poron (Dovetail), V-Poron, Y-Silicone, Z-Special

(6b) GASKET LOCATION:	(7) ACCEPTANCE LEVEL:	(8) FACEGUARD MATERIAL:
0 - No Gasket	H - 99.99% Scanned Tested	A - None
1 - Air Entering Side	S - 99.99% Cold PAO Scan	B - White Painted Expanded Steel
2 - Air Leaving Side	Z - Special	C - Expanded 304 Stainless Steel
3 - Both Faces		D - Perforated 304 Stainless Steel
4 - Special		E - Perforated Anodized Aluminum
		Z - Special
(9) FACEGUARD LOCATION:	(10) CENTER DIVIDER:	
0 - No Gasket	A - No Center Divider or Test Port	
1 - Air Entering Side	B - Center Divider	
2 - Air Leaving Side	C - Center Divider and 1 Test Port	
3 - Both Faces	D - Center Divider and 2 Test Ports	
4 - Special	Z - Special	

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HEPA & ULPA Filters

MEGAcel® II

Product Overview

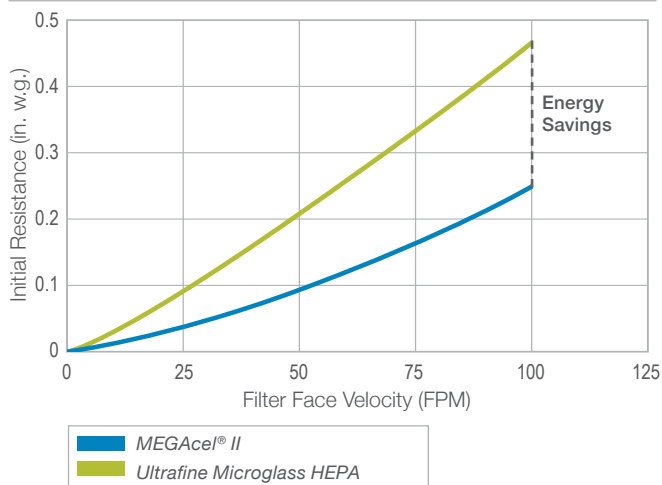
- Lowest pressure drop mini-pleat HEPA filter available
- First and only Polyalphaolefin (PAO) compatible ePTFE air filter media
- Highly resistant to corrosive environments (acids, alkalis, and organic substances)
- Near-zero off-gassing properties
- 99.99% minimum efficiency @ 0.3 µm



Specifications

Efficiency	HEPA
Filter Depth	50 mm
Frame Material	Aluminum
Separator Style	Hot Melt
Max Operating Temperature	150°F (66°C)
Special Size Available	Yes
Single Header	No
Antimicrobial Available	No
Media Type	ePTFE
Air Filtration Certification	UL 900, ULC-S111

Initial Resistance vs. Filter Face Velocity



99.99% HEPA Filter, 50mm Packs

Product Information

Part Number	Actual Size Inches (H x W x D)	Style Code	Rated SCFM @ 0.25" w.g.	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
50 mm pack for AAF PharmaGel Hood						
E21F19HB85K2F0SA0A	21¾ x 19¾ x 2¾	E21F19HB85K2F0SA0A	235	1	15.0	1.1
E21F43HB85K2F0SA0A	21¾ x 43¾ x 2¾	E21F43HB85K2F0SA0A	550	1	28.0	2.3
50 mm pack for Camfil Farr PharmaSeal or Flanders Model 22 Hood						
E21G20AB85K2F0SA0A	21¾ x 20 x 2¾	E21G20AB85K2F0SA0A	235	1	15.0	1.1
E21G44AB85K2F0SA0A	21¾ x 44 x 2¾	E21G44AB85K2F0SA0A	550	1	28.0	2.3

Additional sizes, media pack depths, and gasket configurations available upon request.



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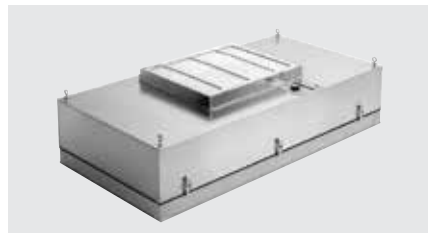
HEPA & ULPA Modules



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Filter Modules**
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Filter Modules**
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FM2-LE™
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PharmaGel™
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HEPA & ULPA Modules

TM-2™ & TM-4™ Style Code

1. FACE SIZE (Inches) H x W x D

21	23 x 47
22	23 x 41
23	23 x 23
24	23¾ x 47½
25	23½ x 41½
26	23½ x 23½
38	23¼ x 23¼
39	SPECIAL SIZE
63	23¼ x 47¼
67	23¼ x 41¼

Note: "39" as a size code designator is only acceptable if the size is not covered in the table above.

2. MEDIA (WATERPROOF MICROGLASS FIBER)

A	HEPA - 99.97% or 99.99%
D	BioCel - 95%
E	ULPA - 99.999% or 99.9995%
X	SPECIAL MEDIA

3. CELL SIDES

01	¾" Knife Edge, TM-4 Hood, 7¾" Overall Depth, Max. Pack Depth of 4"
02	⅝" Gasketed TM-4 Hood, 7" Overall Depth, Max. Pack Depth of 4"
05	⅝" Gasketed TM-2 Hood, 5" Overall Depth, Max. Pack Depth of 2" "A" or "X" Pack Depth
06	¾" Knife Edge, TM-2 Hood, 5" Overall Depth, Max. Pack Depth of 2" "A" or "X" Pack Depth
09	Special Configuration and Construction

4. MEDIA PACK DEPTH (Ribbon Separators)

A	2" Media Pack
B	3" Media Pack
F	4" Media Pack
X	Special Depth

5. COLLAR SIZE, DAMPER & BOND MATERIAL

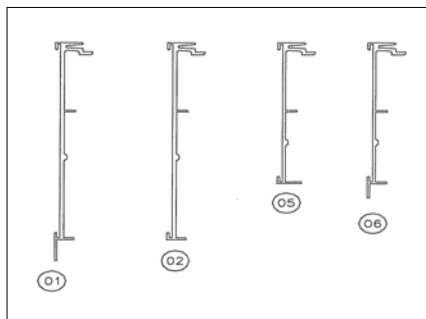
3	10" Collar, Adjustable Damper, Polyurethane Bond.
4	12" Collar, Adjustable Damper, Polyurethane Bond.
6	10" Collar, Fixed Damper, Polyurethane Bond.
7	12" Collar, Fixed Damper, Polyurethane Bond.
9	Special Collar Size, Polyurethane Bond.

6. GASKET MATERIAL

P	No Gasket
W	PVC Gasket Dovetail
Z	Special

7. GASKET LOCATION

0	No Gaskets
2	Gasket - Downstream Face
4	Special



8. ACCEPTANCE LEVEL (Factory Test)

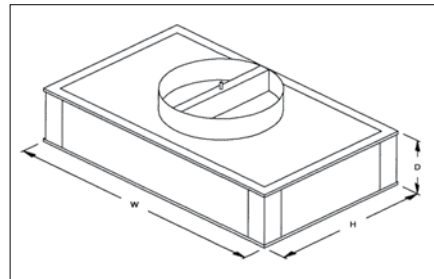
A	99.97% on PAO	(A)
E	SPECIAL	
F	BioCel only - 95% on 0.3 mm	(D)
G	99.99% on 0.3 mm PSL	(A)
H	HEPA Media - 99.99% Scan Test	(A)
J	99.999% on 0.3 mm PSL	(E)
K	ULPA Media - 99.999% Scan Test	(E)
M	ULPA Media - Laser Tested, Scanned 99.9995%	(E)
R	99.99% PAO{	(A)
S	Cold PAO hand scan (99.99%)	(A)

Note: Letter in parentheses following each acceptance level indicates the media type identified in Section 2.

9. FACEGUARD

0	No Faceguard
2	Faceguard Downstream
4	Special Faceguard

Note: Standard faceguard is flattened expanded metal painted white.



General Notes: The purpose of this style code is for identification of components used in standard, catalogued TM-2™ & TM-4™ modules. Because of compatibility limitations, the style code should not be used to arbitrarily "build" a filter using random components.

The first dimension of the filter is the height, which runs parallel to the pleats and support struts.

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HEPA & ULPA Modules

TM-2™ - Ceiling Filter Modules

Product Overview

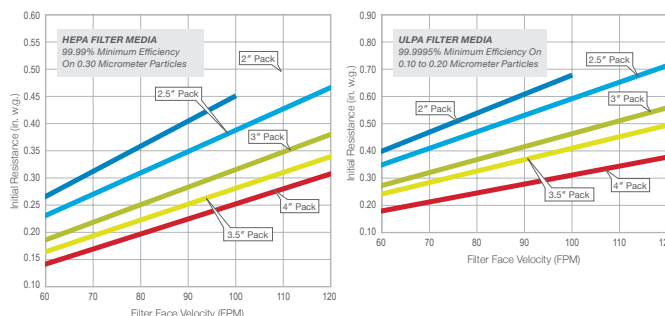
- Low profile
- Lightweight anodized extruded aluminum body
- Available with microglass HEPA or ULPA media or extremely durable, low pressure drop ePTFE
- Individually tested for certified performance
- One-piece aluminum top with integral duct collar connector
- Adjustable or Fixed Diffusion Disk
- Suitable for tee grid or gel seal ceiling grids



Specifications

Special Size Available	Yes
Filter Depth	Various
Frame Material	Aluminum
Separator Style	Ribbon
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Air Filter Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Style Code	Module Designator	Nominal Size (Feet)	Actual Size Inches (H x W x D)	Rated SCFM @ 100 FPM	Std. Pkg. Qty	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
99.99% Efficient on 0.3 micron - Scan Tested (H)								
Aluminum Housing - 10" Adjustable Damper - Faceguard								
576-002-026	26A05A3POH2	TM2-43FS	2 x 2	23 $\frac{5}{8}$ x 23 $\frac{5}{8}$ x 5	335	1	25.0	3.0
576-002-025	25A05A3POH2	TM2-73FS	2 x 3.5	23 $\frac{5}{8}$ x 41 $\frac{1}{8}$ x 5	615	1	34.0	4.9
576-002-024	24A05A3POH2	TM2-83FS	2 x 4	23 $\frac{5}{8}$ x 47 $\frac{3}{8}$ x 5	710	1	39.0	6.0
Aluminum Housing - 10" Adjustable Damper								
576-000-026	26A05A3POH0	TM2-43S	2 x 2	23 $\frac{5}{8}$ x 23 $\frac{5}{8}$ x 5	335	1	25.0	2.8
576-000-025	25A05A3POH0	TM2-73S	2 x 3.5	23 $\frac{5}{8}$ x 41 $\frac{1}{8}$ x 5	615	1	34.0	4.9
576-000-024	24A05A3POH0	TM2-83S	2 x 4	23 $\frac{5}{8}$ x 47 $\frac{3}{8}$ x 5	710	1	39.0	5.5
99.9995% Efficient on 0.1 to 0.2 micron - Scan Tested (M)								
Aluminum Housing - 10" Adjustable Damper - Faceguard								
579-002-026	24E05A3POM2	TMU2-43FS	2 x 2	23 $\frac{5}{8}$ x 23 $\frac{5}{8}$ x 5	335	1	25.0	2.8
579-002-025	25E05A3POM2	TMU2-73FS	2 x 3.5	23 $\frac{5}{8}$ x 41 $\frac{1}{8}$ x 5	615	1	34.0	#N/A
579-002-024	24E05A3POM2	TMU2-83FS	2 x 4	23 $\frac{5}{8}$ x 47 $\frac{3}{8}$ x 5	710	1	39.0	6.2
Aluminum Housing - 10" Adjustable Damper								
579-000-026	26E05A3POM0	TMU2-43S	2 x 2	23 $\frac{5}{8}$ x 23 $\frac{5}{8}$ x 5	335	1	25.0	#N/A
579-000-025	25E05A3POM0	TMU2-73S	2 x 3.5	23 $\frac{5}{8}$ x 41 $\frac{1}{8}$ x 5	615	1	34.0	#N/A
579-000-024	24E05A3POM0	TMU2-83S	2 x 4	23 $\frac{5}{8}$ x 47 $\frac{3}{8}$ x 5	710	1	39.0	5.5

Additional sizes and knife-edge configuration available upon request.

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HEPA & ULPA Modules

TM-4™ - Ceiling Filter Modules

Product Overview

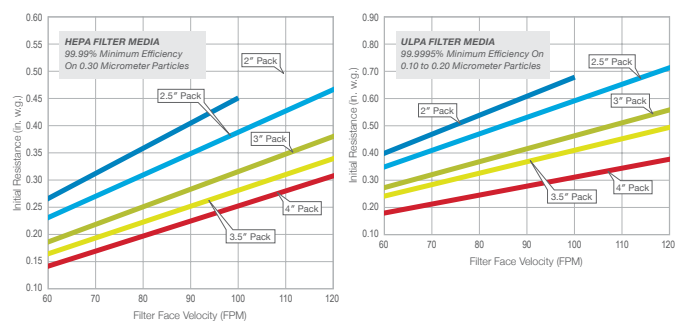
- Low profile
- Lightweight anodized extruded aluminum body
- Available with microglass HEPA or ULPA media
- Individually tested for certified performance
- One-piece aluminum top with integral duct collar connector
- Adjustable or Fixed Diffusion Disk
- Suitable for tee grid or gel seal ceiling grids



Specifications

Special Size Available	Yes
Filter Depth	Various
Frame Material	Aluminum
Separator Style	Ribbon
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)
Air Filter Certification	UL 900

Initial Resistance vs. Airflow Capacity



Product Information

Part Number	Style Code	Nominal Size (Feet)	Actual Size Inches (H x W x D)	Rated SCFM @ 100 FPM	Std. Pkg. Qty	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
99.99% Efficient on 0.3 micron - Scan Tested (H)							
3" Deep Pack - 10" Adjustable Damper - Faceguard							
571-265-302	26A02B3P0H2	2 x 2	23¾ x 23¾ x 7	335	1	40.0	3.5
571-255-302	25A02B3P0H2	2 x 3.5	23¾ x 41½ x 7	615	1	50.0	#N/A
571-245-302	24A02B3P0H2	2 x 4	23¾ x 47¾ x 7	710	1	55.0	3.5
4" Deep Pack - 10" Adjustable Damper - Faceguard							
571-266-302	26A02F3P0H2	2 x 2	23¾ x 23¾ x 7	335	1	40.0	3.5
571-256-302	25A02F3P0H2	2 x 3.5	23¾ x 41½ x 7	615	1	50.0	6.1
571-246-302	24A02F3P0H2	2 x 4	23¾ x 47¾ x 7	710	1	55.0	6.9
99.9995% Efficient on 0.1 to 0.2 micron - Scan Tested (M)							
3" Deep Pack - 10" Adjustable Damper - Faceguard							
572-265-302	26E02B3P0M2	2 x 2	23¾ x 23¾ x 7	335	1	40.0	#N/A
572-255-302	25E02B3P0M2	2 x 3.5	23¾ x 41½ x 7	615	1	50.0	#N/A
572-245-302	24E02B3P0M2	2 x 4	23¾ x 47¾ x 7	710	1	55.0	0.2
4" Deep Pack - 10" Adjustable Damper - Faceguard							
572-266-302	26E02F3P0M2	2 x 2	23¾ x 23¾ x 7	335	1	40.0	#N/A
572-256-302	25E02F3P0M2	2 x 3.5	23¾ x 41½ x 7	615	1	50.0	5.5
572-246-302	24E02F3P0M2	2 x 4	23¾ x 47¾ x 7	710	1	55.0	#N/A

Additional sizes and knife-edge configuration available upon request.

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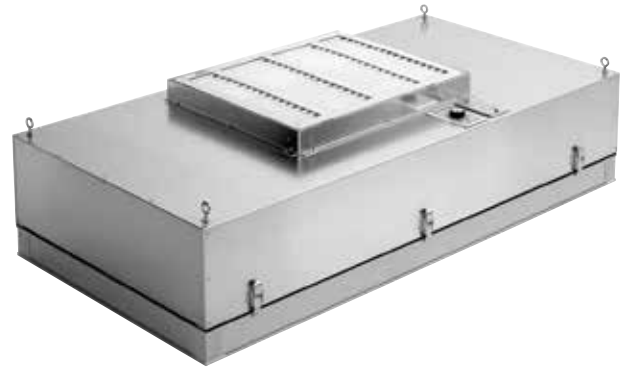


HEPA & ULPA Modules

FM2-LE™

Product Overview

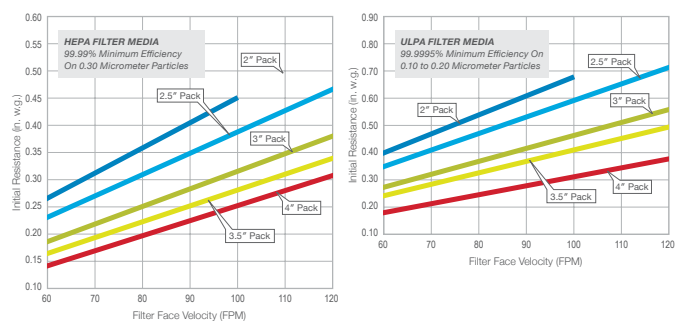
- Low pressure drop Astrocel® II HEPA filter included
- Backward curved motorized impeller uses minimal electricity
- Variable speed controller
- MERV 8 PerfectPleat® prefilter extends HEPA life
- Duct connections available
- Lightweight aluminum construction



Specifications

Filter Depth	13"
Frame Material	Metal
Separator Style	Ribbon
Special Size Available	No
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (Feet)	Actual Size Inches (H x W x D)	Dust Collar Size (Inches)	Rated SCFM @ 100 FPM	Std. Pkg. Quantity Per Box	Ship. Wt. Lbs/Box (± 7%)	Cubic Ft.
Aluminum Housing - Faceguard - 99.99% Scanned (H) - 115V, 60Hz Motor							
3010352-002	2 x 2	23½ x 23½ x 13	NA	340	1	30.0	1.0
3010352-006	2 x 2	23½ x 23½ x 13	10	340	1	30.0	0.0
3010352-010	2 x 2	23½ x 23½ x 13	12	340	1	30.0	0.0
3010345-002	2 x 3	23½ x 35½ x 13	NA	525	1	50.0	1.6
3010345-006	2 x 3	23½ x 35½ x 13	10	525	1	50.0	4.6
3010345-010	2 x 3	23½ x 35½ x 13	12	525	1	50.0	0.0
3010337-002	2 x 4	23½ x 47½ x 13	NA	710	1	60.0	6.2
3010337-006	2 x 4	23½ x 47½ x 13	10	710	1	60.0	0.0
3010337-010	2 x 4	23½ x 47½ x 13	12	710	1	60.0	0.0
Aluminum Housing - Faceguard - 99.99% Scanned (H) - 115V, 60Hz Motor - Power Cord							
3010352-001	2 x 2	23½ x 23½ x 13	NA	340	1	30.0	1.0
3010352-005	2 x 2	23½ x 23½ x 13	10	340	1	30.0	3.1
3010352-009	2 x 2	23½ x 23½ x 13	12	340	1	30.0	0.0
3010345-001	2 x 3	23½ x 35½ x 13	NA	525	1	50.0	1.6
3010345-005	2 x 3	23½ x 35½ x 13	10	525	1	50.0	1.6
3010345-009	2 x 3	23½ x 35½ x 13	12	525	1	50.0	0.0
3010337-001	2 x 4	23½ x 47½ x 13	NA	710	1	60.0	2.1
3010337-005	2 x 4	23½ x 47½ x 13	10	710	1	60.0	0.0
3010337-009	2 x 4	23½ x 47½ x 13	12	710	1	60.0	6.2

Additional sizes and configurations available upon request.

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HEPA & ULPA Modules

PharmaGel™

Product Overview

- Room side replaceable filter access
- Welded construction for strength and leak-free operation
- Easy access for filter testing
- Available with microglass HEPA or ULPA media or extremely durable, low pressure drop ePTFE
- Stainless steel removable protective grill
- Vertical or horizontal flow applications
- Adjustable butterfly damper
- Designed for tee grid or plaster ceiling applications
- Wall-mounted model available



Specifications

Media Type	Fiberglass, ePTFE optional
Special Size Available	Yes
Depth	12"
Antimicrobial Available	No
Max Operating Temperature	150°F (66°C)

Product Information

Nominal Size Inches (Feet)	Actual Size Inches (H x W x D)	Dust Color Size (Inches)	Rated SCFM @ 100 FPM	Std. Pkg. Quantity
2 x 2	23 ⁵ / ₈ x 23 ⁵ / ₈ x 9	10	235	1
2 x 4	23 ⁵ / ₈ x 47 ⁵ / ₈ x 9	10	550	1

Additional sizes, configurations, and part number information available upon request.

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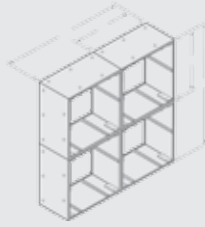


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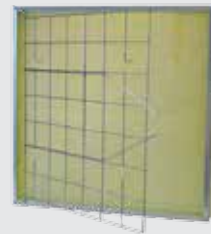
Air Filter Frames & Latches



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Air Filter Frames & Latches

AmerFrame®

Product Overview

- 22-gauge galvanized steel U-channel cell sides form a seal around the frame's perimeter to contain the pad and prevent leakage
- Expanded metal support grid
- 9-gauge hinged retainer gate
- 1" and 2" thicknesses
- Fast, easy pad changing



AIR FILTER
FRAMES & LATCHES

Product Information

With Retainer		Without Retainer		Nominal Size Inches (W x H x D)	Std. Pkg. Qty./Box	Ship. Wt. Lbs/Box (±10%)
Part Number	Cubic Ft.	Part Number	Cubic Ft.			
1"						
322-319-111	2.1	322-319-121	2.1	12 x 24 x 1	12.0	23.0
322-500-111	2.4	322-500-121	2.4	16 x 20 x 1	12.0	23.0
322-600-111	2.9	322-600-121	3.0	16 x 25 x 1	12.0	27.0
322-700-111	3.0	322-700-121	3.0	20 x 20 x 1	12.0	26.0
322-782-111	3.6	322-782-121	3.6	20 x 24 x 1	12.0	30.0
322-800-111	3.8	322-800-121	3.8	20 x 25 x 1	12.0	31.0
322-863-111	4.3	322-863-121	4.3	24 x 24 x 1	12.0	33.0
2"						
322-319-112	2.1	322-319-122	3.6	12 x 24 x 2	6.0	16.0
322-500-112	2.2	322-500-122	2.4	16 x 20 x 2	6.0	16.0
322-600-112	2.9	322-600-122	3.0	16 x 25 x 2	6.0	17.5
322-700-112	3.0	322-700-122	3.0	20 x 20 x 2	6.0	19.0
322-782-112	3.6	322-782-122	3.6	20 x 24 x 2	6.0	20.0
322-800-112	3.8	322-800-122	3.8	20 x 25 x 2	6.0	20.5
322-863-112	4.3	322-863-122	4.3	24 x 24 x 2	6.0	23.0

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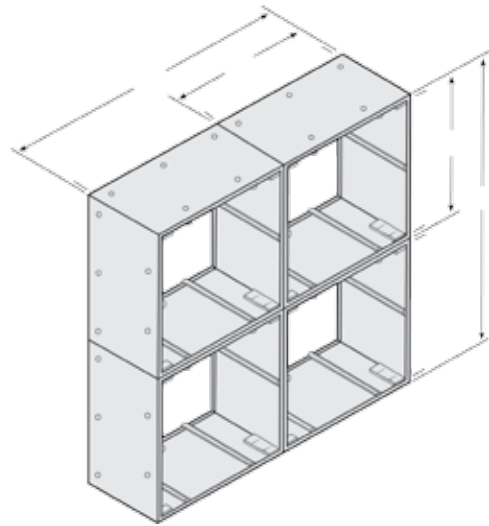
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Air Filter Frames & Latches

AstroFrame™

Product Overview

- 14-gauge all-welded construction to deliver maximum enclosure integrity
- Galvanized steel or type 304 stainless steel
- Predrilled for ease of field assembly
- Pressure-bolt latches for positive seal
- Gasket seal or gel seal
- 99.97% efficiency on 0.3µm DOP



Product Information

Galvanized		304 Stainless Steel		AstroCel® Size Inches (W x H x D)	Actual Frame Size	Weight
Part Number	Cubic Ft.	Part Number	Cubic Ft.			
Gel Seal AstroCel® Filters						
329-526-006	5.2	329-526-014	5.2	24 x 24 x 11½	24¾ x 24¾ x 13½	20
329-526-005	2.7	329-526-013	2.7	12 x 24 x 11½	12¾ x 24¾ x 13½	15
329-526-019	2.7	329-526-023	2.7	24 x 12 x 11½	24¾ x 12¾ x 13½	15
Gasket Seal AstroCel® Filters						
329-526-002	5.2	329-526-010	5.2	24 x 24 x 11½	24¾ x 24¾ x 13½	20
329-526-001	2.7	329-526-009	2.7	12 x 24 x 11½	12¾ x 24¾ x 13½	15
329-526-017	2.7	329-526-021	2.7	24 x 12 x 11½	24¾ x 12¾ x 13½	15

Additional sizes and configurations available upon request.

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Air Filter Frames & Latches

RenuFrame™

Product Overview

- Heavy-duty industrial design
- Durable, rigid construction with cell sides that have full overlap corners, sealing the pad in place
- 18-gauge galvanized steel U-channel cell sides
- 11-gauge wire retainer grid
- 11-gauge wire retainer gate with pad support spikes
- 2" thickness



Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
325-319-003	12 x 24 x 2	6	32.0	2.1
325-500-003	16 x 20 x 2	6	30.0	2.4
325-600-003	16 x 25 x 2	6	36.0	2.9
325-700-003	20 x 20 x 2	6	36.0	3.0
325-782-003	20 x 24 x 2	6	42.0	3.8
325-800-003	20 x 25 x 2	6	44.0	3.8
325-863-003	24 x 24 x 2	6	32.0	4.3

AIR FILTER FRAMES & LATCHES

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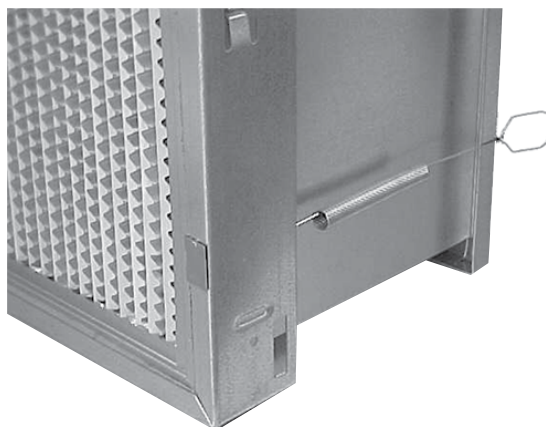


Air Filter Frames & Latches

Universal Holding Frames

Product Overview

- Designed to exclusively work with the Universal Holding Frame retaining tab
- Latches available for a variety of filters, filter depths, and combinations of filters
- Zinc-plated to withstand harsh environments
- Double latches allow prefilters to be changed without disturbing the final filter



AIR FILTER
FRAMES & LATCHES

Product Information

Part Number	Nominal Size Inches (W x H x D)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)	Cubic Ft.
Galvanized Steel with PVC Gaskets				
321-000-319	12 x 24 x 3	8	31.5	2.4
321-000-500	16 x 20 x 3	4	12.5	2.4
321-000-600	16 x 25 x 3	4	18.5	3.0
321-000-700	20 x 20 x 3	4	18.0	3.0
321-000-750	20 x 24 x 3	4	20.0	3.6
321-000-800	20 x 25 x 3	4	20.2	3.8
321-000-863	24 x 24 x 3	4	21.5	4.3

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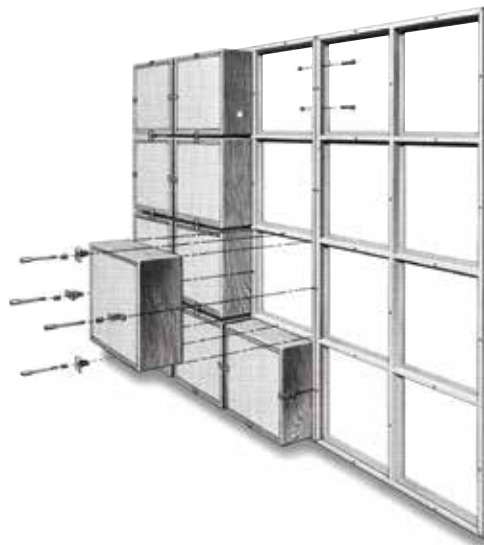


Air Filter Frames & Latches

Welded Bevel Seal Frames

Product Overview

- Welded aluminum construction
- Two-level seal surface connected by bevel
- Prevents over-compression of gaskets
- Calibrated spring-loaded clamps
- Easy to install



AIR FILTER
FRAMES & LATCHES

Product Information

24" x 24" x 11½" Filters		24" x 24" x 5⅝" Filters		Type	Number of Filters	Ship. Weight (±10%)
Part Number	Cubic Ft.	Part Number	Cubic Ft.			
For AstroCel® I and AstroCel® II Filters						
391-000-001	2.0	391-000-101	2.0	1 x 1	1	21
391-000-002	3.8	391-000-102	3.8	1 x 2	2	34
391-000-003	5.6	391-000-103	5.6	1 x 3	3	47
391-000-004	7.4	391-000-104	7.4	1 x 4	4	60
391-000-005	9.2	391-000-105	9.2	1 x 5	5	75
391-000-006	11.1	391-000-106	11.1	1 x 6	6	90
391-000-007	6.7	391-000-107	6.7	2 x 2	4	55
391-000-008	10.0	391-000-108	10.0	2 x 3	6	80
391-000-009	13.2	391-000-109	13.2	2 x 4	8	102
391-000-010	16.4	391-000-110	16.4	2 x 5	10	117
391-000-011	19.7	391-000-111	19.7	2 x 6	12	145
391-000-012	14.3	391-000-112	14.3	3 x 3	9	113
391-000-013	19.0	391-000-113	19.0	3 x 4	12	145
391-000-014	23.7	391-000-114	23.7	3 x 5	15	178
391-000-015	28.3	391-000-115	28.3	3 x 6	18	210
391-000-016	24.8	391-000-116	24.8	4 x 4	16	190
391-000-017	30.9	391-000-117	30.9	4 x 5	20	234
391-000-018	36.9	391-000-118	36.9	4 x 6	24	278
391-000-019	40.1	391-000-119	40.1	5 x 5	25	290
391-000-020	48.0	391-000-120	48.0	5 x 6	30	346
391-000-021	56.6	391-000-121	56.6	6 x 6	36	415

*These sizes will be shipped in 2 pieces, to be assembled on site.

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Air Filter Frames & Latches

Knock-On Conversion Latches

Product Overview

- Zinc-plated to withstand harsh environments
- Latches available for a variety of filters and filter combinations
- Easy conversion of other manufacturers' holding frames to accept AAF filters
- For use with AAF aluminized and stainless steel frames



Product Information

Part Number	Drawing Number	Length (L)		Application
Single Latches (Four (4) latches recommended per frame) for Installing AAF Products in Competitive Holding Frames				
391-006-004	80-1529262-4	1 ¹ / ₁₆ "		Holds single header* filter or a 1" filter.
391-006-009	80-1529262-9	1"		Holds DriPak or VariCel with CA (1 1/8") header.
391-006-005	80-1529262-5	1 ⁵ / ₈ "		Holds 2" thick filter. Also holds single header* filter with a 1" prefilter.
391-006-006	80-1529262-6	2 ⁹ / ₁₆ "		Holds single header* filter with a 2" prefilter.
391-006-008	80-1529262-8	3 ⁵ / ₈ "		Holds two 2" filters or one 4" deep filter.
391-006-010	80-1529262-10	3 ²⁵ / ₃₂ "		Holds 4" filter with a ring panel prefilter.
391-006-007	80-1529262-7	4 ¹ / ₂ "		Holds single header* filter with a 4" prefilter.
Double Latches (Prefilter can be changed without disturbing the final filter)				
		L-1	L-2	
391-006-003	80-1529262-3	1 ¹ / ₁₆ "	3 ⁵ / ₈ "	Holds 4" filter with a 1" prefilter.
391-006-002	80-1529262-2	1 ¹ / ₁₆ "	3 ⁵ / ₈ "	Holds 4" filter with a 2" prefilter.
391-006-001	80-1529262-1	3 ⁹ / ₁₆ "	3 ⁵ / ₈ "	Holds 4" filter with a 4" prefilter.

*A single header filter is any filter with a 13/16" header, such as VariCel® SH, DriPak® 2000, VariCel® V, etc. Additional sizes available upon request.

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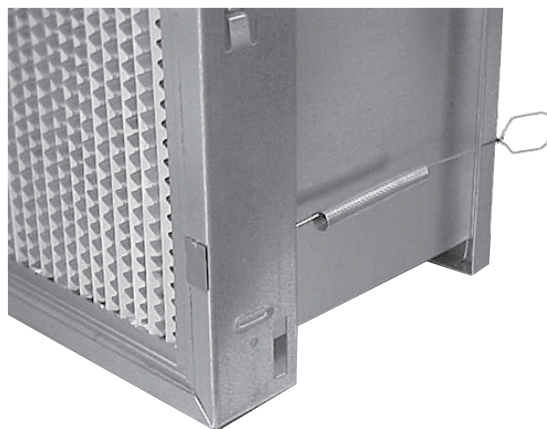


Air Filter Frames & Latches

Universal Holding Frame Latches

Product Overview

- Designed to exclusively work with the Universal Holding Frame retaining tab
- Latches available for a variety of filters, filter depths, and combinations of filters
- Zinc-plated to withstand harsh environments
- Double latches allow prefilters to be changed without disturbing the final filter



AIR FILTER
FRAMES & LATCHES

Product Information

Part Number	Drawing Number	Latch Model Number	Length (L)		Application
Single Latches (Four (4) latches are recommended per frame)					
391-007-004	80-1503507-4	L-10	5/32"		Holds single header* filter or 1" filter in AAF Universal Holding Frame (UHF)
391-007-005	80-1503507-5	L-20	1 1/16"		Holds 2" thick filter. Also holds single header* filter with a 1" prefilter in AAF UHF
391-007-006	80-1503507-6	L-30	1 7/8"		Holds single header* filter with a 2" prefilter in AAF UHF
391-007-003	80-1503507-3	L-40	3 1/16"		Holds two 2" or one 4" deep filter in AAF UHF
391-007-007	80-1503507-7	L-50	3 15/16"		Holds single header* filter with a 4" prefilter in AAF UHF
Double Latches (Prefilter can be changed without disturbing the final filter)					
			L-1	L-2	
391-007-009	80-1503507-9	L-41	1 1/16"	3 1/16"	Holds 4" filter with a 1" prefilter in AAF UHF
391-007-002	80-1503507-2	L-42	1 11/16"	3 1/16"	Holds 4" filter with a 2" prefilter in AAF UHF
391-007-001	80-1503502-1	L-44	3 9/16"	3 1/16"	Holds 4" filter with a 4" prefilter in AAF UHF

* A single header filter is any filter with a 13/16" header, such as VariCel® SH, DriPak® 2000, VariCel® V, VariCel® II MH, etc.

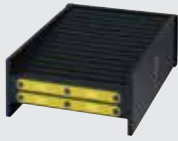
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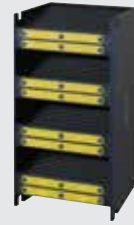
Gas-Phase Cassettes & Chemical Media Delivery Devices



SAAF™ Cassette Medium Duty
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SAAF™ Cassette Heavy Duty
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SAAF™ Cassette Cleanroom Grade
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GAS-PHASE CASSETTES &
CHEMICAL MEDIA DEVICES

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Gas-Phase Cassettes & Chemical Media Delivery Devices

SAAF™ Cassette Medium Duty

Product Overview

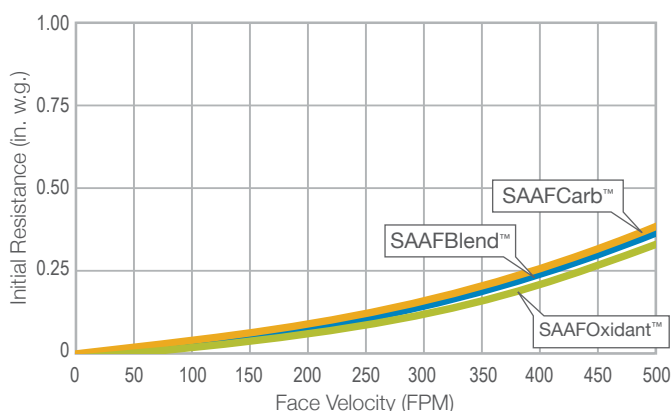
- More energy-efficient than any other competitive cassette
- Designed for full media utilization
- Improves fit and sealing integrity in any cassette holding system
- Glue-free design eliminates off-gassing, bypass, and leakage
- Filled cassettes are UL Classified
- Multiple patents pending



Specifications

Filter Depth	18"
Media Type	Chemical
Frame Material	High impact polystyrene (HIPS)
Special Size Available	No
Antimicrobial Available	No
Single Header	No

Initial Resistance vs. Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Media Type	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)
3024148-002	6 x 24 x 18	SAAFOxidant	1 set	25.0
3024148-003	6 x 24 x 18	SAAFCarb	1 set	27.0
3024148-004	6 x 24 x 18	SAAFCarb MA	1 set	27.0
3024148-005	6 x 24 x 18	SAAFCarb MB	1 set	27.0
3024148-007	6 x 24 x 18	SAAFBlend GP	1 set	27.0
3024148-008	6 x 24 x 18	SAAFBlend WS	1 set	26.0
3024148-009	6 x 24 x 18	SAAFCarb MA.HT	1 set	27.0
3024148-012	6 x 24 x 18	SAAFOxidant SC	1 set	25.0
3024148-013	6 x 24 x 18	SAAFBlend GP SC	1 set	27.0

GAS-PHASE CASSETTES & CHEMICAL MEDIA DEVICES

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Gas-Phase Cassettes & Chemical Media Delivery Devices

SAAF™ Cassette Heavy Duty

Product Overview

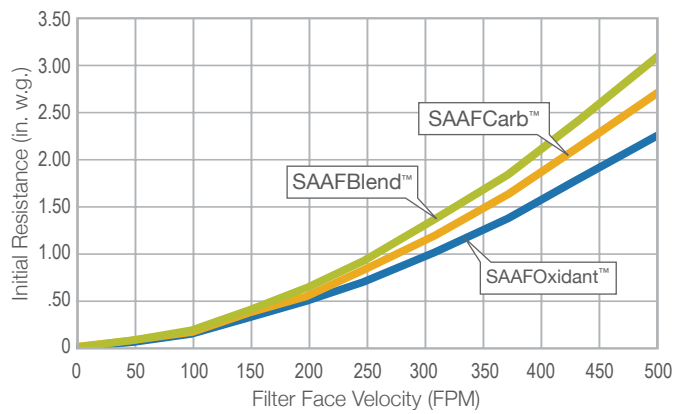
- More energy-efficient than any other competitive cassette
- Designed for full media utilization
- Improves fit and sealing integrity in any cassette holding system
- Glue-free design eliminates off-gassing, bypass, and leakage
- Filled cassettes are UL Classified
- Multiple patents pending



Specifications

Filter Depth	12"
Media Type	Chemical
Frame Material	High impact polystyrene (HIPS)
Special Size Available	No
Antimicrobial Available	No
Single Header	No

Initial Resistance vs. Filter Face Velocity



GAS-PHASE CASSETTES & CHEMICAL MEDIA DEVICES

Product Information

Part Number	Nominal Size Inches (W x H x D)	Media Type	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)
3024130-002	12 x 24 x 12	SAAFOxidant	1 set	42.0
3024130-003	12 x 24 x 12	SAAFCarb	1 set	47.0
3024130-004	12 x 24 x 12	SAAFCarb MA	1 set	47.0
3024130-005	12 x 24 x 12	SAAFCarb MB	1 set	47.0
3024130-007	12 x 24 x 12	SAAFBlend GP	1 set	47.0
3024130-008	12 x 24 x 12	SAAFBlend WS	1 set	45.0
3024130-009	12 x 24 x 12	SAAFCarb MA.HT	1 set	47.0
3024130-012	24 x 12 x 12	SAAFOxidant SC	1 set	42.0
3024130-013	24 x 12 x 12	SAAFBlend GP SC	1 set	47.0

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Gas-Phase Cassettes & Chemical Media Delivery Devices

SAAF™ Cassette Cleanroom Grade

Product Overview

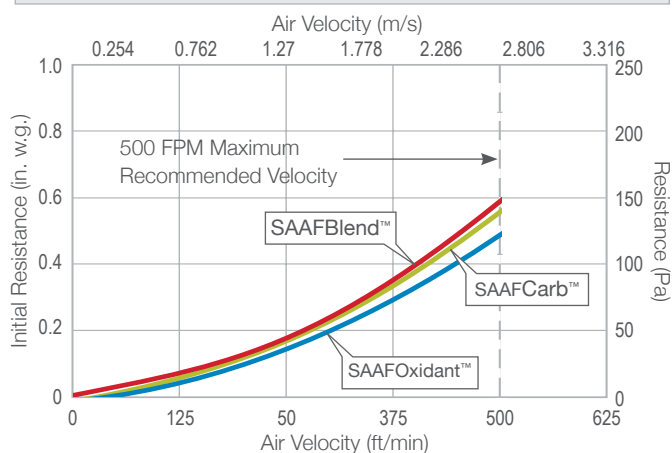
- More energy efficient than any other competitive cassette
- Designed for full media utilization
- Improves fit and sealing integrity in any cassette holding system
- Glue-free design eliminates off-gassing, bypass, and leakage
- Filled cassettes are UL Classified
- Multiple patents pending



Specifications

Filter Depth	12"
Media Type	Chemical
Frame Material	High impact polystyrene (HIPS)
Special Size Available	No
Antimicrobial Available	No
Single Header	No

Initial Resistance vs. Airflow Capacity



Product Information

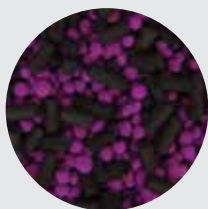
Part Number	Nominal Size Inches (W x H x D)	Media Type	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)
3024155-002	12 x 24 x 12	SAAFOxidant	1	28.0
3024155-003	12 x 24 x 12	SAAFCarb	1	30.0
3024155-004	12 x 24 x 12	SAAFCarb MA	1	30.0
3024155-005	12 x 24 x 12	SAAFCarb MB	1	30.0
3024155-007	12 x 24 x 12	SAAFBlend GP	1	30.0
3024155-008	12 x 24 x 12	SAAFBlend WS	1	29.0
3024155-009	12 x 24 x 12	SAAFCarb MA.HT	1	30.0
3024155-012	12 x 24 x 12	SAAFOxidant SC	1	28.0
3024155-013	12 x 24 x 12	SAAFBlend GP SC	1	30.0

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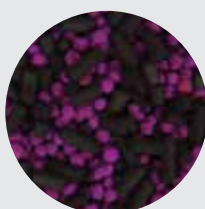
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Gas-Phase Chemical Media



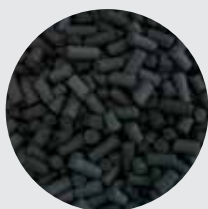
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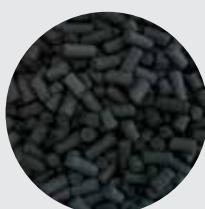
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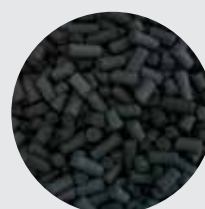
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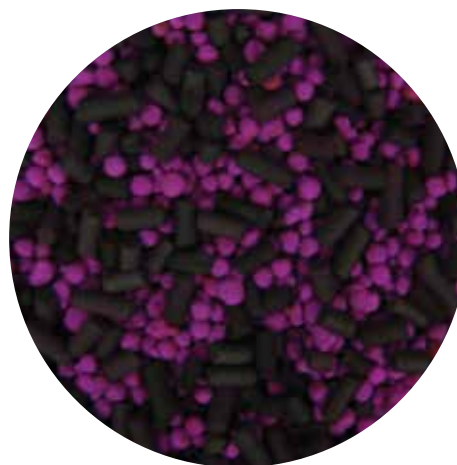
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Gas-Phase Chemical Media

SAAFBlend™ GP

Product Overview

- Targets reactive compounds and volatile organic compounds
- Removes toxic and impure gases by physical adsorption
- Suitable for use in commercial and industrial applications
- Accurate service life testing
- Target contaminants include:
 - Formaldehyde
 - Hydrocarbons (VOCs)
 - Hydrogen sulfide
 - Lower molecular weight aldehydes and organic acids
 - Nitric oxide
 - Nitrogen dioxide
 - Sulfur dioxide



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-001	SAAFBlend GP (50/50 Mix)	43	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-001	SAAFBlend GP (50/50 Mix)	1100	27.5
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

GAS-PHASE CHEMICAL MEDIA

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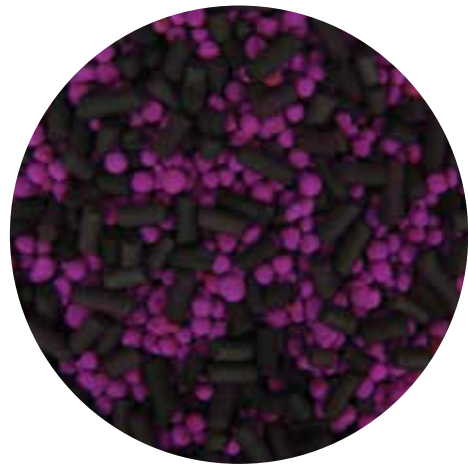


Gas-Phase Chemical Media

SAAFBlend™ GP SC

Product Overview

- Targets reactive compounds and volatile organic compounds
- Accurate service life testing
- Suited for use in commercial and industrial applications
- Target contaminants include:
 - Formaldehyde
 - Hydrocarbons (VOCs)
 - Hydrogen sulfide
 - Lower molecular weight aldehydes and organic acids
 - Nitric oxide
 - Nitrogen dioxide
 - Sulfur dioxide



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-003	SAAFBlend GP SC (50/50 Mix)	43	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-003	SAAFBlend GP SC (50/50 Mix)	1100	27.5
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

GAS-PHASE
CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAFBlend™ WS

Product Overview

- Targets acidic gases, volatile organic compounds, reactive molecular weight organics
- Accurate service life testing
- Target contaminants include:
 - Formaldehyde
 - Hydrocarbons (VOCs)
 - Hydrogen sulfide
 - Lower molecular weight aldehydes and organic acids
 - Nitric oxide
 - Nitrogen dioxide
 - Sulfur dioxide



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-002	SAAFBlend WS (33/33/33 Mix)	40	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-002	SAAFBlend WS (33/33/33 Mix)	1100	29.7
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

GAS-PHASE CHEMICAL MEDIA

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BETTER AIR IS OUR BUSINESS®

Gas-Phase Chemical Media

SAAFCarb™

Product Overview

- Pelletized activated carbon media that removes toxic and impure contaminants from the atmosphere
- Quick and easy media changeovers
- Resists a wide range of impure gases
- Low pressure drop and high adsorptive capacity



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-200	SAAFCarb	30	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-200	SAAFCarb	1100	36.7
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			
Special Containers			
395-919-200	SAAFCarb (50-lb bag)	50	1.7
<i>NOTE: All media packaged in Special Containers is sold per pound. Containers cannot be broken.</i>			

GAS-PHASE
CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAFCarb™ MA

Product Overview

- Manufactured exclusively for acidic corrosive environments
- Targeted contaminant removal capacity for acid gases
- Provides extended equipment protection with infrequent media changeovers
- Compatible for use in all carbon-based air filtration systems
- Low pressure drop and high adsorptive capacity



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-300	SAAFCarb MA	34	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-300	SAAFCarb MA	1100	31.5
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			
Special Containers			
395-919-300	SAAFCarb MA (50-lb bag)	50	1.5
<i>NOTE: All media packaged in Special Containers is sold per pound. Containers cannot be broken.</i>			

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CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAFCarb™ MA.HT

Product Overview

- High capacity, chemical media targeted for H₂S removal
- Provides extended equipment protection with infrequent media changeovers
- Compatible for use in all carbon-based air filtration systems
- Low pressure drop and high adsorptive capacity



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-800	SAAFCarb MA.HT	28	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-800	SAAFCarb MA.HT	1100	39.3
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

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CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAFCarb™ MB

Product Overview

- Provides effective removal of ammonia gas
- Effective removal volatile organic compounds (VOCs)
- Low pressure drop
- Specifically impregnated media



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-400	SAAFCarb MB	34	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
395-913-400	SAAFCarb MB	1100	31.5
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

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CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAF[®]Oxidant™

Product Overview

- Removes and holds contaminants by chemical conversion
- Non-flammable and non-toxic
- Accurate service life testing
- Does not support bacterial and fungal growth
- Patent-pending high capacity formulation
- UL Classified



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	120°F (49°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-100	SAAF [®] Oxidant	50	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
033-050-021	SAAF [®] Oxidant	1100	22.0
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

GAS-PHASE
CHEMICAL MEDIA

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Gas-Phase Chemical Media

SAAF[™]Oxidant™ SC

Product Overview

- Removes and holds contaminants by chemical conversion
- Non-flammable and non-toxic
- Accurate service life testing
- Does not support bacterial and fungal growth
- Easy disposal by landfill
- UL Classified



Specifications

Media Type	Chemical
Frame Material	None
Max Operating Temperature	125°F (52°C)

Product Information

Part Number	Media Type	Media Wgt. per Container (Lbs.)	Shipping Container Volume (Cubic Feet)
Cubic Foot Containers			
395-914-110	SAAFOxidant SC	50	1.2
<i>NOTE: All media packaged in Cubic Foot Containers is sold per container. Containers cannot be broken.</i>			
Large Super Sack Containers			
033-050-022	SAAFOxidant SC	1100	22.0
<i>NOTE: All media packaged in Large Super Sack Containers is sold per pound. The weights should be sold in multiples of the container weight.</i>			

GAS-PHASE
CHEMICAL MEDIA

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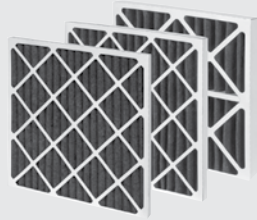
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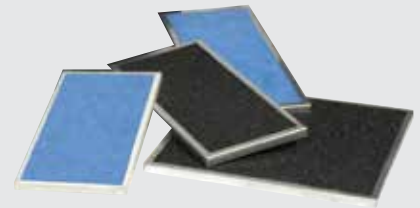
Gas-Phase Filters



AmAir®/C Family of Filters
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AmAir®/CE Pleated Carbon Filter
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AmerSorb® BP
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VariCel® RF/C & RF/C+SAAFoxi
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VariSorb® HC
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VariSorb® XL
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Gas-Phase Filters

AmAir®/C Family of Filters

Product Overview

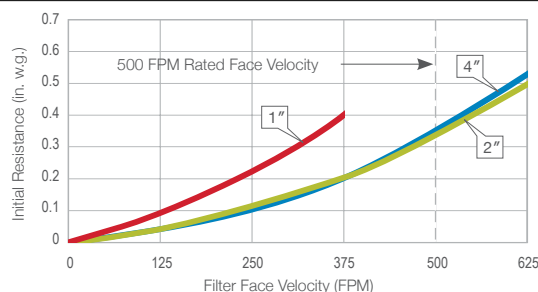
- The easiest and most economical solution to many gaseous contaminant problems, including odors
- High chemical media density yields superior odor control
- MERV 7 particulate efficiency
- Directly interchangeable with standard air filters
- Available in pleats, panels, and pads
- 1", 2", and 4" pleated filters
- Disposable



Specifications

Efficiency	MERV 5, MERV 7
Filter Depth	1", 2", 4"
Media Type	Chemical
Frame Material	Beverage Board
Special Size Available	Yes
Max Operating Temperature	120°F (49°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Rated Airflow Capacity (CFM)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.	Carbon Density
C-1 Pleated Carbon Filters (1") - 100 Carbon Density							
182-111-319	12 x 24 x 1	11¾ x 23¾ x 7/8	1,000	12	8.5	2.0	100
182-111-500	16 x 20 x 1	15½ x 19½ x 7/8	1,100	12	9.5	2.2	100
182-111-600	16 x 25 x 1	15½ x 24½ x 7/8	1,400	12	11.0	2.8	100
182-111-700	20 x 20 x 1	19½ x 19½ x 7/8	1,400	12	11.5	2.8	100
182-111-782	20 x 24 x 1	19¾ x 23¾ x 7/8	1,650	12	12.0	3.3	100
182-111-800	20 x 25 x 1	19½ x 24½ x 7/8	1,750	12	12.5	3.5	100
182-111-863	24 x 24 x 1	23¾ x 23¾ x 7/8	2,000	12	14.0	4.0	100
C-2 Pleated Carbon Filters (2") - 200 Carbon Density							
182-122-319	12 x 24 x 2	11¾ x 23¾ x 1¼	1,000	6	9.9	2.0	200
182-122-500	16 x 20 x 2	15½ x 19½ x 1¼	1,100	6	11.0	2.2	200
182-122-600	16 x 25 x 2	15½ x 24½ x 1¼	1,400	6	14.5	2.8	200
182-122-700	20 x 20 x 2	19½ x 19½ x 1¼	1,400	6	13.9	2.8	200
182-122-782	20 x 24 x 2	19¾ x 23¾ x 1¼	1,650	6	15.6	3.3	200
182-122-800	20 x 25 x 2	19½ x 24½ x 1¼	1,750	6	16.3	3.5	200
182-122-863	24 x 24 x 2	23¾ x 23¾ x 1¼	2,000	6	18.5	8.0	200
C-3 Pleated Carbon Filters (4") - 300 Carbon Density							
182-134-319	12 x 24 x 4	11¾ x 23¾ x 3½	1,000	3	7.9	2.0	300
182-134-500	16 x 20 x 4	15¾ x 19¾ x 3½	1,100	3	8.5	2.2	300
182-134-600	16 x 25 x 4	15¾ x 24¾ x 3½	1,400	3	10.0	2.8	300
182-134-700	20 x 20 x 4	19¾ x 19¾ x 3½	1,400	3	12.2	2.8	300
182-134-800	20 x 25 x 4	19¾ x 24¾ x 3½	1,750	3	16.5	3.3	300
182-134-859	24 x 20 x 4	23¾ x 19¾ x 3½	1,650	3	15.5	3.5	300
182-134-863	24 x 24 x 4	23¾ x 23¾ x 3½	2,000	3	19.0	4.0	300
C-3 Panel Fillers (2") - 300 Carbon Density							
182-032-319	12 x 24 x 2	11¾ x 23¾ x 1¼	1,000	6	12.0	2.0	300
182-032-500	16 x 20 x 2	15½ x 19½ x 1¼	1,100	6	13.4	2.2	300
182-032-600	16 x 25 x 2	15½ x 24½ x 1¼	1,400	6	15.7	2.8	300
182-032-700	20 x 20 x 2	19½ x 19½ x 1¼	1,400	6	15.7	0.8	300
182-032-782	20 x 24 x 2	19¾ x 23¾ x 1¼	1,650	6	18.2	3.3	300
182-032-800	20 x 25 x 2	19½ x 24½ x 1¼	1,750	6	18.7	3.5	300
182-032-863	24 x 24 x 2	23¾ x 23¾ x 1¼	2,000	6	21.4	4.0	300

Additional types of filters and sizes available upon request.

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GAS-PHASE FILTERS

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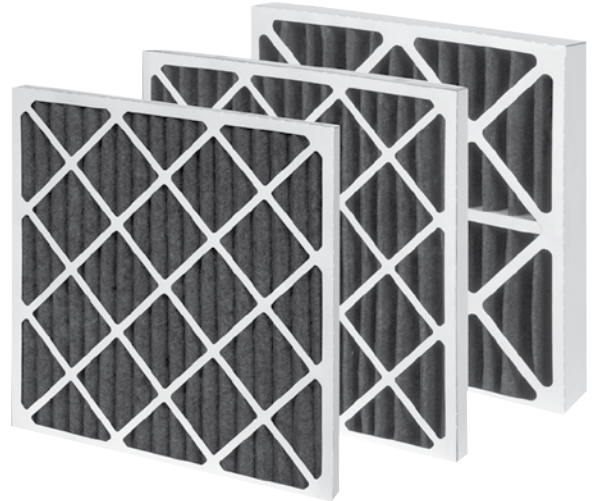


Gas-Phase Filters

AmAir®/CE Pleated Carbon Filter

Product Overview

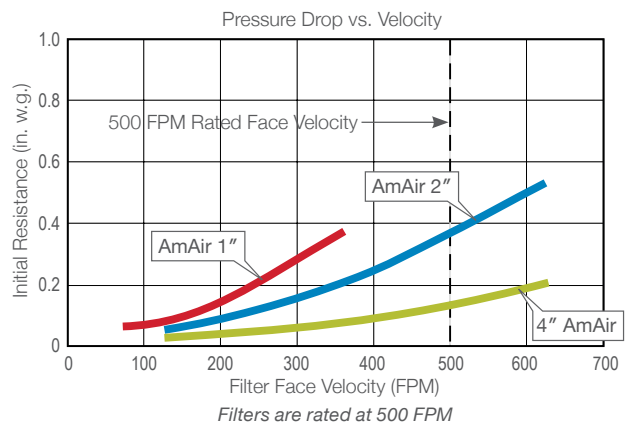
- Economical solution to many odor problems, from light to moderate
- MERV 6 particulate efficiency
- Directly interchangeable with standard air filters
- No expensive housings or ductwork modifications are necessary
- Easy to install
- 1", 2", and 4" models available
- Disposable



Specifications

Efficiency	MERV 6
Filter Depth	1", 2", 4"
Media Type	Chemical
Frame Material	Beverage Board
Special Size Available	Yes
Single Header	No
Max Operating Temperature	120°F (49°C)
Air Filtration Certification	UL 900

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Rated Airflow Capacity (CFM) (Mid/High)	Std. Pkg. Qty. per Carton	Shipping Wt. Lbs. per Box (± 7%)	Cubic Ft.
1"						
411-301-319	12 x 24 x 1	11½ x 23¾ x 7/8	750 / 1000	12	7.9	4.0
411-301-500	16 x 20 x 1	15½ x 19½ x 7/8	830 / 1110	12	8.8	4.4
411-301-600	16 x 25 x 1	15½ x 24½ x 7/8	1050 / 1400	12	11.0	5.6
411-301-700	20 x 20 x 1	19½ x 19½ x 7/8	1050 / 1400	12	11.0	5.6
411-301-782	20 x 24 x 1	19¾ x 23¾ x 7/8	1250 / 1675	12	13.2	6.7
411-301-800	20 x 25 x 1	19½ x 24½ x 7/8	1300 / 1750	12	13.8	6.9
411-301-863	24 x 24 x 1	23¾ x 23¾ x 7/8	1500 / 2000	12	15.9	8.0
2"						
411-302-319	12 x 24 x 2	11¾ x 23¾ x 1¼	750 / 1000	12	11.3	4.0
411-302-500	16 x 20 x 2	15½ x 19½ x 1¼	830 / 1110	12	12.6	4.4
411-302-600	16 x 25 x 2	15½ x 24½ x 1¼	1050 / 1400	12	15.7	5.6
411-302-700	20 x 20 x 2	19½ x 19½ x 1¼	1050 / 1400	12	15.7	5.6
411-302-782	20 x 24 x 2	19¾ x 23¾ x 1¼	1250 / 1680	12	18.9	6.7
411-302-800	20 x 25 x 2	19½ x 24½ x 1¼	1300 / 1750	12	19.7	6.9
411-302-863	24 x 24 x 2	23¾ x 23¾ x 1¼	1500 / 2000	12	22.6	20.8
4"						
411-304-319	12 x 24 x 4	11½ x 23½ x 3¾	1000 / 1250	6	9.4	2.0
411-304-500	16 x 20 x 4	15½ x 19½ x 3¾	1100 / 1400	6	10.4	2.2
411-304-600	16 x 25 x 4	15½ x 24½ x 3¾	1400 / 1750	6	13.0	2.8
411-304-700	20 x 20 x 4	19½ x 19½ x 3¾	1400 / 1750	6	13.0	2.8
411-304-782	20 x 24 x 4	19½ x 23½ x 3¾	1680 / 2100	6	15.6	1.1
411-304-800	20 x 25 x 4	19½ x 24½ x 3¾	1750 / 2200	6	16.3	1.2
411-304-863	24 x 24 x 4	23½ x 23½ x 3¾	2000 / 2500	6	18.7	4.0

Additional sizes available upon request.

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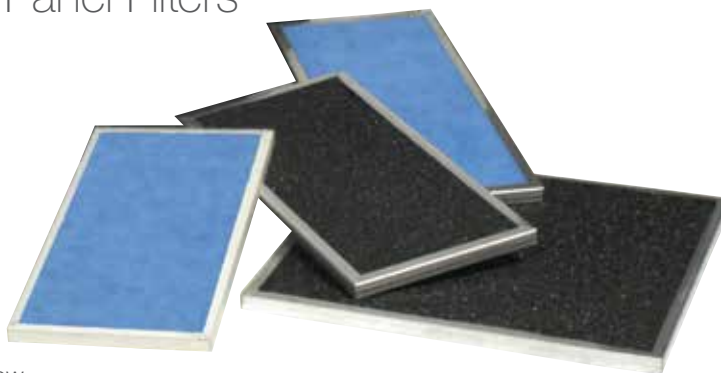
BETTER AIR IS OUR BUSINESS®

Gas-Phase Filters

AmerSorb® BP Carbon Bonded Panel Filters

Product Overview

- An economical alternative to refillable trays used in granular media housings
- Easier to handle, reduces maintenance costs versus refillable trays
- Direct replacement for 1" panels used in most manufacturers' side and front access housings
- No carbon dusting – no settling
- Easy disposal
- High first-pass removal efficiency and low resistance to airflow
- 60% CTC activity carbon

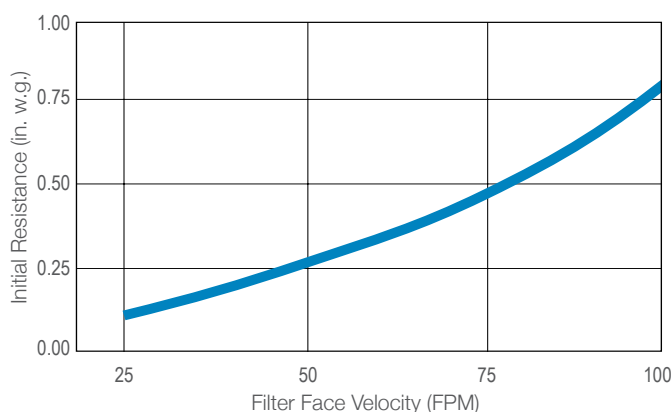


Performance Data

Static Adsorption Capacity

Carbon Tetrachloride (CCl₄) adsorption capacity is virtually unaffected by bonding. Several carbon samples in the 60-80% CCl₄ activity range are shown in the graph below. As indicated, there is little impact on the activated carbon by the bonding process.

Initial Resistance vs. Filter Face Velocity

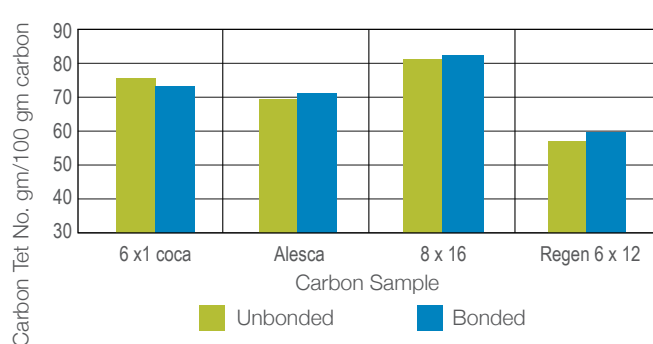


Product Information

Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)
12 x 24 x 1	11 3/8 x 23 3/8 x 7/8
24 x 24 x 1	23 3/8 x 23 3/8 x 7/8
12 x 24 x 2	11 3/8 x 23 3/8 x 1 1/4
24 x 24 x 2	23 3/8 x 23 3/8 x 1 1/4

Additional sizes available upon request.

Static Adsorption, CCl₄ Bonded vs. Unbonded Carbon



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Gas-Phase Filters

VariCel® RF/C & RF/C+SAAFoxi

Extended Surface Rigid Air Filters

Product Overview

- VariCel RF/C – 60% activated granular activated carbon
- VariCel RF/C+SAAFoxi – 50/50 blend of 60% activated carbon and AAF’s proprietary activated alumina impregnated with potassium permanganate (KMnO₄)
- Particulate and gaseous contaminant removal
- MERV 8
- Single and no-header models



Specifications

Efficiency	MERV 8
Filter Depth	12"
Media Type	Chemical
Frame Material	Galvanized Steel
Special Size Available	No
Single Header	Yes
Max Operating Temperature	125°F (52°C)
Air Filtration Certification	UL 900, ULC-S111

Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)	Cubic Ft.
VariCel RF/C - No Header with Carbon					
185-100-319	12 x 24 x 12	11 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	2	24.0	0.0
185-100-700	20 x 20 x 12	19 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	13.7	0.0
185-100-782	20 x 24 x 12	19 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	15.3	0.0
185-100-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	17.5	0.0
VariCel RF/C Type SH - Single Header with Carbon					
185-101-319	12 x 24 x 12	11 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	2	23.2	0.0
185-101-700	20 x 20 x 12	19 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	13.9	0.0
185-101-782	20 x 24 x 12	19 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	15.8	0.0
185-101-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	18.0	4.3
VariCel RF/C+SAAFoxi - No Header with 50/50 Blend					
185-110-319	12 x 24 x 12	11 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	2	26.4	0.0
185-110-700	20 x 20 x 12	19 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	15.2	0.0
185-110-782	20 x 24 x 12	19 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	17.1	0.0
185-110-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	19.8	0.0
VariCel RF/C+SAAFoxi Type SH - Single Header with 50/50 Blend					
185-111-319	12 x 24 x 12	11 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	2	23.4	0.0
185-111-700	20 x 20 x 12	19 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	15.2	0.0
185-111-782	20 x 24 x 12	19 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	17.3	0.0
185-111-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	19.7	0.0

GAS-PHASE FILTERS

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Gas-Phase Filters

VariSorb® HC

High Capacity Disposable Filter

Product Overview

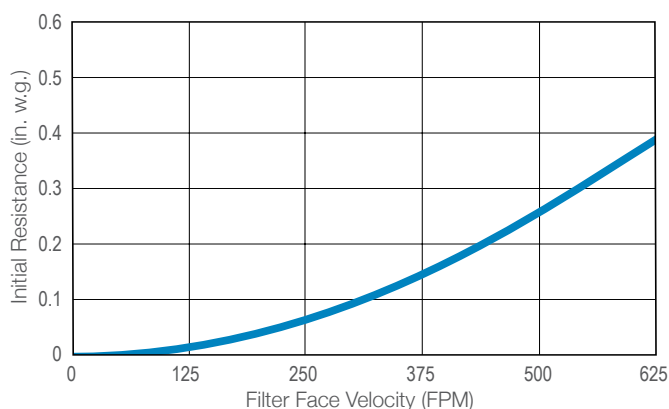
- High chemical media content
- Low resistance V-bank design
- Eight 1" deep honeycomb panels
- Corrosion-free, non-metal construction
- Fully incinerable
- Available with SAAFCarb™, SAAFOxidant™, or SAAFBlend™ GP (50/50 Blend)



Specifications

Efficiency	MERV 8
Filter Depth	12"
Media Type	Chemical
Frame Material	Galvanized Steel
Special Size Available	No
Single Header	Yes No
Max Operating Temperature	125°F (52°C)

Initial Resistance vs. Filter Face Velocity



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)	Cubic Ft.
with SAAFCarb					
411-500-319	24 x 12 x 12	23 ³ / ₈ x 11 ¹ / ₂ x 11 ¹ / ₂	1	14.0	0.0
411-500-859	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	24.0	0.0
411-500-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	28.0	4.3
with SAAFOxidant					
411-501-319	24 x 12 x 12	23 ³ / ₈ x 11 ¹ / ₂ x 11 ¹ / ₂	1	18.0	0.0
411-501-859	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	31.0	0.0
411-501-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	37.0	0.0
with SAAFBlend GP (50/50 Mix)					
411-502-319	24 x 12 x 12	23 ³ / ₈ x 11 ¹ / ₂ x 11 ¹ / ₂	1	16.0	0.0
411-502-859	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	27.0	0.0
411-502-863	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	32.0	0.0

GAS-PHASE FILTERS

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BETTER AIR IS OUR BUSINESS®

Gas-Phase Filters

VariSorb® XL

High Efficiency Filter

Product Overview

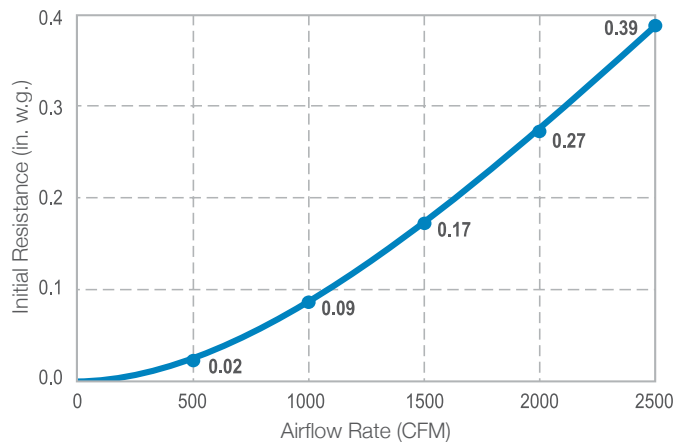
- Highest-activity carbon
- Effective in removing VOCs, SOx, NOx, and Ozone
- Energy-efficient mini-pleat design
- Corrosion-free, non-metal construction
- Easy to retrofit particulate installations
- Fully incinerable



Specifications

Filter Depth	12"
Media Type	Chemical
Frame Material	Plastic
Special Size Available	No
Single Header	Yes
Max Operating Temperature	130°F (54°C)

Initial Resistance vs. Airflow (based on 24 x 24 x 12 filter)



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)	Cubic Ft.
With No Gaskets					
3039567-001	24 x 12 x 12	23 ³ / ₈ x 11 ³ / ₈ x 11 ¹ / ₂	1	11.0	2.2
3039567-002	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	17.0	3.6
3039567-003	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	20.0	4.3
With Gasketing on the Air Leaving Side					
3039567-004	24 x 12 x 12	23 ³ / ₈ x 11 ³ / ₈ x 11 ¹ / ₂	1	11.0	2.2
3039567-005	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	17.0	3.6
3039567-006	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	20.0	4.3

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Gas-Phase Filters

VariSorb® XL15

High Efficiency Particulate and Gas-Phase Filter

Product Overview

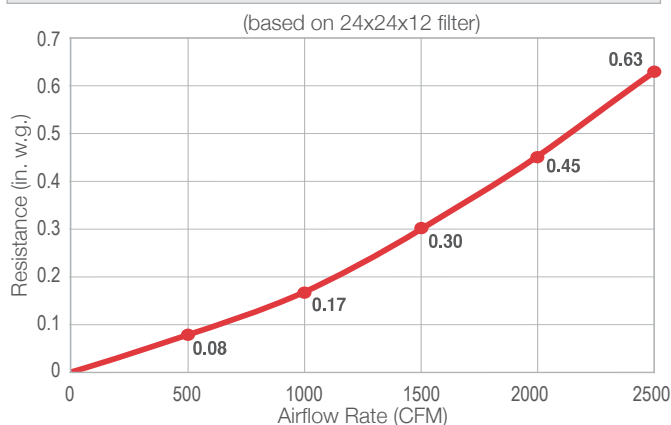
- High-efficiency filters designed to improve Indoor Air Quality
- Suitable for retrofit into existing HVAC systems, specification in new construction, or for direct replacement of 12" deep, single-header filters
- Particulate and gaseous contaminant removal
- Highest activity carbon = highest adsorption
- Energy-efficient mini-pleat design
- Corrosion-free, non-metal construction
- MERV 15
- Can assist in meeting National Ambient Air Quality Standards in nonattainment areas



Specifications

Efficiency	MERV 15
Filter Depth	12"
Media Type	Chemical
Frame Material	Plastic
Special Size Available	No
Single Header	Yes
Max Operating Temperature	130°F (54°C)

Initial Resistance vs. Airflow



Product Information

Part Number	Nominal Size Inches (W x H x D)	Actual Size Inches (W x H x D)	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)	Cubic Ft.
With No Gaskets					
3100465-001	24 x 12 x 12	23 ³ / ₈ x 11 ³ / ₈ x 11 ¹ / ₂	1	9.1	2.2
3100465-002	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	14.9	3.6
3100465-003	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	17.8	4.3
With Gasketing on the Air Leaving Side					
3100465-004	24 x 12 x 12	23 ³ / ₈ x 11 ³ / ₈ x 11 ¹ / ₂	1	9.2	2.2
3100465-005	24 x 20 x 12	23 ³ / ₈ x 19 ³ / ₈ x 11 ¹ / ₂	1	15.0	3.6
3100465-006	24 x 24 x 12	23 ³ / ₈ x 23 ³ / ₈ x 11 ¹ / ₂	1	17.9	4.3

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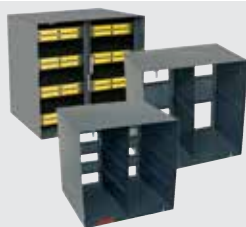
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Gas-Phase Standard Equipment



SAAF™ Air Purification Systems: Pressurization and Recirculation Unit (PRU) and Recirculation Unit (RU)
Page 156



SAAF™ Front Access Housings (FAH)
Page 157



SAAF™ PORTA-Scrubber
Page 158

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Gas-Phase Standard Equipment

SAAF™ Air Purification Systems:
Pressurization and Recirculation Unit (PRU)
and Recirculation Unit (RU)

Product Overview

- Pressurize, recirculate, and clean the air in a controlled environment
- Easy installation, operation, and maintenance in a self-contained system
- Combines gas-phase and high efficiency air filters to create total clean air solutions
- Patent-pending SAAF™ Seal provides superior filtration efficiency
- Designed with internal variable speed fan (electronically commutated)
- Customizable media combinations to meet your specific requirements
- Whisper-quiet operation



Product Information

DESCRIPTION	PRODUCT & SIZE					
	RU500V	RU1000V	RU2000V	RU500H	RU1000H	RU2000H
SAAF™ Air Purification Systems: Pressurization and Recirculation Unit (PRU)						
Fan style	ebm	ebm	ebm	ebm	ebm	ebm
Height (inches)	78½	85	85	29	29	29
Width (inches)	31	31	60	26	26	50
Depth (inches)	26	26	26	89	93	93
SAAF™ Air Purification Systems: Recirculation Unit (RU)						
Fan style	ebm	ebm	ebm	ebm	ebm	ebm
Height (inches)	73¾	80	80	29	29	29
Width (inches)	31	31	60	26	26	50
Depth (inches)	26	26	26	77	77	77

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Gas-Phase Standard Equipment

SAAF™ Front Access Housings (FAH)

Product Overview

- Combines particulate filters and gas-phase cassettes to create a total clean air solution
- Stand-alone system can be easily incorporated into new and existing air handling units
- Patent-pending SAAF™ Seal provides the best seal available and superior filtration efficiency



Product Information

Part Number	Nominal Size Inches (W x H x D)	Model Number	Std. Pkg. Qty. per Box	Shipping Wt. Lbs. per Box (± 12%)	Cubic Ft.
SAAF:FAH - Medium Duty (for use with MD Cassettes only)					
3026705-001	24 x 24 x 21½	FAH 202-2P-MD	1	70.0	8.0
3028404-001	24 x 12 x 21½	FAH 201-2P-MD	1	50.0	4.0
3028172-001	12 x 24 x 21½	FAH 102-2P-MD	1	50.0	4.0
SAAF:FAH - Heavy Duty (for use with HD Cassettes only)					
3028438-001	24 x 24 x 15¾	FAH 202-2P-HD	1	70.0	6.0
3028487-001	24 x 12 x 15¾	FAH 201-2P-HD	1	50.0	3.0
3028412-001	12 x 24 x 15¾	FAH 102-2P-HD	1	50.0	3.0
SAAF:FAH - Cleanroom Grade (for use with CG Cassettes only)					
3028552-001	24 x 24 x 15¾	FAH 202-2P-CG	1	70.0	6.0
3028503-001	24 x 12 x 15¾	FAH 201-2P-CG	1	50.0	3.0

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Gas-Phase Standard Equipment

SAAF™ PORTA-Scrubber

Product Overview

- Units available as Powered and Non-Powered
- Ideal for a wide variety of applications
- Suitable for outdoor installation
- Compact design is space-efficient while reducing capital and installation costs
- Quick, easy installation and operation in a self-contained system — virtually maintenance free
- Corrosion-resistant, cast aluminum fan
- Designed to remove gaseous and particulate contaminants from the airstream in the most demanding applications
- Ultra-high capacity SAAFCarb™ MA.HT chemical media provides complete contaminant removal and longer service life than conventional scrubber media currently available



Product Information

Style Model Number & Nominal Airflow (SCFM)	Non-Powered		Powered		
	200NP	500NP	200	500	1000
Dimensions Nominal (in.)	49H x 24D	65H x 39D	51H x 24D	65H x 39D	83H x 58D
Inlet Diameter (in.)	4	6	4	6	10
Part Number	3040821-001E	3040839-001	3052941-001	3040789-001	3064441-001
Particulate Filters Required (PolyKlean™ Media Pads)	24" Round PN 358-012-024	37" Round PN 358-012-037	24" Round PN 358-012-024	37" Round PN 358-012-037	59" Round PN 358-012-058
Gas-Phase Chemical Media Options (Sold in 1 ft³ boxes)	Media Volume Required				
SAAFOxidant™ (395-914-100)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³
SAAFCarb™ (395-914-200)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³
SAAFCarb™ MA (395-914-300)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³
SAAFCarb™ MB (395-914-400)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³
SAAFCarb™ MA.HT (395-914-800)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³
SAAFBlend™ GP (395-914-001)	5 ft³	17 ft³	5 ft³	17 ft³	39 ft³

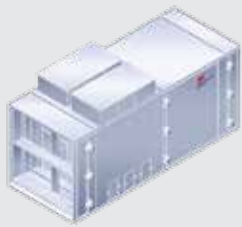
Additional Options
Motor Rain Cover (123A-3061942)
115v, 10 foot Power Cord (5246707)

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Custom Gas-Phase Equipment



**SAAF™ Deep Bed Scrubber
(DBS)**

Page 160



**SAAF™ Machine Intake Filter
(MIF)**

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**SAAF™ Side Access Housings
(SAH)**

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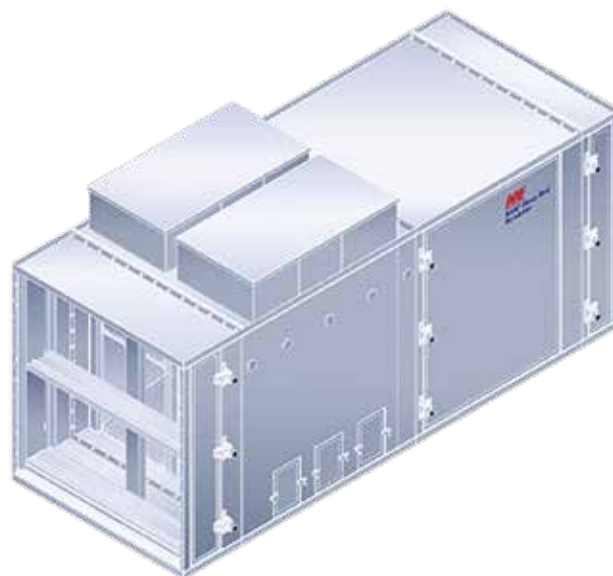
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Custom Gas-Phase Equipment

SAAF™ Deep Bed Scrubber (DBS)

Product Overview

- Combines AAF's particulate and gas-phase technologies for an AAF Total Filtration Solution
- Provides highest chemical media-to-air ratio for heavily polluted environments that require air quality guarantees and optimal cost of ownership
- Available with internal fan: wide range of sizes and combination of AAF Filtration technologies
- Offers the best flexibility and control to adapt to changes in the environment



Product Information

304 Stainless Steel Housing	
Housing Size Inches (W x H)	Section Length Inches
2 x 2	10
2 x 2	12
2 x 2	48
3 x 2	10
3 x 2	12
3 x 2	48
4 x 2	10
4 x 2	12
4 x 2	48
4 x 3	10
4 x 3	12
4 x 3	48
4 x 4	10
4 x 4	12
4 x 4	48
4 x 6	10
4 x 6	12
4 x 6	48
4 x 8	10
4 x 8	12
4 x 8	48
5 x 4	10
5 x 4	12
5 x 4	48
5 x 6	10
5 x 6	12
5 x 6	48

Available in additional sizes, and in painted steel and 316 stainless steel

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Custom Gas-Phase Equipment

SAAF™ Machine Intake Filter (MIF)

Product Overview

- Specifically designed for machine air intakes within hostile air quality environments, such as industrial manufacturing facilities, mining, smelting, petrochemical, and pulp and paper processing
- Combines decades of AAF air filtration expertise in gas turbine and complex machine air intakes
- Incorporates AAF low pressure drop, enhanced performance air filtration technologies for high efficiency, high capacity, maintenance-effective solutions
- Patent-pending SAAF™ Seal provides the best seal available and superior filtration efficiency



Product Information

Inches (W x H)	Depth (Inches)
6 x 4	12

Rain louver/birdscreen at the inlet is available as an option for outdoor installation.

Weather cover with drip-edge is available as an option for outdoor installation.

2" Prefilter track

Metal mesh screen and cone protection

Outlet flange

Heavy-duty channel base

The cassette support track (non-sealing face shown above) is constructed of extruded aluminum.

AAF's track installation method provides trouble-free filter installations and changeouts. Precise connections between support tracks and the track support post ensure accurate filter spacing for superior efficiency.

The cassette support track (sealing face shown) is constructed of extruded aluminum with the cassette locating bar, gasket for sealing.

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Custom Gas-Phase Equipment

SAAF™ Side Access Housings (SAH)

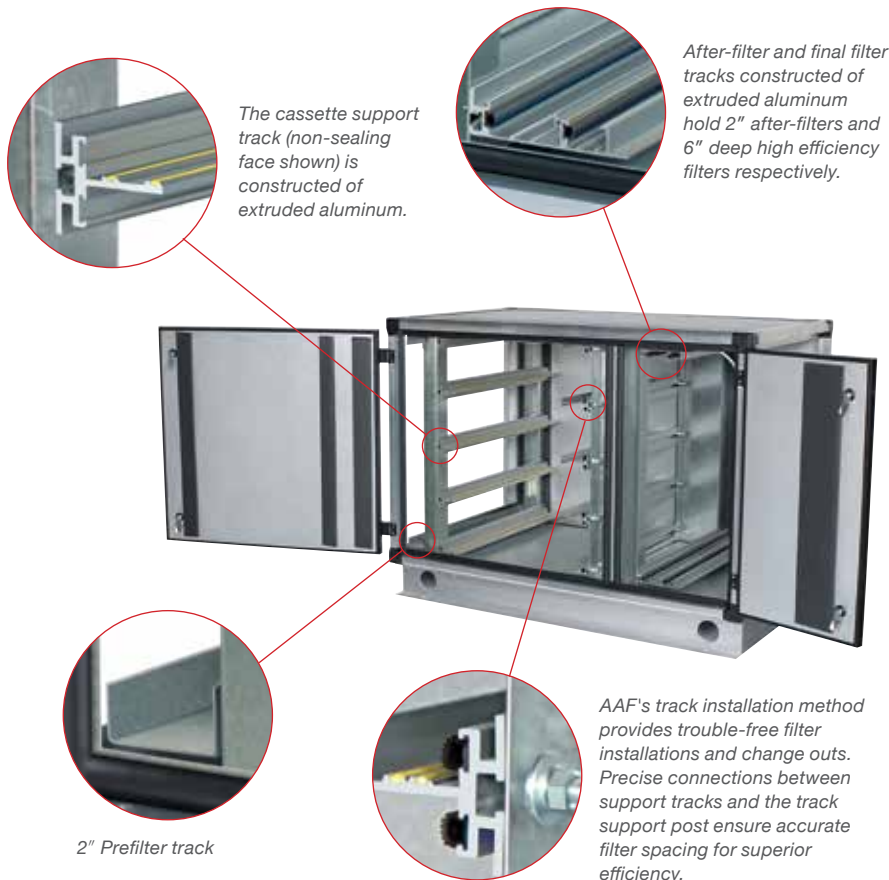
Product Overview

- Combines particulate filters, gas-phase cassettes, and high-efficiency filters to create a total clean air solution (removing both airborne particulate and gaseous contaminants)
- Patent-pending SAAF™ Seal provides the best seal available and superior filtration efficiency
- Wide range of sizes and combinations of filter banks
- Available with internal fan
- Insulated double-walled construction
- Allows for easy installation, operation, and maintenance in a totally self-contained system



Product Information

Zintroalum Housing	
Housing Size Inches (W x H)	Section Length Inches
1 x 2	4
1 x 2	6
1 x 2	24
1 x 4	4
1 x 4	6
1 x 4	24
2 x 2	4
2 x 2	6
2 x 2	24
2 x 4	4
2 x 4	6
2 x 4	24
2 x 6	4
2 x 6	6
2 x 6	24
3 x 2	4
3 x 2	6
3 x 2	24
3 x 4	4
3 x 4	6
3 x 4	24
3 x 6	4
3 x 6	6
3 x 6	24



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Gas-Phase Environmental, Analytical & Design Services



**SAAF™ Chemical Media
Remaining Life Analysis (RLA)**
Page 164



**SAAF™ Reactivity
Monitoring Coupons (RMC)**
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SAAF™ Tech Tools
Page 166



**SAAFShield®
Technology**
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GAS-PHASE ENVIRONMENTAL,
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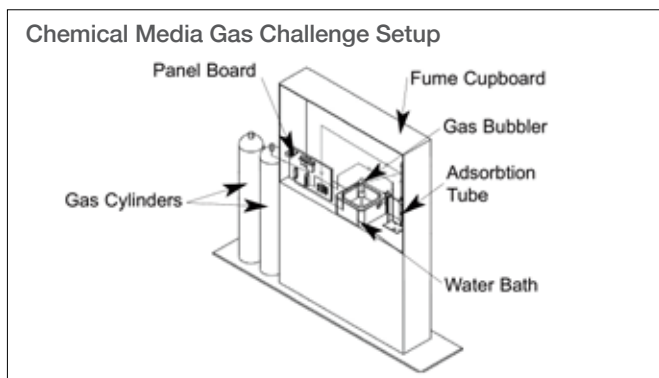
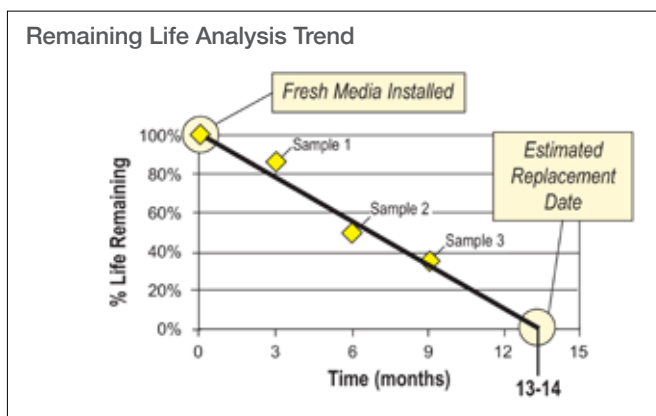
SAAF™ Chemical Media Remaining Life Analysis (RLA)

Product Overview

- Estimates remaining life, replacement schedules, and inventory requirements for chemical media and gas-phase filters
- Provides confirmation of media activity after an event (helicopter landing, solvent spill, open media container)
- Provides information to optimize media choices and maximize system life
- Controls cost by ensuring replacement of media at the proper time



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Detailed example of AAF's Remaining Life Analysis Report

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Gas-Phase Environmental, Analytical & Design Services

SAAF™ Reactivity Monitoring Coupons (RMC)

Product Overview

- Investigative tool to gauge gas-phase filter performance
- Ideal for site assessment reports related to air reactivity
- Qualifies the presence or absences of gas types (sulfur compounds, chlorine compounds, compounds that form oxide films, and unknowns)
- Quantifies reactivity of environment per ISA-71.04-2013 and related coupon standards
- Available in light-duty and heavy-duty versions to suit the application contamination severity



GAS-PHASE ENVIRONMENTAL,
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Product Information

Part Number	Description	Std. Pkg. Qty.	Ship Wt. Lbs/Box (± 7%)	Cubic Ft.
392-801-000	Glass Coupon - Reactivity Monitor	1	1.0	0.0
392-801-001	Metal Coupon - Reactivity Monitor	1	1.0	0.0

Part Number	Description	Ship Wt. (lbs.)	Cubic Ft.
1 oz. SAAF Media Samples			
395-920-100	SAAFOxidant™	1	0.1
395-920-200	SAAFCarb™	1	0.1
395-920-300	SAAFCarb™ MA	1	0.1
395-920-400	SAAFCarb™ MB	1	0.1
395-920-800	SAAFCarb™ MA.HT	1	0.1
395-920-001	SAAFBlend™ GP (50/50 Mix)	1	0.1
395-920-002	SAAFBlend™ WS (33/33/33 Mix)	1	0.1

NOTE: All media samples are placed in glass bottles with screw top lids.

5 lb SAAF Media Samples			
395-921-100	SAAFOxidant™	5	0.5
395-921-200	SAAFCarb™	5	0.5
395-921-300	SAAFCarb™ MA	5	0.5
395-921-400	SAAFCarb™ MB	5	0.5
395-921-800	SAAFCarb™ MA.HT	5	0.5
395-921-001	SAAFBlend™ GP (50/50 Mix)	5	0.5

NOTE: All media samples are placed in glass bottles with screw top lids.

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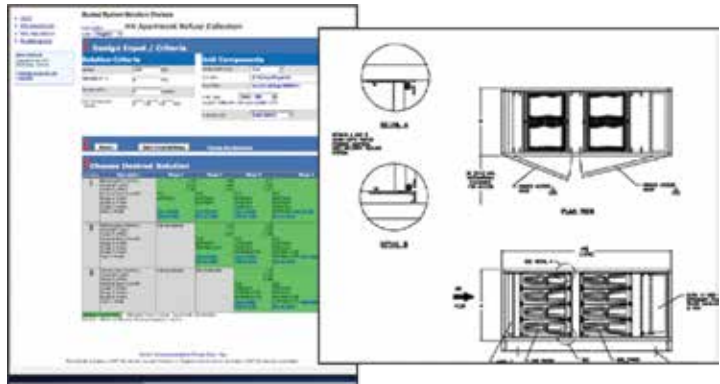


Gas-Phase Environmental, Analytical & Design Services

SAAF™ Tech Tools

Product Overview

- Chemical media selection
- Equipment sizing
- Dynamic logic for blended media options, pressure drop limitations, estimated service life requirements, and space limitations
- Media usage report generation
- Equipment summary generation
- Technical proposal generation



Determine Gas-Phase Filtration Solution Options

SAAF Tech Tools is decision-sciences software that configures clean air products to remove airborne gaseous contaminants. Using SAAF Tech Tools, AAF experts can enter application-specific data or select from a list of pre-defined applications to configure the exact clean air solution required for our customers. Detailed information on contaminants, adsorbers, oxidants, and links to industry information relevant to specific applications is also readily available.

GAS-PHASE ENVIRONMENTAL, ANALYTICAL & DESIGN SERVICES

Quick Look Report

SAAF
INTERNATIONAL

Prepared By: Brad Stanley
Company: American Air Filter
For Questions contact the preparer by:
Email: bstanley@aafintl.com

Air Quality is defined on the basis of the following components -

1. Airborne Liquids (e.g. aerosols, mist, etc.)
2. Airborne Particulates
3. Airborne Molecular Contaminants (Airborne Gases)
4. Temperature and
5. Relative Humidity

Various companies offer products to address a component of air quality. American Air Filter™ (AAF™ International) and its group companies - McGuire™ and Daikin™ Air Conditioning possess unique capabilities and technologies to provide complete, ENERGY EFFICIENT and customized air quality innovations.

This SAAF Selection Tools™ Quick Look report focuses on Airborne Molecular Contaminants (AMCs) chosen within the SO2 & Ozone environment. The table below lists the expected AMCs, their concentrations, the AAF™ chemical media required to eliminate the AMCs and the chemical media quantity for the desired replacement frequencies (service life). Other gases can be present that will affect the results of these calculations or the appropriate application solution. Therefore, AAF strongly recommends testing to determine application concentrations. If a user is unsure of the media or system solution for an application, he should contact the local AAF sales representative.

Example
Media Usage Volume (ft³)

Air Flow (cfm): 2000

Contaminant	PPMv	Months							
		1	3	6	9	12	18	24	
SO2	0.10	0.13	0.39	0.75	1.17	1.56	2.34	3.12	
SAAFCell Total Usage		0.13	0.39	0.75	1.17	1.56	2.34	3.12	
SO2/Ozone	0.10	0.48	1.34	2.68	4.02	5.36	8.04	10.72	
SAAFCell Total Usage		0.48	1.34	2.68	4.02	5.36	8.04	10.72	

IMPORTANT:

1. One may assume that only a specific AMC within an application requires attention. In practice, this is rarely the situation. Most environments contain a complex mix of AMCs that interact to greatly accelerate (or retard) the damage potential posed by an individual AMC in isolation.
2. Chemical and temperature effects cause the rates of destructive chemical reactions to more than double for every 10°C (18°F) increase in temperature.
3. High or variable relative humidity accelerates the reactivity or decay potential of a gaseous mixture.

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JAN 13/08/01

Issued By: Brad Stanley
Page: 1

Example of AAF's Quick Look Report

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Gas-Phase Environmental, Analytical & Design Services

SAAFShield® Technology

Product Overview

- Quartz crystal microbalance technology measures the corrosion of metal due to reactions with the environment, using patent-pending hardware and method of corrosion measurement
- Monitor up to 500 sites by using multiple SAAFShield Detecting Units and one SAAFShield Reading Unit
- SAAFShield Reading Unit provides a formatted data report via saafshield.aafintl.com
- SAAFShield Communications Module provides easy integration into instrumentation networks with a 4-20 mA output
- Parameters monitored include: cumulative corrosion, incremental corrosion, temperature, and relative humidity



GAS-PHASE ENVIRONMENTAL,
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Product Information

Part Number	Description	Ship Wt. Lbs	Cubic Ft.
392-803-001	SAAFShield Reading Unit (RU)	1	0.1
392-803-002	SAAFShield Detecting Unit (DU)	1	0.1
392-803-003	Connection Cable (RU to DU)	1	0.1
392-803-010	Silver Crystal QCM	1	0.1
392-803-011	Gold Crystal QCM	1	0.1
392-803-012	Copper Crystal QCM	1	0.1
392-803-5X0	SAAFShield Communications Module (CM)	1	0.1
392-803-004	Connection Cable (CM to DU)	1	0.1
392-803-000	12V adaptor for Reading Unit (RU)	1	0.1

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