

3M Purification Inc.  
Wine Filtration Systems



Tradition blended with innovation. . .

Fruit cultivated with  
exacting detail. . .

Aged Oak Barrels. . .

Complex flavors and  
aromas. . .



# Wine Filtration Systems

Winemaking skills passed down from generation to generation. . .

. . .The key ingredients in award winning wines, 3M Purification understands the demanding and complex nature of creating the best wines in the world.

In wineries from the fields of Bordeaux, to the vineyards of Napa, to the Barossa Valley, 3M Purification has worked for decades with winemakers providing the filtration expertise required for absolute clarity and stability of fine wines.

This expertise has led to a number of ground breaking 3M Purification inventions including the depth filter, Zeta Plus™, the Nylon membrane, prefilters, LifeASSURE™ BLA series filters and now, the first Nylon membrane optimized to withstand the arduous conditions found in wineries, LifeASSURE™ BA series filters

3M Purification takes a systems approach to helping winemakers optimize their filtration. Just as a fine wine is more than the sum of its parts, 3M Purification works individually with the winemaker to design the optimum system for

clarification, prefiltration and final filtration. This results in integrated

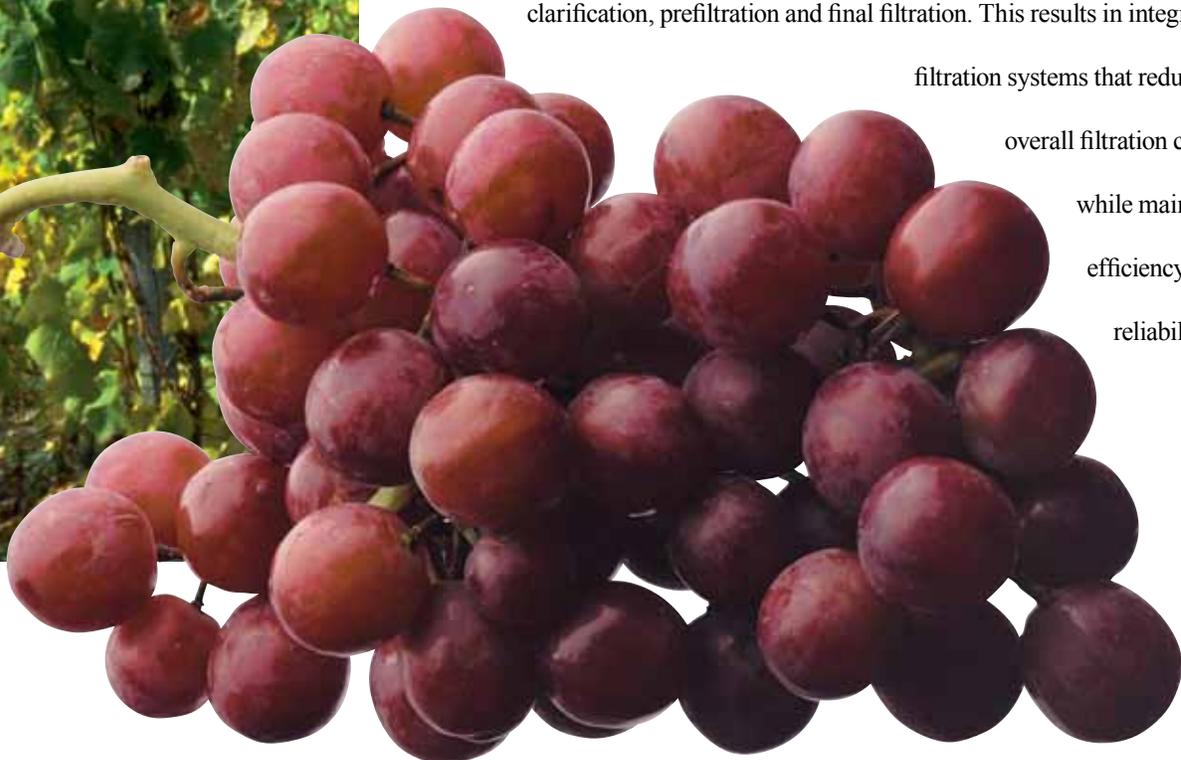
filtration systems that reduce

overall filtration costs

while maintaining

efficiency and

reliability.



## Why do winemakers around the world choose 3M Purification Filter Systems for their wines?



### **Performance:**

3M Purification systems deliver **ECONOMICAL** answers to the filtration needs of winemakers.

- Longer filter life and highest throughputs
- Reduced labor and change-out time
- Exceptional contaminant holding capacity
- Filter cartridges designed for regeneration and reuse
- Consistent, reliable quality

### **Convenience:**

3M Purification filter systems offer **CONVENIENCE** and ease-of-use.

- Easy filter installation and rapid change-out for minimal downtime
- User friendly housing designs
- Wide range of products to match all process flow rates
- Leak-free, totally enclosed filter housings

### **Quality:**

3M Purification filter systems deliver world wide **QUALITY** for consistent operation.

- ISO9001 quality systems
- World wide manufacturing and distribution
- Rigorous in-house testing and validation



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## 3M Purification Inc. and Winemaking

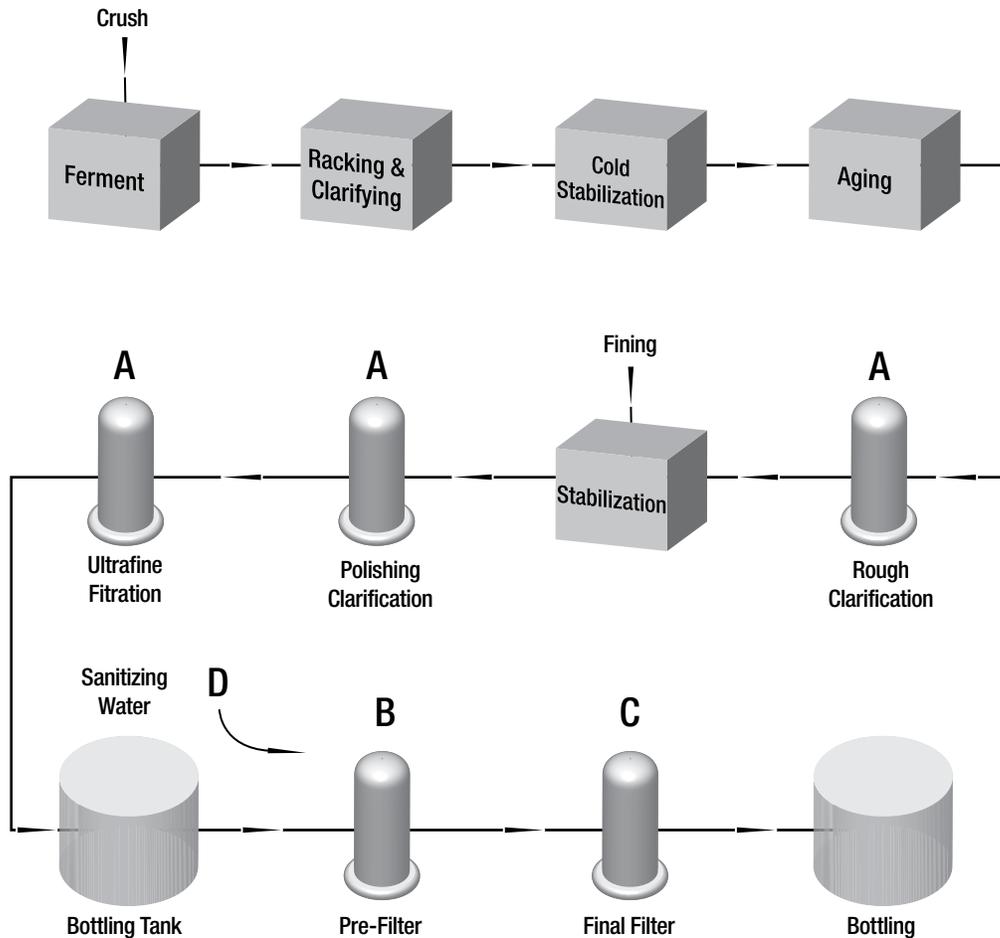


Figure 1 – Because filtration A requirements vary from winery to winery, the above schematic is intended only to provide possible filtration configurations. On-site filter evaluation is recommended for process optimization.

### A. Zeta Plus™:

The Flagship of Wine Filtration.

Convenient and cost effective rough and polishing clarification of fine wines using Zeta Plus filter sheets or the cartridge concept

### B. Membrane Prefiltration:

LifeASSURE™ BLA Series: Superior Protection of Final Membrane Filters.

LifeASSURE BLA prefilters, featuring the innovative multi-zone membrane design, protect and extend final membrane service life, greatly reducing overall filtration costs.

### C. Membrane Filtration:

LifeASSURE™ BA Series: The Next Generation in Performance and Economy. Durable, high surface area, cleanable LifeASSURE BA series membrane filters provide the final barrier to spoilage organisms, resulting in microbiologically stable fines wines and low per-case filtration costs.

### D. Water Filtration:

A Key Ingredient in Particulate Control and System Integrity. For bottle washing, cartridge flushing, and system sanitation, 3M Purification filter cartridges deliver clean, particle-free water.

## Wine Clarification with Zeta Plus™ Series Filters

Winemakers the world over rely on Zeta Plus™ depth filter cartridge systems to clarify and stabilize their wines. The Zeta Plus technology provides superior clarification and significant reduction of spoilage yeast and bacteria to enhance and protect fine wines. Zeta Plus systems offer the following major benefits to the winemaker:



Zeta Plus™: The Flagship of Wine Filtration.

- Cost effective reduction of particulates, haze, and microorganisms to provide the highest quality wine.
- A totally enclosed housing design that reduces wine loss due to leakage. It also prevents wine contamination from airborne molds and fruit flies while protecting the wine from oxidation unlike open filter presses.
- Zeta Plus systems offer durable filter cartridges capable of withstanding repeated heat sanitation and arduous processing conditions. This results in long, dependable service life and excellent process economies.
- Zeta Plus cartridges are fast and easy to install and change-out, ensuring low labor costs and minimal system down time.

## How Does the Zeta Plus™ Cartridge System Stack Up Against a Conventional Filter Press?

### Benefits of the Zeta Plus™ Cartridge System

#### *Saves on product loss*

Zeta Plus™ cartridges are contained in a totally enclosed, sanitary filter housing to reduce any chance of leakage.

#### *Saves on labor*

A Zeta Plus cartridge system can be changed out in 15 minutes compared to much longer change-out times for a filter press (4 - 8 hours or longer for large presses).

#### *Saves on media change-outs*

Zeta Plus cartridges are used to complete blockage at 35 psid which results in fewer media change-outs when compared to sheet filters in a filter press. To avoid product contamination, sheet filters are changed every 3 - 5 days, regardless of used capacity, and typically cannot be stored in the press when not being used.

#### *Saves on capital costs*

For comparable flow rates, a typical Zeta Plus system housing costs less than one half of a stainless steel filter press.

#### *Saves on maintenance*

Zeta Plus systems have only one set of O-rings to maintain, resulting in easy upkeep. Filter presses have hundreds of O-rings to maintain and replace.

#### *Saves on energy*

Since Zeta Plus housings are totally enclosed, they are easier and quicker to sanitize with hot water than a filter press, leading to lower energy costs.

#### *Saves on space*

Zeta Plus systems are vertical in design and require only a fraction of the floor space needed for a comparable filter press.

#### *Saves on disposal*

Since Zeta Plus cartridges are used until they are plugged, disposal costs are reduced when compared to sheets in a filter press which are changed out every 3 - 5 days.

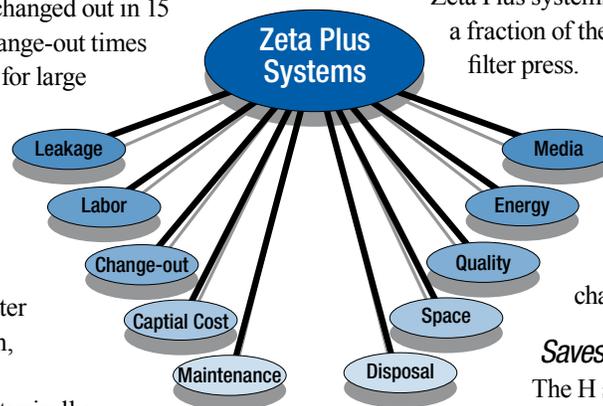
#### *Saves on media*

The H series filter media used in the Zeta Plus cartridge has tensile strength three times that of competitive filter media. The superior media strength results in longer life and throughput when compared to sheet filters.

#### *Saves on quality*

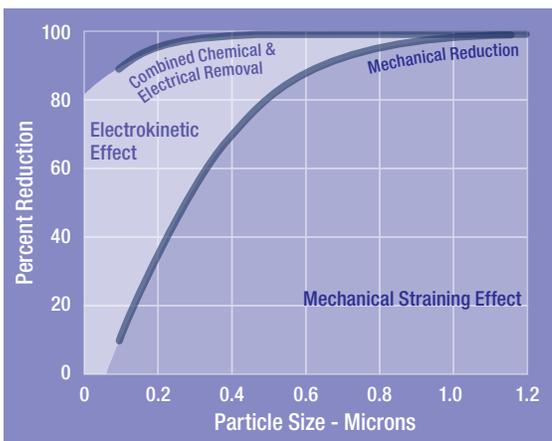
Zeta Plus media is made around the world in state-of-the-art, manufacturing facilities. Zeta Plus products undergo an extensive battery of Quality Control tests before release to ensure consistent, reliable filtration performance.

For more information, please ask for Customer Application Brief LITCABZPS2.

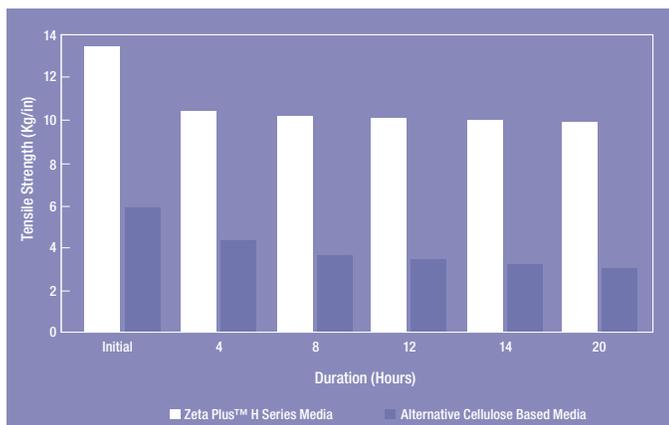


**Table 1 – Filter Press versus Zeta Plus™ Cartridges**

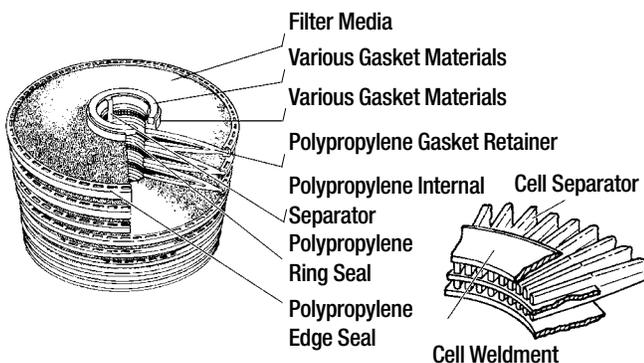
|                          | Filter Press<br>(¢ / Case) | Zeta Plus™<br>(¢ / Case) |
|--------------------------|----------------------------|--------------------------|
| Capital Cost             | 0.46                       | .01                      |
| Media Cost               | 0.34                       | 0.66                     |
| Labor Cost               | 0.16                       | 0.04                     |
| Product Losses (leakage) | 5.2                        | -                        |
| Regeneration/Sanitation  | 0.15                       | 0.1                      |
| Parts/Maintenance        | 0.2                        | 0.1                      |
| Total Cost/Case          | 6.5 ¢                      | 1.0 ¢                    |



**Figure 2**



**Figure 3 – Tensile Strength at 90 °C Water Exposure**



**Figure 4**

## The Benefits of the Zeta Plus™ Cartridge System Versus a Filter Press

Winemakers have long used conventional filter presses to filter their wines. However, filter presses have never been considered a particularly convenient or efficient method of filtration. 3M Purification developed the Zeta Plus™ cartridge system to reduce the disadvantages of filter presses and provide convenient and cost effective wine filtration. Table 1 highlights the significant economic advantage that the Zeta Plus system provides over conventional sheet filtration using a filter press. To complete this analysis, a typical bottling line running 180 bottle/min was used with a single stage Zeta Plus configuration compared to a standard filter press. A 10 year depreciation was assumed for capital costs.

## Zeta Plus™ Formulation

Zeta Plus, the world's first, non-asbestos depth filter media, is composed of filter aids embedded in a cellulose fiber matrix. During the Zeta Plus manufacturing process, molecules carrying a positive charge are chemically bonded to the matrix components permanently forming an interconnected, rigid filter. The resulting porous filter structure is a tortuous network of charge-enhanced flow channels capable of reducing hazes and retaining bacteria, particulate, colloidal debris and submicronic contaminants to a level which mechanical screening alone cannot achieve<sup>1</sup> (see Figure 2). The graded density construction and the charge-enhanced internal absorptive capacity of Zeta Plus media provide high-efficiency submicronic filtration to outperform pleated filters and competitive depth filters. Available in 10 grades with varying retention capabilities (see Figure 6), Zeta Plus media provides optimal rough clarification, polishing and bioburden reduction filtration.

## Zeta Plus™ H Series Media

The Zeta Plus™ H series of filter media was specifically designed to meet the rigorous challenges of the winery environment. The H series media formulation is optimized to withstand repetitive hot water sanitation cycles while maintaining media strength and efficiency superior to that of other filter media (see Figure 3). This media formulation, combined with the rugged cartridge structure detailed below, results in superior filter life and optimum process economies.

## Durable <sup>Generation</sup> Cartridge Design

The innovative Zeta Plus cartridge is constructed with two sheets of filter media formed into an envelope-like cell which is then stacked with similar cells to make a cartridge. Cartridges are constructed with stiff cell separators for better flow and media utilization, hence longer life (see Figure 4). Competitive filters without stiff cell separators allow filter media to obstruct internal flow channels leading to higher differential pressures and shorter

<sup>1</sup> K. Hou, et al, Capture of Latex Beads, Bacteria, Endotoxin and Viruses by Charge-Modified Filters, Applied and Environmental Microbiology, 1980

service life. Improved "tensioning" provides for the ultimate in cartridge integrity under arduous operating conditions including hot water sanitation cycles.

## Media Regeneration

In order to extend the filter service life and provide the lowest possible operating cost to the winemaker, 3M Purification has developed a media regeneration protocol. The protocol, seen in Figure 5, is designed to dissolve warm water soluble compounds that, over time, can plug filter media. Typically performed prior to hot water sanitation at the end of the daily filtration cycle, this regeneration protocol results in a lower differential pressure at the next start-up, thereby extending the filter life and reducing overall filtration costs — sometimes as much as 25%. A guide to warm water regeneration is available from 3M Purification Request LITTDC02.

## Rough and Polishing Clarification with Zeta Plus™ Media

The goal of most winemakers is to produce a microbiologically stable wine with excellent clarity and low turbidity. Sometimes this goal can be elusive. Haze and turbidity may have simple origins such as heat, unstable proteins or excess yeast in the wine. They can also be caused by more elaborate phenomenon such as complexes of proteins and polyphenols. Microbiological contaminants have a variety of origins as well, from the grapes themselves, contaminated yeast strains, barrel surfaces and unsanitary process lines. In properly controlled and maintained systems, Zeta Plus™ cartridges containing 30H media or tighter have consistently exhibited 100% reduction of yeast (refer to Table 2). Actually, Zeta Plus media is formulated to reduce haze due to the charge modified feature of the media formulation. Haze complexes generally carry a net negative charge. As the wine is filtered through Zeta Plus cartridges, hazes are attracted by the positive charge sites in the matrix of the filter media. This results in wine with low turbidity and excellent clarity.

## Ultrafine Filtration with Zeta Plus™ Media

The bioburden (yeast and spoilage bacteria) of wine must be greatly reduced or reduced in order to provide a product that is microbiologically stable. Winemakers use Zeta Plus cartridges, either in a single stage or in a series, to provide microbiologically stable wine even without the use of a final membrane. The combination of mechanical reduction and electrokinetic adsorption provided by Zeta Plus filter media results in superb microorganism reduction.

Table 2 shows significant retention of organisms that simulate wine contamination in laboratory studies<sup>2</sup>. In each test, the filter effluent was free of organisms. These challenge levels are much higher than what would be typically encountered in a winery and represent a "worst case" scenario. Actual reduction performance

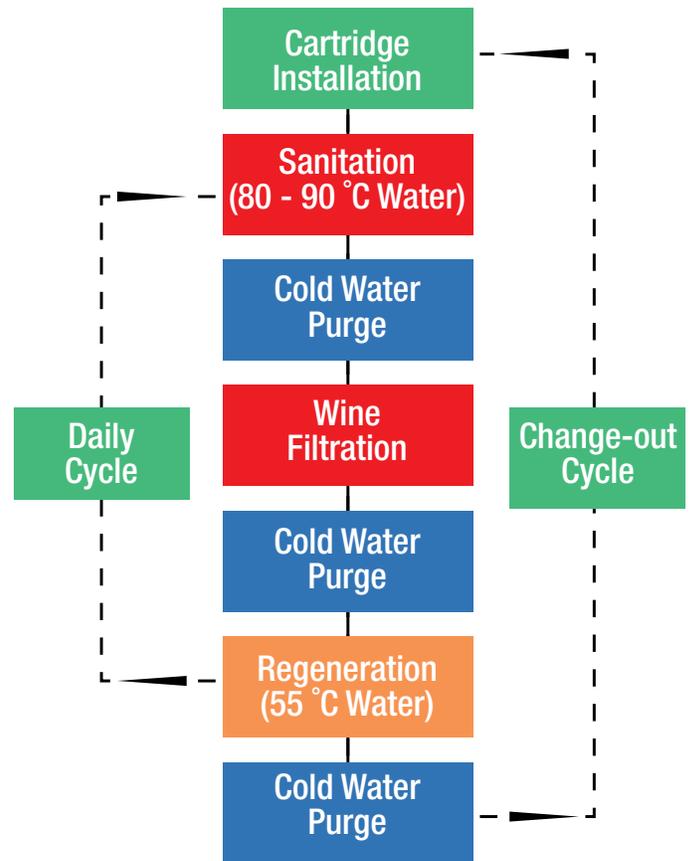


Figure 5

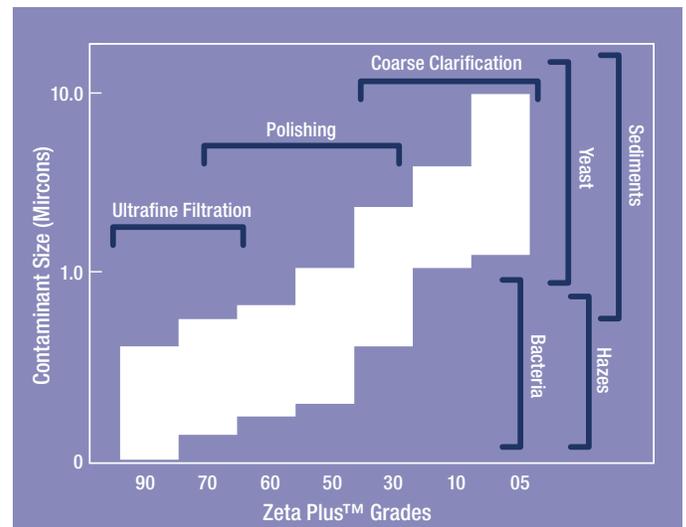


Figure 6 – Filter Grades

<sup>2</sup> Patel, Filtration Technologies and Beverage Processing, Filtration and Separation, 1993

**Table 2 – High Performance in Microbial Reduction**

| Zeta Plus™ H Grade | Challenge Organism              | Reduction (CFU's/cm <sup>2</sup> of Media) | Organisms in Effluent |
|--------------------|---------------------------------|--|-----------------------|
| 30H                | <i>Saccharomyces cerevisiae</i> | 4.4 x 10 <sup>8</sup>                      | 0                     |
| 50H                |                                 | 5.8 x 10 <sup>8</sup>                      | 0                     |
| 60H                |                                 | 6.0 x 10 <sup>8</sup>                      | 0                     |
| 60H                | <i>Oenococcus oeni</i>          | 5.5 x 10 <sup>8</sup>                      | 0                     |
| 90H                |                                 | 7.2 x 10 <sup>8</sup>                      | 0                     |

in a winery will be influenced by process variables such as flow, pressure and temperature, as well as the species and condition of the spoilage organisms.

**Table 3 – Recommended 3M Purification Filters for Rough Clarification, Polishing Clarification, and Bioreduction Filtration**

| Application             | Recommended Filter | Filter Grade* | Nominal Reduction Rating | Purpose  | For Sizing/Product Refer to Page: |
|-------------------------|--------------------|---------------|--------------------------|--|-----------------------------------|
| Rough Clarification     | Zeta Plus™         | 05H           | 5 µm                     | <ul style="list-style-type: none"> <li>tank-to-tank</li> <li>yeast &amp; haze reduction</li> </ul>       | 15/18                             |
|                         |                    | 07H           | 3 µm                     |  |                                   |
|                         |                    | 10H           | 2 µm                     |  |                                   |
|                         |                    | 20H           | 1.5 µm                   |  |                                   |
| Polishing Clarification | Zeta Plus™         | 30H           | 1 µm                     | <ul style="list-style-type: none"> <li>yeast reduction</li> <li>bacteria &amp; haze reduction</li> </ul> |                                   |
|                         |                    | 40H           | 0.9 µm                   |  |                                   |
|                         |                    | 50H           | 0.8 µm                   |  |                                   |
| Ultrafine Filtration    | Zeta Plus™         | 60H           | 0.5 µm                   | <ul style="list-style-type: none"> <li>bacteria &amp; haze reduction</li> </ul>                          |                                   |
|                         |                    | 70H           | 0.3 µm                   |  |                                   |
|                         |                    | 90H           | 0.2 µm                   |  |                                   |

\*Zeta Plus™ grade recommendations vary according to the nature and style of the wine, contaminant levels, and the previous degree of filtration. On site testing by 3M Purification's SASS team or a member of our distribution organization can be performed to determine the optimum grade.



**LifeASSURE™ BA Series Filters: The next generation in performance and economy.**

## Membrane Filtration

### Quality, Economy, and Consistent Performance

Membrane filtration is the premier method of achieving microbiological stability in the container without the use of chemicals or heat. The organoleptic properties are completely preserved until the product is opened, be it weeks, months or years after filling.

The LifeASSURE™ BA series 0.65 µm rated filter reduces contaminating yeast, molds, and most spoilage bacteria from wine. The LifeASSURE BA series 0.45 µm rated filter reduces not only yeast and molds, but even the smallest spoilage bacteria such as *Oenococcus oeni*, at significant levels.

### Advances in Membrane Technology

LifeASSURE BA series filters incorporate new membrane technology that allows casting of an integral membrane onto a variety of substrates. The result is a microporous membrane with characteristics, such as increased flow and reduced pressure drop, tailored to provide ideal performance for the intended application.

### Enhanced Cartridge Design

The new membrane technology is combined with a completely new cartridge design construction to provide enhanced mechanical and thermal resistance. This superior construction allows longer service life even under the most demanding process conditions and enables full use of the 3M Purification advantage.

## Superior Bacteria Retention

3M Purification evaluates the retention performance of LifeASSURE™ BA series filters using organisms common to wineries including the malolactic fermentation bacterium, *Oenococcus oeni* (formerly *Leuconostoc oenos*) and the spoilage yeast, *Dekkera intermedia* (formerly *Brettanomyces*).

In laboratory studies, LifeASSURE BA series filters 0.45 µm rated membranes demonstrated retention of *O. oeni* at concentrations much greater than those commonly found in wineries. LifeASSURE BA series filters 0.65 µm rated membranes likewise exhibited exceptional retention of *D. intermedia* at equivalent extreme concentrations.

### 1. Maximized Surface Area

LifeASSURE BA series filter has 20 - 50% more area than most competitive filters. Cartridge filter life is directly proportional to filter area and inversely proportional to face velocity (flow rate per filter area). For most beverages, when the filter area is doubled at the same flow rate, the throughput is increased by two and one-half times. LifeASSURE BA series filter's area is 20 - 50% higher than most competitive filters, so the face velocity can be lower and lifetime longer.

### 2. Enhanced Hot Water Stability

Hot water sanitation and warm-water flushing to dissolve accumulated contaminants are common practices. Longer hot water stability means longer filter life. LifeASSURE BA series filter is constructed with nylon membrane optimized for enhanced thermal stability to ensure more hot water cycles (50 cycles for 30 minutes held at 180 °F or 80 °C) than other competitive filters.

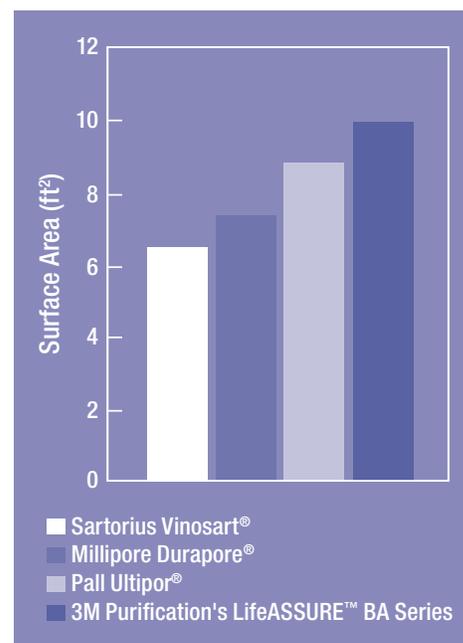
### 3. Robust Cartridge Design

LifeASSURE BA series filter cartridges are manufactured to withstand the most arduous processing conditions found in wineries. All cartridge hardware (outer cage, core, endcaps, upstream and downstream supports) are constructed with durable polypropylene. All materials of construction are FDA CFR 21 listed for direct food contact. The filters are manufactured in a state-of-the-art manufacturing facility and 100% integrity tested to ensure quality.

## Integrity Testing

LifeASSURE BA series filter can be integrity tested in situ by users. Bubble point pressure, diffusion flow, or pressure hold procedures can be performed while filters are in the housing, thus providing assurance of the filter's efficiency to reduce spoilage microorganisms on-line. A guide to integrity testing LifeASSURE BA series filter systems is available from 3M Purification. Request LITDDBA1.

Figure 7 – Maximum Surface Area



LifeASSURE™ BA series filters membrane provides the maximum filtration surface area to reduce initial differential pressures, provide longer filter life, and minimize overall filtration costs<sup>3</sup>.

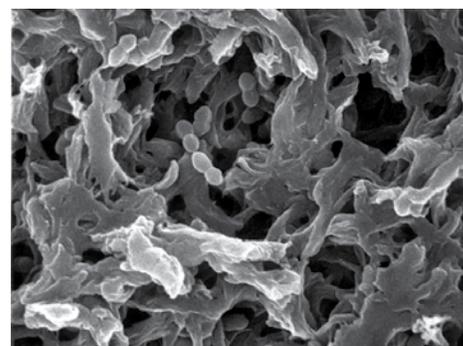


Figure 8 – SEM of the secondary fermentation organism, *Oenococcus oeni* (formerly *Leuconostoc oenos*), trapped on LifeASSURE™ BA series filters 0.45 µm membrane. Mag. 10,000x.

Table 4 – Recommended 3M Purification Filters for Membrane Filtration

| Application                            | Recommended Filter    | Filter Grade | Reduction Rating | Purpose                   | For Sizing/Product Refer to Page: |
|--|-----------------------|--------------|------------------|---------------------------|-----------------------------------|
| Final Filtration (White & Sweet Wines) | LifeASSURE™ BA series | BA045        | 0.45 µm          | Microbiological Stability | 15/19                             |
| Final Filtration (Red & Dry Wines)     | LifeASSURE™ BA series | BA065        | 0.65 µm          | Microbiological Stability |                                   |

## Membrane Prefiltration

LifeASSURE™ BLA series filter cartridges are 3M Purification’s latest advance in membrane filter technology. Encompassing two leading-edge processes, multi-zone membrane manufacture and MaxMedia pleating construction, the LifeASSURE series of filters offers unmatched protection of final membrane filters, as well as exceptionally long service life. Designed with pleated Nylon 6,6 membrane in an all-polypropylene cartridge construction, LifeASSURE BLA series filters are ideally suited for a wide range of prefiltration and clarification applications in the beverage industry.



LifeASSURE™: Microbial protection with LifeASSURE™ membrane filters.

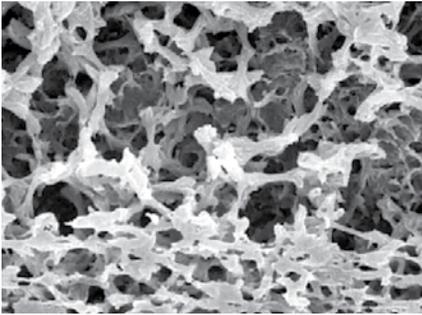


Figure 9

### Optimal System Performance

Used as a prefilter, LifeASSURE BLA series filters protect and extend the service life of LifeASSURE BA series final filters, as well as other membrane filters. LifeASSURE BLA series filters will:

- Increase final filter life substantially, often by 10 times or more
- Decrease filter change-outs, greatly reducing filter costs, and
- Significantly reduce effluent microorganism content

### Multi-zone Membrane Technology

LifeASSURE cartridge filters incorporate 3M Purification’s advanced multi-zone membrane technology. It allows unmatched flexibility in creating a multi-zone membrane that offers the maximum in contaminant holding capacity while maintaining high retention efficiency. The SEM photograph in Figure 9 shows that the single layer LifeASSURE BLA series membrane consists of an "open" zone on the upstream side of the membrane and a "tighter" zone on the downstream side. In effect, the open zone acts as a prefilter by capturing larger particles and colloids while the tighter zone provides the retention of smaller contaminants. This multi-zone structure reduces dual-layer membrane construction to provide a larger surface area, significantly increased contaminant holding capacity, and longer service life.

### Significant Microorganism Reduction

LifeASSURE BLA series filters consistently exhibit a greater reduction of microorganisms than competitive filters that are either constructed of glass or polypropylene fibers, or filters that are constructed with non-integral membranes. For effective prefiltration and clarification of beverages, microorganism reduction is a critical parameter resulting in economical, reliable filter systems.

In tests with *Brevundimonas diminuta*, (considered one of the smallest bacteria) LifeASSURE BLA020 grade filters exhibited an average log reduction value (LRV) of 7.3 and the LifeASSURE BLA045 grade filters exhibited an average LRV of 3.5.

Table 5 – Comparative Log Reduction Values

| Filter Product            | Average LRV* |
|---------------------------|--------------|
| LifeASSURE™ BLA020        | 7.3          |
| Millipore Milligard® CWSS | 2.5          |
| LifeASSURE™ BLA045        | 3.5          |
| Millipore Milligard® CWSC | 2.6          |

\*LRV = log10 number of organisms in/number of organisms out.  
Milligard is a registered trademark of Millipore Corporation.

### Optimized for Service Life and Filtrate Quality

As the data in the Figures 10 and 11 demonstrates, LifeASSURE BLA series cartridges are designed to provide both enhanced service life and performance. When compared to competitive products, the available grades of LifeASSURE BLA series filters allow the user to select equivalent filtrate quality with vastly superior life, or improve the filtrate quality with reduced, yet competitively superior, service life. Either way, the result is the same, LifeASSURE BLA series filters allow significantly more throughput than competitive filters and provide up to double the service life.

## Installation Integrity Test

Unlike other prefilters, LifeASSURE™ BLA series filter cartridges are 100% tested for integrity in manufacturing prior to shipment. Additionally, LifeASSURE BLA series filter cartridges are integrity testable in situ by the user. For integrity test procedures and values, please consult 3M Purification document LITTDC03.

## Prefilter Selection

Since beverages encompass a wide range of fluid conditions, 3M Purification provides an array of LifeASSURE BLA series prefilters to meet the needs of filter users. Prefiltration selection is highly dependent on:

- The nature of the fluid
- The particulate/colloid content of the fluid
- The amount of pretreatment or clarification of the fluid
- The rating of the membrane filter being protected

The table below is provided as a guide to prefilter selection, although actual process conditions may dictate the use of a more open or closed prefilter than specified below. Prefilter selection can be aided by smaller scale pilot tests or flow decay studies using membrane discs. Consult 3M Purification's Scientific Applications and Support Services (SASS) or 3M Purification Technical Sales for more information.

**Table 6 – Recommended LifeASSURE™ BLA Series Filters for Membrane Prefiltration**

| Filter Grade | Upstream Zone | Downstream Zone | Fluid Condition                  | Prefilter For:   |
|--------------|---------------|-----------------|----------------------------------|--|
| BLA045       | 0.8 µm        | 0.45 µm         | Low particle/colloid content     | LifeASSURE™ BA Series BA045                                |
| BLA065       | 1.2 µm        | 0.45 µm         | High particulate/colloid content | LifeASSURE™ BA Series BA045                                |
| BLA080       | 2.5 µm        | 0.8 µm          | High particulate/colloid content | LifeASSURE™ BA Series BA045<br>LifeASSURE™ BA Series BA065 |

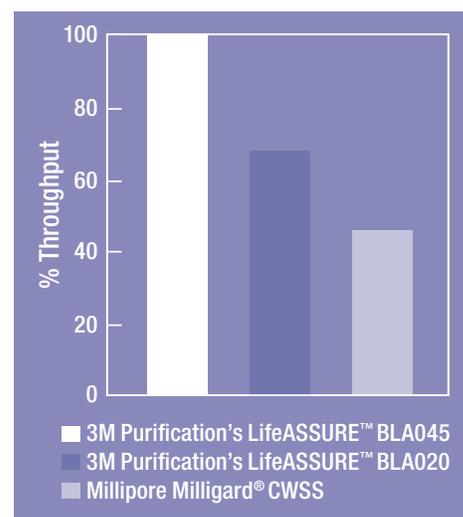
## Water Filtration

Using poorly filtered water to rinse or sanitize the wine system filters typically results in premature blockage and poor filter economics. Whether for bottle washing, system flushing and sanitation or cooler blending, clean, particle free water is required to protect the integrity of the process system and optimize wine filter life.

## Regeneration and Sanitation Water

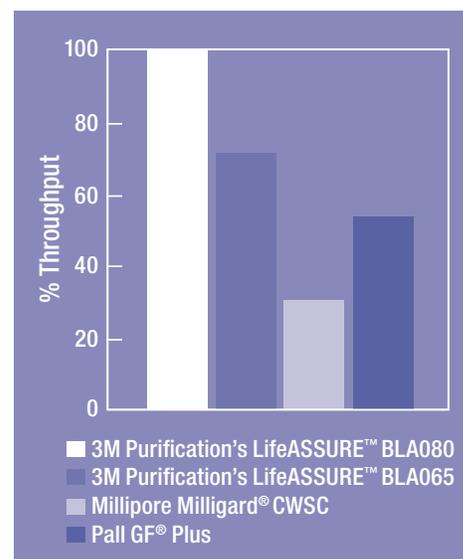
Water used to regenerate filters (typically 130 °F/55 °C) or sanitize the filters and piping system (typically 180 °F/80 °C) needs to be free of particulate. Filtering sanitizing water prior to using it in the system is essential so that the system is not contaminated with particulate in the sanitizing water between wine production runs. Additionally, the sanitizing water should be filtered to at least the same level as the wine process filters it will be sanitizing. To use a lesser degree of filtration would expend the capacity of the wine process filters by filtering the sanitizing water, leading to poor filter life.

**Figure 10 – Throughput Comparison**



**Throughput comparison of LifeASSURE™ BLA series filters, and 0.2 µm nominal filters.**

**Figure 11 – Throughput Comparison**



**Throughput comparison of LifeASSURE™ BLA series filters, a 0.5 µm nominal filter, and a 1.0 µm absolute filter**

## Washing and Blending Water

Particulate and biological control is also required for water that is used in cooler blending or in bottle washing operations. Furthermore, reduction of spoilage organisms from water with the LifeASSURE™ BA series 0.45 µm rated membrane filter protects the final product from infection and spoilage. In applications where particulate levels are high, prefiltration with LifeASSURE filters is recommended to extend the final filter life.

3M Purification water filter system benefits:

- High contaminant holding capacity filters optimized for water filtration provide optimal control of particulate for crystal clear water.
- Maximized effective filtration area of the LifeASSURE filter results in higher throughputs, fewer change-outs and lower overall filtration costs for blending water applications.
- A wide range of filter housing choices allow flexibility in designing the best system solution for each individual winemaking process.

**Table 4 – Recommended 3M Purification Filters for Membrane Filtration**

| Application      | Recommended Filter | Filter Grade | Reduction Rating | Purpose               | For Sizing/Product Refer to Page: |
|------------------|--------------------|--------------|------------------|-----------------------|-----------------------------------|
| Water Filtration | Betapure™ BK       | Z2300        | 30 µm            | Particulate reduction | 15/20                             |
| Water Filtration | Betapure™ NT       | T100         | 10 µm            | Colloid reduction     | 15/21                             |
| Water Filtration | LifeASSURE™ BLA    | BLA080       | 0.8 µm           | Final Filtration      | 15/19                             |

## 3M™ Filter Housings and Systems



**Figure 12 – Zeta Plus™ systems are available in a wide range of sizes to meet the flow requirements of any winery.**



**Figure 13 – 3M Purification's innovative plug-in style center-post filter housing line provides rapid cartridge change-outs for minimal downtime. This design also encompasses enhanced CIP features greatly improving cleanability.**

3M Purification offers an extensive range of versatile cartridge filter housings designed to meet any process flow requirement and handle even the most critical applications found in wineries.

## Process Flow Rates from 1 GPM to 2000 GPM (200 l/hr to 450,000 l/hr)

3M™ filter housings can meet virtually any process flow requirements found in wineries. From the start-up to full production, 3M filter housings are available to grow with the needs of the winemaker.

## Wide Variety of Materials and Ratings

Housings are manufactured of high impact plastic; 316L stainless steel and other high alloy steels, offering the winemaker a number of options. A variety of internal and external surface finishes are available. These finish options include selected polymer coatings, mechanical finishes from 35 Ra (average roughness) to mirror polish and electropolishing that limit microbial adhesion. Additionally, housings can be manufactured in accordance with the ASME Code, "CE" marked and various other requirements of countries around the world. For more information about housing options, please contact your local 3M Purification distributor.

## User Friendly Designs

3M filter housings are specifically designed with the end user in mind to make installing and reducing filter cartridges quick and easy. Fast action swing bolts, quick release clamps and convenient cartridge hold-down devices allow for rapid filter change-outs, low labor requirements and reduced down-time.

## Skid-Mounted Systems

For increased flexibility and enhanced mobility, 3M Purification manufactures fixed skid-mounted or cart-mounted mobile filtration systems custom designed to meet the needs of the winemaker. Skids include all the equipment necessary to perform any winery operation from D.E. pre-coating of body feed Zeta Plus™ cartridges for small scale primary filtration, to aseptic filtration filter trains with prefilters, final filters, pumps, gauges, and sampling ports.

## 3M™ Filter Housing Ordering Guide

3M Purification's Filter Systems can provide a wide array of filter housings designed to meet all process requirements found in wineries. Standard housings are available to meet flow rates from 1 GPM to 2000 GPM.

3M filter housings are engineered specifically for easy cartridge installation and reduction and are simple to clean and maintain. Surface finishes of all microfiltration housings are mirror polish 316L stainless steel providing a high quality, low adhesion surface for easy sanitation.

3M Zeta Plus™ ZPB filter housing can be supplied with an integral downstream check valve for system protection. They also include the spring loaded sealing system designed for effective cartridge sealing for the entire life of the filter.



Figure 14 – A self-contained mobile filtration system is shown above. This system consists of stages of Zeta Plus™ and LifeASSURE™ BA series filter housings as well as pumps, valves, flow meters and gauges for easy incorporation into a winery.



Figure 15 – 3M Purification manufactures a wide range of sanitary design, pre and final filter housings. The ZMS/ZVS models (shown above) accommodate a single 10" - 40" filter cartridge while the ZWC/ZWB models (not shown) accommodate up to 21 10" - 40" cartridges.

## Zeta Plus Filter Housings

Zeta Plus™ filters are contained in totally enclosed, 316L stainless steel filter housings that set the standard for quality, performance and ease of use. Benefits of the housing system include:

- A totally enclosed system that reduces edge leakage, external contamination, and oxidation of wine.
- An advanced sanitary design constructed of polished 316L stainless steel that provides maximum corrosion resistance and limits microbial and particulate adhesion of wetted surfaces.
- A full range of housing sizes to provide easy scale-up from bench-top to pilot scale to full production as your winery grows.
- A positive spring-loaded cartridge to housing sealing system that provides proper sealing compression to prevent filter bypass even under the most arduous process conditions.
- Housing seals, fast action bolts or clamps, that permit rapid assembly and cartridge change-outs to minimize downtime and ensure operator safety.
- Available as complete sanitary systems including piping, valves, pressure gauges, and skid-mounted mobile systems for single source system solutions.

**Table 8 – Zeta Plus™ Series**

These housings are ideal for rough and polishing clarification using Zeta Plus™ Filter Cartridges

| Model  | Filter Cartridge Diameter | Number of Filter Cartridges | Flow Rate*           | Maximum Allowed Pressure/Temp   | Literature Reference |
|--|---------------------------|-----------------------------|----------------------|---------------------------------|----------------------|
| ZPB <sup>1</sup> –<br>316L, T-type, swing bolt closure | 8", 12" or 16"            | 1 to 4                      | up to 74 GPM/280 LPM | 150 psi /200 pF<br>10 bar/90 pC | LITHS.ZPBC           |
| ZPIP –<br>316L, in-line, clamp closure                 | 8" or 12" plug-in         | 1                           | up to 4 GPM/15 LPM   | 75 psi /200 pF<br>5 bar/90 pC   | LITHS.1P2            |

<sup>1</sup> Special sanitary style Zeta Plus™ housings are available for processes with greater flow rates. Please contact your local 3M Purification distributor or 3M Purification directly.

\* Based on the recommended flow rate for wine of 0.5 GPM per ft<sup>2</sup> of filtration media.

**Table 9 – Sanitary Series**

These housings are ideal for pre and final filtration applications

| Model                                     | Filter Cartridge Style | Number of Filter Cartridges | Length of Filter Cartridge | Max Flow Rate*        | Maximum Allowed Pressure/Temp   | Literature Reference |
|---|------------------------|-----------------------------|----------------------------|-----------------------|---------------------------------|----------------------|
| ZWB –<br>316L, T-type, swing bolt closure | SOE 226 O-rings        | 4, 8, 11, 21                | 10" to 40"                 | 360 GPM<br>(1360 LPM) | 150 psi /200 pF<br>10 bar/90 pC | LITZRZWBC            |
| ZMS –<br>316L, T-type, clamp closure      | SOE 226 O-rings        | 1                           | 10" to 40"                 | 26 GPM<br>(98 LPM)    | 150 psi /100 pF<br>10 bar/38 pC | LITZRH               |
| ZVS –<br>316L, in-line, clamp closure     | SOE 226 O-rings        | 1                           | 10" to 40"                 | 26 GPM<br>(98 LPM)    | 150 psi /200 pF<br>10 bar/90 pC | LITZRH               |

\*Flow rates listed are for housings only. Do not use this value to size an application. Actual process flow rates are determined by the recommended flow rates of the installed cartridges and other process conditions.

SOE - Single Open End. DOE - Double Open End.

**Table 10 – Industrial Series**  
**These housings are ideal for water and general utility applications**

| Model   | Filter Cartridge Style       | Number of Filter Cartridges  | Length of Filter Cartridge | Max Flow Rate*            | Maximum Allowed Pressure/Temp   | Literature Reference |
|---|------------------------------|------------------------------|----------------------------|---------------------------|---------------------------------|----------------------|
| SD –<br>316L, side inlet/outlet, quick-release clamp                            | DOE or SOE 222 O-rings       | 5, 12, or 22                 | 10" to 40"                 | up to 400 GPM (1514 LPM)  | 150 psi /250 pF (10 bar/121 pC) | LITHS.SD1            |
| DC –<br>304L, side inlet/outlet, quick-release clamp                            | DOE                          | 4, 5, 12, or 22              | 10" to 40"                 | up to 400 GPM (1514 LPM)  | 150 psi /250 pF (10 bar/121 pC) | LITHS.DC1            |
| ZMO –<br>316L, side inlet/outlet, threaded closure                              | SOE 222 O-rings              | 1                            | 10" to 30"                 | up to 26 GPM (98 LPM)     | 150 psi /200 pF (10 bar/90 pC)  | LITZRH.101           |
| CT –<br>brass, 304/316, threaded closure  | DOE                          | 1                            | 9 ¾" to 29 ¼"              | up to 26 GPM (98 LPM)     | 300 psi /200 pF (20 bar/90 pC)  | LITHS.CT3            |
| ES –<br>ASME code, Fast-Hex closure, carbon steel, 304L or 316L stainless steel | DOE, SOE 222 and 226 O-rings | 6, 12, 18, 24, 36, 52, or 85 | 10" to 40"                 | up to 2000 GPM (7570 LPM) | 300 psi /450 pF (20 bar/232 pC) | LITHSES1             |
| 1M –<br>plastic, top inlet/outlet   | DOE                          | 1                            | 9 ¾" & 19 ½"               | up to 16 GPM (60 LPM)     | 125 psi /100 pF (8 bar/38 pC)   | LITHS.1M1            |

\*Flow rates listed are for housings only. Do not use this value to size an application. Actual process flow rates are determined by the recommended flow rates of the installed cartridges and other process conditions. Please consult 3M Purification for actual filter system sizing.

SOE - Single Open End. DOE - Double Open End.

## Filter Selection Guide

The following pages contain charts designed to help you select the style and number of filters needed for your application.

### 1. From the application sections:

the filter cartridge needed for your application.

### 2. From the selection guide charts:

select the style, grade and number of 10" cartridge elements required for your process based on the recommended flow rate and pressure drop per filter element. (Divide your process flow rate by the recommended flow rate per 10" cartridge element to find how many cartridge elements are needed.)

### 3. From the housing section:

select the appropriate housing to accommodate the number of cartridges needed for the application.

### Example:

You wish to replace your current filter press with the Zeta Plus™ cartridge system as well as add a LifeASSURE™ prefilter and LifeASSURE™ BA series final membrane filter to your white wine bottling line. Your process flow rate is 24 GPM.

#### 1. From the filter selection guide:

you determine that you will need 3, 45245-01D-50H style 12" diameter

Zeta Plus cartridges to replace your plate & frame. From the housing selection guide, a 3M™ 12ZPC3 will contain these cartridges.

#### 2. From the filter selection guide:

you determine that you will need 4, LifeASSURE™ BLA065 grade 10" cartridge elements. From the housing selection guide, a ZMS housing will contain one 40" length cartridge.

**3. From the filter selection guide:**

you determine that you will need 12 LifeASSURE™ BA series 045BA grade 10" cartridge elements. From the housing selection guide, a 3M™ 42WB3 will contain 4, 30" cartridges.

**Caution:**

Please exercise care when applying equivalent cartridges to competitive housings. While every effort has been made to assure compatibility, exceptions may exist. A dimensional check of competitive products in the field is recommended.

**Zeta Plus™**



Known as the flagship of wine filtration, Zeta Plus™ filters are used the world over for providing effective haze reduction and clarification, substantial bioburden reduction and excellent membrane prefiltration.

Available in either the conventional sheet form, or the innovative, convenient totally-enclosed cartridge system, Zeta Plus filters deliver the performance, ease-of-use, and economy unmatched by any competitive product. 3M Purification's pioneering work in charge-enhanced depth filtration has led to numerous engineering innovations that provide benefits to the user. These innovations include: advanced media formulations and retention ratings tailored to provide consistent and reliable wine filtration; a computer designed "stiff-cell" separator between each sheet of media that results in increased utilization and low filtration costs; and a spring-loaded cartridge-to-housing sealing system that takes the worry out of installing cartridges. Zeta Plus Generation 2 cartridge and housing systems are available to meet a wide range of needs, from the smallest to the largest winery. For more information, please ask for literature number: LITCZPG23

**Selection Guide**

| Catalog Number   | Recommended Flow Rate                    | Geometric Variation   | Gasket  | Media Grade                              | Media Formation |
|--|--|---|---|--|-----------------|
| 45109 (8" - 8 Cell) - 4 ft <sup>2</sup><br>45167 (8" - 7 Cell Plug-in) - 3.5 ft <sup>2</sup> | 2 GPM<br>2 GPM                           |   | 11 - Nitrile<br>13 - Fluorocarbon<br>14 - EPR<br>01 - Nitrile<br>02 - EPR<br>03 - Fluorocarbon<br>04 - Silicone | 05, 07, 10, 20, 30<br>40, 50, 60, 70, 90 | H               |
| 45237 (12" - 12 Cell) - 12 ft <sup>2</sup><br>45245 (12" - 16 Cell) - 16 ft <sup>2</sup>     | 6 GPM<br>8 GPM - reds<br>10 GPM - whites | 01 - Standard Polypropylene<br>02 - Talc Filled Polypropylene | A - Silicone<br>B - Fluorocarbon<br>C - EPR<br>D - Nitrile  |  |                 |
| Z16P (16" - 14 Cell) - 37 ft <sup>2</sup>  | 18 GPM - reds<br>22 GPM - whites         |   | A - Silicone<br>B - Fluorocarbon<br>C - EPR<br>D - Nitrile  |  |                 |

## LifeASSURE™ BA Series

How can a winemaker achieve microbiological stability? LifeASSURE™ BA series membrane filter is the solution.

Made with durable, microporous Nylon 6,6 membrane, LifeASSURE BA series filters provide superior retention of spoilage organisms resulting in microbiologically stable wines. The LifeASSURE BA series filter meets the rigors of wine processing including multiple hot water sanitation cycles. Made with inert Nylon 6,6 and without the use of adhesives, binders or surfactants, the LifeASSURE BA series filter has virtually zero extractables and does not effect the organoleptic qualities of wine. For filter system sizing purposes, a minimum flow rate of 2 GPM per 10" cartridge can be used, although faster flow rates are achievable. Refer to the Flow Rate vs Differential Pressure chart in the LifeASSURE BA series literature for more information on faster flow rates.



For more information, please ask for literature number: LITZRBA2.

### Selection Guide

| Cartridge Type | Grade                          | Configuration | Length                                   | End Modification   | O-ring/Gasket   |
|----------------|--------------------------------|---------------|--|--|---|
| BA             | 045 - 0.45 µm<br>065 - 0.65 µm | A – Cartridge | 01- 10"<br>02- 20"<br>03- 30"<br>04- 40" | B – 226 Bayonet Locking<br>C – 222 O-ring & Spear<br>D – DOE, Flat Gasket (10")<br>E – DOE, Flat Gasket (9 ¾")<br>F – 222 O-ring & Flat Cap<br>J – 226 O-ring & Flat Cap | A – Silicone<br>B – Fluorocarbon<br>C – EPR<br>D – Nitrile<br>H – Clear Silicone* |

\*O-ring only.

## LifeASSURE™ BLA Series

The new, multi-zone membrane design in LifeASSURE BLA series prefilters provides unmatched throughput combined with excellent protection of downstream final membranes.

This combination results in greatly reduced operating costs when compared to similar competitive systems. The multi-zone membrane also provides a superior flux rate (flow per filter at a specified pressure drop) than any similar prefilter. The benefit of this feature is that fewer LifeASSURE BLA series prefilters are required to provide the same flow rate at a given pressure drop when compared to alternative prefilters.

For filter system sizing purposes, a minimum flow rate of 6 GPM per 10" cartridge can be used, although faster flow rates are achievable. Refer to the Flow Rate vs Differential Pressure chart in the LifeASSURE BLA series literature for more information on faster flow rates.



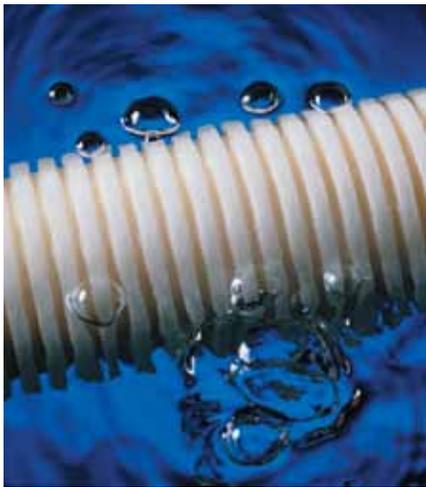
For more information, please ask for literature number: LITCLAFB1

### Selection Guide

| Cartridge Type | Grade  | Configuration                       | Length                                   | End Modification  | O-ring/Gasket   |
|----------------|--|-------------------------------------|--|---|---|
| BLA            | 020 - 0.20 µm<br>045 - 0.45 µm<br>065 - 0.65 µm<br>080 - 0.80 µm | B – Pleated Max Media Configuration | 01- 10"<br>02- 20"<br>03- 30"<br>04- 40" | B – 226 O-ring & Spear<br>C – 222 O-ring & Spear<br>D – Double Open End (10")<br>E – Double Open End (9 ¾")<br>F – 222 O-ring & Flat Cap<br>J – 226 O-ring & Flat Cap | A – Silicone<br>B – Fluorocarbon<br>C – EPR<br>D – Nitrile<br>H – Clear Silicone* |

\*O-ring only.

# Betapure™ BK Series



Known the world over as the standard for water filtration, the exclusive manufacturing process of Betapure™ BK series filters produces a rigid, resin bonded, graded-density structure that reduces by-pass and the unloading characteristics of soft, easily deformable competitive filters.

The design of Betapure BK series filters provides a family of filter cartridges that offer a number of distinct benefits. The filter's graded density design provides a low pressure drop resulting in long life and consistent performance. The rigid, resin bonded structure prevents by-pass and unloading common with soft filters as the system pressure increases or surges. The Betapure BK series filter contains no metal or plastic cores which allows for easy disposal. Betapure BK series filters are available in absolute retention ratings from 10 to 60 µm, in a variety of lengths and end fittings designed to fit seamlessly into any application.

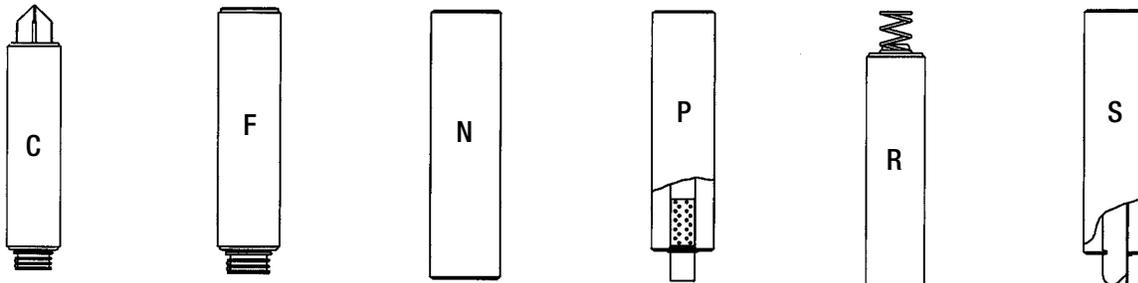
For more information, please ask for literature number: LITCBK.002.

## Selection Guide

| Cartridge Type           | Grade Option                                   | Surface                      | Packing                                  | Temperature  | Length*   | End Modification  | O-ring/Gasket   |
|--------------------------|--|------------------------------|--|--------------|---|---|---|
| BK – Betapure™ BK Series | Z2 100<br>Z2 200<br>Z2 300<br>Z2 400<br>Z2 600 | G – Grooved<br>U – Ungrooved | 1 – Standar Shrink Wrap<br>2 – Bulk Pack | S – Standard | 09 - 9¾"<br>10 - 10"<br>19 - 19½"<br>20 - 20"<br>29 - 29 ½"<br>30 - 30"<br>39 - 39"<br>40 - 40" | C – 222 O-ring & Spear<br>F – 222 O-ring & Flat Cap<br>N – None<br>P – Polypropylene Core Extender<br>Q – Same as R w/o Spring<br>R – End Cap w/ Stainless Spring<br>S – SS Core Extender | A – Silicone<br>B – Fluorocarbon<br>C – EPR<br>D – Nitrile<br>G – Volara Gasket**<br>N – None |

\* Lengths are multiples of either 9 3/4" or 10".  
 \*\* Available in N, P, Q, R, and S end modifications.  
 C, F, Q, and R end modifications available in 10" increments only.

## End Modifications

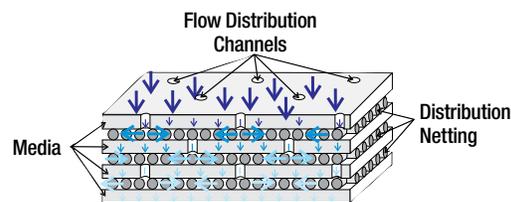


| Grade    | Typical Flow Rate (GPM) | Pressure Drop per 10' Cartridge PSID/GPM |
|----------|-------------------------|--|
| Z2 – 100 | 4                       | 0.35                                     |
| Z2 – 200 | 4                       | 0.19                                     |
| Z2 – 300 | 5                       | 0.11                                     |
| Z2 – 400 | 5                       | 0.10                                     |
| Z2 – 600 | 6                       | 0.09                                     |

## Betapure™ NT-T Series



3M Purification designed the Betapure™ NT-T series cartridge to provide significantly superior service life while maintaining consistent filtration efficiency. Betapure NT-T series filters achieve this through an innovative cartridge design that allows uniform distribution of fluid flow and contaminant throughout the entire depth of the cartridge.



Betapure NT-T series filter construction combines a polypropylene media with fluid distribution netting to form multiple layers. Critically positioned media flow channels allow greater movement of fluid from layer to layer. Three distinct media sections, made from multiple media/netting layers, are combined to form the filter cartridge. The outer and middle sections contain multiple layers of interleaved filter media and fluid distribution netting. Within each media layer a portion of the fluid travels through the media while the balance of the fluid is delivered directly to the next distribution layer through the flow channels. The fluid distribution netting provides longitudinal and latitudinal flow paths to evenly distribute fluid flow across the surface of each successive media layer.

For more information, please ask for literature number: LITCPN2ADM.

## Selection Guide

| Cartridge Type         | Grade-Micron Absolute | Length*    | Packing Option  | Support Ring  | End Modification   | Gasket/O-ring   |
|------------------------|-----------------------|------------|---|---|--|---|
| NT – Betapure™<br>NT-T | T005 – 0.5            | 09 -9¾"    | S – Individual Poly Bag<br>1 High: 30/carton<br>2 - 4 High: 15/carton | For End Modifications<br>C, N, P, Q, & R:<br>0 – None | B – 226 O-ring & Spear<br>C – 222 O-ring & Flat Cap<br>F – 222 O-ring & Flat Cap | For End Modifications<br>B, C, & F:<br>A – Silicone<br>B – Fluorocarbon<br>C – EPR<br>D – Nitrile<br>For End Modifications<br>N, P, Q, & R:<br>G – Polyethylene |
|                        | T010 – 1              | 10 -10"    |   |   |  |   |
|                        | T020 – 2              | 19 - 19½"  |   | For End Modifications<br>B, C, & F:<br>0 – None       | N – None   |   |
|                        | T030 – 3              | 20 - 20"   |   |   |  |   |
|                        | T050 – 5              | 29 - 29 ½" |   | 1 – Polysulfone                                       | P – Polypropylene Core<br>Extender   |   |
|                        | T100 – 10             | 30 -30"    |   |   |  |   |
|                        | T200 – 20             | 39 -39"    |   | 2 – Stainless Steel                                   | Q – End Cap w/o Spring<br>R – End Cap w/ Spring                                  |   |
|                        | T300 – 30             | 40 -40"    |   |   |  |   |
|                        | T400 – 40             |            |   |   |  |   |
|                        | T500 – 50             |            |   |   |  |   |
| T700 – 70              |                       |            |   |   |  |   |

\* Lengths are multiples of 9 ¾" or 10" depending on an end modification.



## Scientific Applications Support Services (SASS)

The cornerstone of 3M Purification's philosophy is service to customers, not only in product quality and prompt delivery, but also in validation, application support and in the sharing of scientific information.

3M Purification's Scientific Applications Support Services works closely with customers to solve difficult filtration challenges and to recommend the most efficient, economical filter systems. SASS specialists can perform on-site testing and utilize filtration applications expertise to partner with customers.

3M Purification resolves filtration problems promptly and efficiently in a cost-effective, confidential manner with a commercial support group consisting of 3M Purification's in-house customer service staff, application specialists, and engineering services. 3M Purification's broad distributor base and sales offices provide worldwide customer service, local inventory, and field support in virtually every major center of manufacturing.

## 3M Purification Inc. Over 90 Years of Solutions

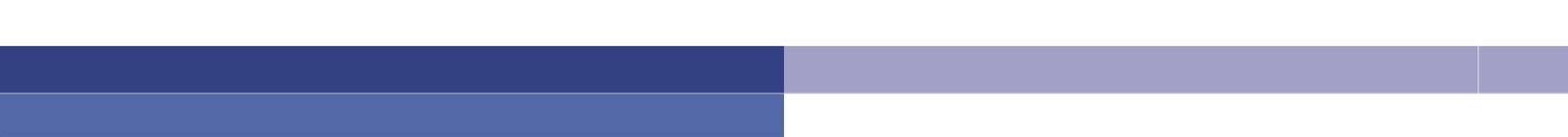
When looking for a solution to challenging food and beverage filtration, the industry has turned to 3M Purification for performance. 3M Purification has achieved a leadership position by striving to be the best supplier of high quality products designed to provide cost effective solutions.

Some filter manufacturers offer a limited range or a single filter option. 3M Purification, however, understands that each application is unique and there is always an alternative. 3M Purification has both the experience and the breadth of products to provide quality improvements and dramatic cost savings for the customer.

## The 3M Purification Commitment

3M Purification understands that the best solutions begin with a thorough awareness of the problem and recognizes that each customer's manufacturing process is unique. The goal is to understand both customer objectives and process requirements, and to recommend solutions to meet customer needs.





### Important Notice

The information described in this literature is accurate to the best of our knowledge. A variety of factors, however, can affect the performance of the Product(s) in a particular application, some of which are uniquely within your knowledge and control. **INFORMATION IS SUPPLIED UPON THE CONDITION THAT THE PERSONS RECEIVING THE SAME WILL MAKE THEIR OWN DETERMINATION AS TO ITS SUITABILITY FOR THEIR USE. IN NO EVENT WILL 3M PURIFICATION INC. BE RESPONSIBLE FOR DAMAGES OF ANY NATURE WHATSOEVER RESULTING FROM THE USE OF OR RELIANCE UPON INFORMATION.**

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