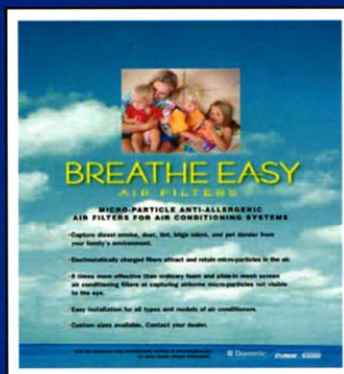


# How to Choose An Air Filter For Your Boat



## That Will Reduce Diesel Fumes, Smoke and Odors

## Air Filtration Fundamentals

Air filters are devices that capture dust and other contaminants from an air stream as the air passes through them. There are three types of air filters:

- Mechanical Air Filters
- Electronic or Electrostatic Air Cleaners
- Gas-phase Adsorption

With the Environmental Protection Agency identifying indoor air pollution as one of the top 5 urgent environmental risks to public health, many consumers are becoming more and more educated about indoor air quality and the importance of air filtration. But with all the misinformation regarding air filters and air filtration, most consumers could use more clear-cut guidance.

The misinformation stems from all the hype that is given to many different types of air filtering devices and mechanisms. Unfortunately, hype is no substitute for physics--the factual, technical way something actually performs.

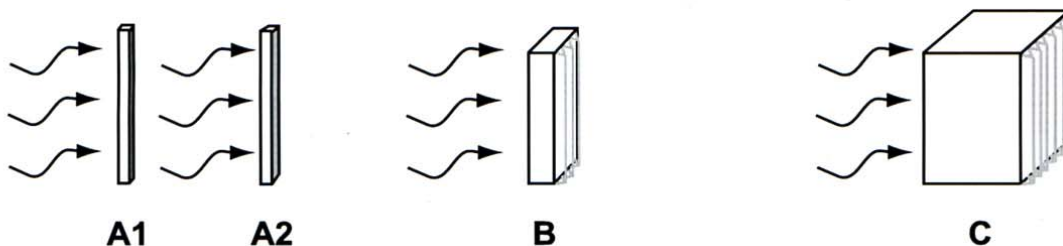
So, if you're confused by all the information, and you want factual, unimpeachable data so you'll know what type of filter you should get for your home, office, and your boat, make sure you read this special report.

### Mechanical Air Filters

Since the focus of this report is choosing the right air filter for your boat, we will limit our discussion to mechanical air filters since that is the only type of filter you will find in a marine environment.

A mechanical air filter is any type of dry media filter. They remove particles from the air by capturing them on the filter medium.

All of the throwaway air filters used in HVAC systems and Air Handlers are mechanical air filters. Any man made or natural fiber filter is a mechanical air filter, including HEPA air filters. For boats, the filter medium is generally nylon, foam mesh, or aluminum mesh;



The three filter sketches represent a standard throw away air filter (A1 & A2) usually 1" thick. B represents a 2" or 4" thick pleated media air filter and C represents a HEPA air filter, usually 11½" thick or deep.

Mechanical air filters operate on two filtration principals: primary air filtration or impingement of the dust on the media itself, and secondary air filtration, which is the dust or filter cake on the filter removing or filtering out smaller dust particles.

## **Taking the Confusion Out Of Air Filter Efficiency**

We'll keep this simple and short so as not to add to some of the confusion over air filter efficiencies.

First, we would like to point out that any company that sells an air filter that states an efficiency rating without basing it on a particle size is providing you with basically useless information. For example: an air filter that has a statement reading "this filter will remove up to 95% of all airborne contaminants in your home or office," doesn't really tell you anything. Since most of the respirable particles that actually are harmful are usually less than 10 microns in size, don't you think it would be important to tell you what size particles they actually remove from the air?

So, let's look at this statement again. "95% of all airborne contaminants" sounds pretty good, doesn't it? Now look at this statement. "Our filters remove 94.7% of all airborne contaminants between 0.3 microns and 1.0 micron."

At first glance these two air filters look similar in capability. But the first air filter provides no particle size range or efficiency based on particle size. The second one does.

One of the ways filter manufacturers and suppliers have been selling filters is through the use of Minimum Efficiency Rating Value (MERV) ratings. MERV ratings were put into place through American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 52.2. This standard was established in 1999, and was a way of establishing a minimum operating capacity for a filter. Through testing, a number or value is placed on a filter, which is meant to tell the contractor or consumer how the air filter will perform under minimum requirements against specific sized particles.

This numbering system makes it easier to evaluate and compare mechanical air filters and will hopefully eliminate some of the confusion regarding the overall effectiveness of any type of a mechanical air filter on removing airborne particulates.

## **How Does Your Filter Stack Up?**

The following table shows you the new **MERV ratings**. Filters are ranked from a rating of MERV 1 up to a rating of MERV 16. Higher MERV ratings mean better filtration efficiency — the ability to screen out smaller particles more effectively.

Most companies that make air filters are now using this MERV rating, so you will see a MERV number on the air filter and perhaps some rated efficiency.



If we look at each size group of particles and assume that ALL of each group passed through the filter, we can calculate Minimum Efficiency Rating Value MERV. EPA, the American Lung Association and others agree that the most harmful particles are 10 microns or smaller so the MERV rating for the larger particles was not calculated. It can be assumed, however, if the filter is stopping most of the SMALL particles, then the filter will be stopping even MORE of the larger particles.

Use the MERV rating as a comparison tool for evaluating the effectiveness of air filters. The higher the MERV rating the better the filter is at trapping specific types of particles. However, the MERV rating is not intended to be the sole basis for deciding which filter to buy, just as the horsepower of a car engine is not the only criteria in buying a car.

### Minimum Efficiency Rating Values (MERV) ASHRAE Standard 52.2

Group Number	MERV Rating	Arrestance	Typical Controlled Contaminant	Typical Applications and Limitations	Typical Air Filter/Cleaner Type
1	MERV 1	<65%	>10 Microns Part. Size	Minimum filtration residential Window air conditioners	<b>Throwaway</b> Disposal fiberglass or synthetic panel filters <b>Washable</b> Aluminum mesh, latex coated animal hair, or foam rubber panel filters
	MERV 2	65—70%	Pollen		
	MERV 3	70—75%	Spanish moss		
	MERV 4	75—80%	Dust mites Sanding dust Textile fibers Carpet fibers		
2	MERV 5	80—85%	3 -10 Microns Part. Size	Better residential Commercial buildings Industrial workplaces	<b>Pleated Filters</b> Disposable, extended surface <b>Cartridge Filters</b> Pocket filters or panel filters <b>Throwaway</b> Disposable synthetic media panel filters
	MERV 6	85—90%	Mold		
	MERV 7	>90%	Spores		
	MERV 8	>90%	Hair spray Dusting aids		
3	MERV 9	>95%	1 -3 Microns Part. Size	Superior residential Better commercial buildings Hospital laboratories	<b>Bag Filters</b> Flexible microfine fiberglass or synthetic media <b>Box Filters</b> Rigid style cartridge filters
	MERV10	>95%	Legionella		
	MERV11	>95%	Humidifier Dust		
	MERV12	>95%	Leed dust Auto emissions Nebulizer drops		
4	MERV13	>98%	0.3-1 Microns Part. Size	Hospital inpatient care General surgery Smoking lounges Superior commercial buildings	<b>Bag Filters</b> Flexible microfine fiberglass or synthetic media <b>Box Filters</b> Rigid style cartridge filters
	MERV14	>98%	All bacteria		
	MERV15	n/a	Most tobacco smoke		
	MERV16	n/a	Cooking oil Most smoke Insecticide dust Most face powder		

### **Additional Factors to Consider When Choosing A Filter**

If you're looking for an air filter for your home, you should research the specific problem you have and address it with the appropriate filter. For example, a fiberglass filter is not effective on tobacco smoke, but they are effective at removing pollen, carpet fibers, etc. If you want to remove tobacco smoke, you'll need a filter with a MERV rating of 13 or better.

The variety and amount of particles in your home's air will depend on how many people and pets live in the house and what types of activities go on there. People with allergies or asthma should be extra diligent about keeping home air filters clean.

You should know that the minimum efficiency level of filtration applied for any area of human occupancy is MERV-6. This is true for both residential and commercial applications.

ASHRAE has also set guidelines for specific commercial buildings. The typical office environment should use a MERV of 7 to 11 or better. Consideration here includes extra contamination contributors, such as photocopies, computers, and additional human traffic.

Also, the MERV rating alone ignores service life and performance over time. For example, two filters with the same MERV ratings may have a different service life. So make sure you ask the sales representative or contractor about a filter's service life.

### **Clean Air Is Just Important Inside a Boat As It Is Inside a Home**

Air filters, whether in your home or on a boat, keep the coil exchange surfaces on the HVAC systems clean. Dirty coils make the system less efficient and consequently work harder, so cleaning (if it's a washable filter) or regularly replacing the filter helps prolong the life of your HVAC unit.

In addition to keeping the HVAC system clean, the filter on your boat can also clean the air that you and your family breathe. But the thing is, until recently, there was only one type of air filter for marine air conditioners. This standard filter has a MERV rating of only 1, which means they primarily remove only particles that are greater than 10.0 microns.

The following table is a copy of the independent test results from LMS Technologies where they tested our standard nylon filter for boats.

## LMS TECHNOLOGIES, INC.

### Test Report-ASHRAE Test Standard 52.2

Test Requested By: Dometic

Manufacturer: Dometic

Product Name: Screen--Standard Filter for Marine AC

Model Number: \_\_\_\_\_

Dimensions: 10.75x12

Number of  
Pleats: None

Filter  
Description: Black nylon screen

How Filter Obtained: Provided by manufacturer

Test Air Flow Rate(CFM)/Velocity (FPM)	<u>264 cfm/295 fpm</u>
Initial Resistance (in. WG)	<u>0.04</u>
Final Resistance (in. WG)	<u>0.6</u>
Minimum Efficiency Rating Value (MERV)	<u>MERV 1 @ 264 cfm</u>
Average Arrestance, %, by standard 52.1 method	<u>56%</u>
Minimum Average Efficiency 3.0 to 10 Microns (E3)	<u>&lt;20%</u>
Dust Fed to Final Resistance(grams)	<u>45 grams</u>

Temp &  
Humidity: 70 @ 30%

Particle  
Analysis: Hiac/Royco FE-80

Test Dust: ASHRAE 52.1 Dust

Test Aerosol: KCL Neutralized

As you can see, our standard filter, which is very similar to every other marine filter on the market, does very little to filter out particles in the 3.0 to 10.0 micron range (less than 20%). But as we mentioned before, the most harmful particles are 10 microns or smaller.

Why are standard marine filters so ineffective in removing the smaller, more harmful particles? Because they are designed to filter out large particles that can clog the air conditioning system, not to help you and your family breathe more easily.

### The *Breathe Easy* Marine Filter Has A MERV Rating Of 7! MERV 7-- Higher Levels of Filtration for Cleaner Air

For every visible particle (10 microns and larger) trapped in your marine air conditioning filter, such as dust, dirt, and mold, there are as many as 100 more that you cannot see, including fungi, bacteria, and pollen. If not stopped, these micro-particles can flow through your air conditioning system and into the air you breathe.

Through independent lab testing, Dometic's *MERV-7 Breathe Easy* filter has been proven to capture a greater percentage of micro-particles than our conventional marine filter--or any other marine filter for that matter. We don't expect you to take our word for it, so we've included a copy of the test results on the next page.

As you can see, the *MERV-7 Breathe Easy* filter not only captures more than half (55.3%) of the particles between 3.0 and 10.0 microns, but it also filters out more than half of the particles that are in the 1.0 to 3.0 micron range. Plus, it even removes close to one quarter of the particles that are as small as 0.3 microns!

If you look at the table on page that lists the MERV ratings, you'll find that tobacco smoke, bacteria, and auto emissions all fall in the range of 0.3--3.0 microns.



## LMS TECHNOLOGIES, INC.

### Test Report-ASHRAE Test Standard 52.2

Test Requested By: Dometic

Manufacturer: Dometic

Product Name: PF12C16A--Breathe Easy Filter

Model Number: \_\_\_\_\_

Dimensions: 10.75 x 12

Number of Pleats: 8 pleats

Filter Description: White synthetic pleat filter

How Filter Obtained: Provided by Manufacturer

Test Air Flow Rate(CFM)/Velocity (FPM)	<u>264 cfm / 295fpm</u>
Initial Resistance (in. WG)	<u>0.217</u>
Final Resistance (in. WG)	<u>0.6</u>
Minimum Efficiency Rating Value (MERV)	<u>MERV 7 @ 264 cfm</u>
Minimum Average Efficiency 0.3 to 1.0 Microns (E1)	<u>23.4</u>
Minimum Average Efficiency 1.0 to 3.0 Microns (E2)	<u>51.8</u>
Minimum Average Efficiency 3.0 to 10 Microns (E3)	<u>55.3</u>
Dust Fed to Final Resistance(grams)	<u>5.8 grams</u>

Temp & Humidity: 70 @ 30%

Particle Analysis: Hiac/Royco FE-80

Test Dust: ASHRAE 52.1 Dust

Test Aerosol: KCL Neutralized



## Choosing a Filter for the Marine Environment

Still not sure what type of filter to use on your boat? Here's a chart that compares the features of the various types of marine filters on the market today to help you select the filter that is best for you.

**Air Filter Comparison Chart (For the Marine Environment)**

<b>Features</b>	<b>Dometic Breathe Easy Marine Filter</b>	<b>Dometic Standard Nylon Marine Filter</b>	<b>Standard Marine Foam Mesh Filter</b>	<b>Standard Marine Aluminum Mesh Filter</b>
ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.) Certification	YES	YES	NO	NO
MERV rating higher than 1	YES	NO	NO	NO
8 times more effective than standard marine filters in capturing harmful particles from the air	YES	NO	NO	NO
Dust Holding Capacity: 165 grams	5.8	4.5	?	?
Helps Protect HVAC System And Health	YES	NO	NO	NO
Money-Back Guarantee	YES	NO	NO	NO
24/7 Customer Service Hotline	YES	YES	NO	NO
ISO 9000 Company Certification	YES	YES	NO	NO
Inhibits Smoke	Partially	NO	NO	NO
Washable	NO	YES	YES	YES
Allergy Relief	Partial	NO	NO	NO
Replaces a standard low efficiency "Throw Away" filter with no modification to the system	YES	NO	NO	NO
Protects furnace and a/c motor	YES	YES	YES	YES
Requires changing every 2-3 months	YES	NO	NO	NO
Excellent for High Velocity Equipment	YES	YES	YES	YES

The Breathe Easy filter offers new levels of protection for your family. The higher MERV rating means the air on your boat will be cleaner and smell better.

The Breathe Easy filter is designed specifically for marine use in most air conditioning systems on the market. Special size? No problem – we'll take a bit more time, but we can get them specially made for you.

Unfortunately, because of its higher efficiency, you'll need to change the Breathe Easy filter more frequently than a standard marine filter. However, you'll know when the filter needs to be changed because the air flow will be reduced, and ice may form on the filter itself. The guidelines for changing are as follows:

We designed the *MERV-7 Breathe Easy* filter knowing that modern air filters must protect people as well as air conditioning equipment. You can call your dealer for a set of filters. If you don't know who your dealer is look on the web – [www.dometicenviro.com](http://www.dometicenviro.com) – and find the closest closest Marine Air or Cruisair distributor. He or she will be happy to send you a new set of filters.

## **What Our Clients Are Saying About The MERV-7 Breathe Easy Filter**

Here is a sampling of comments we've received from our many satisfied clients:

*"I put a Breathe Easy filter on my boat and the next day I got rid of odors and mustiness. My kids' allergies even stopped acting up. You simply can't put a price tag on that. Thank you!"*

*- P. Soto, Fort Lauderdale, FL*

*"I bought an air cleaner for my house and it made a huge difference. So I figured I'd do the same thing for my boat. I purchased your marine filter and I couldn't believe the difference it made."*

*- M. Graham, Miami, FL*

*"I'm very happy with my Breathe Easy filter. Although I hadn't noticed that my boat smelled before, the difference is pretty dramatic. I'll never use another filter!!"*

*-J. Burns, San Diego, CA*



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