

circuitGuard™ Filter/Construction Technology

Filter media

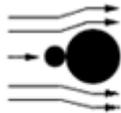
- 3M filtrete
Most widely used filter in the world
- Air Filtration: Technology

3M's Filtration Products Division approach to air filtration is simple: efficient particle removal without sacrificing airflow rate. This approach has yielded a line of highly efficient, low-pressure drop air filtration media and filters.

In many applications, particles larger than 10 microns drop out of the air stream before reaching the filter due to gravitational settling. Particles less than 10 microns are those, which are of most concern to human health and damage to sensitive equipment. Our products use several filtration mechanisms to remove these smaller particles from the air. The following capture mechanisms are present:

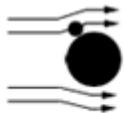
Sieving: Large particles are too large to pass between the fibers of the filter.

Inertial impaction: Larger particles collide with the filter fibers because due to the high inertia they cannot follow the air stream as it moves around the fibers.



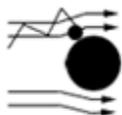
Inertial Impaction

Direct interception: Intermediate-sized particles are captured as they follow the air stream around the filter fibers; active whenever the air stream comes within a half particle diameter of the fiber.



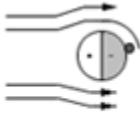
Direct Interception

Brownian diffusion: Particles smaller than 0.1 micron are carried by the motion of the air molecules, causing the particles to randomly come into contact with the filter fibers.



Brownian Diffusion

Electrostatic enhancement: Fibers are given permanent electrical charges to attract particles in their vicinity, which greatly increases the “electret” filter’s ability to capture small- or medium-sized particles.



Electrostatic Enhancement

A prime example of electrostatic enhancement in action is our Filtrete™ Split fiber filtration media. Each nonconductive fiber contains permanent, electrostatic charges that enhance particle capture efficiency. With its patented electret construction, Filtrate media captures particles throughout the media, rather than on the media surface.

The result is filter systems with demonstrated high efficiency against difficult-to-capture, sub micron particles. It is best designed for use when high efficiency is needed with low-pressure drop. Because we have created electrostatic fibers that are so efficient in capturing particles, we are also able to give Filtrete™ media a more open construction. Air molecules encounter fewer fibers as they pass through the filter, resulting in extraordinarily low-pressure drops and greater airflow.

The low-pressure drop is maintained during use because Filtrete™ Split fibers filtration media is a three-dimensional, depth-loading filter rather than a surface-loading filter. Although the use of electrostatics is not uncommon in filtration, the Filtrete™ charged filtration media is superior for three reasons:

- The highest charge density of any electrostatically charged material;
- Permanently charged rectangular fibers that provide more loading surface than round fibers;
- Charged media combined with depth filtration to provide a higher loading capacity.

Unitized Construction

- The **construction** of circuitGuard™ (the only product with this type of construction) ensures integrity of the filter media.
- We have an exclusive advantage in manufacturing. Our engineers assemble our devices so that the top and bottom halves of the device will NOT fit together UNLESS the **filter** is properly seated.

The housing of the circuitGuard™ is unique in its construction. There is a ledge on one half and a lip on the other half. When the two halves come together in the assembly process it creates an inner wall and directs all the gas through the filter media. Our product when pressure tested actually tests for the correct placement of the filter within the housing as well as the seal of the two outer components. The gas cannot bypass the filter because there are no fail points. This is not the case in products that glue or ultrasonically weld the two pieces together. Pressure testing of these other devices assures that the top and bottom are sealed **not** that their filter is in place.



Independent Testing

- Nelsen Laboratory
FDA registered testing laboratory. 1996 certified ISO 9001 Standards
- CAMR
CAMR – the Center for Applied Microbiology and Research located in Porton Down, England - One of the largest independent microbiology laboratories in the world, which is also associated with the International Standard Organization (ISO)