



## Filter Retention: Understanding Nominal and Absolute Ratings

*Understanding a filter's retention rating (pore size) and whether or not it is nominal, absolute, and what the filter's true particle retention will be is crucial to making sure the correct filter is selected for a process.*

### How is a filter's pore size determined?

There are no industry standard guidelines regarding how filter pore size, retention, or rating is determined. When assigning a filter its pore size, 0.45  $\mu\text{m}$  for example, many factors are taken into consideration by the manufacturer including type of filter, removal efficiency, challenge testing, and ability to retain trapped particles.

### What is an absolute rated filter?

Absolute ratings are one of the most varied claims in industry. One manufacturer may state that a filter must remove greater than 99% of particles at its pore size to be rated absolute, while others may rate a filter that only removes 90% of particles at its stated pore size as absolute. A manufacturer may also rate a pre, clarification, or depth filter as absolute due to high initial retention, but when its media may be susceptible to deformation or unloading thereby allowing particles larger than the pore size downstream. Gusmer Enterprises considers an integrity-testable membrane with validated retention of  $10^7$  at its stated pore size as being absolute.

### What is a nominal rated filter?

A nominal filter is one that is not absolute. A nominal filter may not have a high retention at its selected pore size or may deform or allow particle bypass under certain conditions, such as excessive pressure. A nominal filter may also possess different retention characteristics with different process streams. Gusmer Enterprises considers any filter that cannot be integrity tested to be nominally rated, regardless of media or retention.

## Can filters rated the same pore size have different retentions?

Yes. Many filters rated 1.0  $\mu\text{m}$ , for example, may only retain 50% of 1.0  $\mu\text{m}$  particles while others may retain 99% of 1.0  $\mu\text{m}$  particles.

## What can be used to determine a filter's true removal characteristics?

Particle or microbial challenge test results are often used with membranes or certain fine prefilters. With bulk depth filters, comparing the clean water pressure drop is a good indicator of retention at the stated pore size. These curves are often available on datasheets or can be requested from the filter manufacturer. In general, when comparing filters with the same pore size rating, the filter with the highest clean water pressure drop at a specific flow rate will often retain the highest percentage of particles at the stated pore size.

## What is graded density and how does that affect retention?

Graded density is a property of many clarification and prefilters in which the upstream of the media is more open than the downstream and may not contribute as much to the stated retention. A graded density filter may have greater dirt holding capacity, but lower retention at its stated pore size. This can be a benefit when requiring a higher capacity but not necessarily needing a high retention, such as when there is another downstream filter with high retention but low capacity.

## Which Gusmer cartridge filters are absolute rated?

Gusmer's BevReady™ Pure series of filter cartridges are integrity-testable with validated  $10^7$  retention. This series of filter cartridges are considered to be absolute rated. Please contact your local Gusmer Enterprises representative if you have any questions on absolute and nominal ratings or integrity testing.



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