

# Beta-Klean™ Z2 Series

Absolute Rated Rigid Filter Cartridges

Beta-Klean™ Z2 Series is a range of white filter cartridges that provide consistent quality and performance at absolute ratings from 10 - 60 µm.

## Consistent Performance

Absolute rated rigid structure Beta-Klean filter cartridges provide consistent performance. Unlike many competitive products, Beta-Klean cartridges do not unload or lose filtration efficiency throughout their usable life!

## Significant Life Advantage

Beta-Klean filter cartridges' rigid graded density grooved structure provides a significant life advantage over the competition!

3M Purification Inc. (3M Purification) provides quality solutions worldwide for the most challenging filtration applications. 3M Purification filtration systems include clarifying filters, pre-filters, final filters, stainless steel housings and engineered skid-mounted systems designed and sized for specific applications.

## What is Beta-Klean?

Beta-Klean filter cartridges are rigid, graded-density cartridges constructed primarily of cellulose fibers, glass fibers, and a chemically resistant thermosetting resin. The proprietary manufacturing process results in more fibers towards the center core region creating a graded-density structure. The thermosetting resin "bonds" the fibers into a permanent rigid matrix. Beta-Klean cartridges are grooved to significantly increase surface area and extend the service life.

Beta-Klean Z2 Series is available with various end fittings to provide compatibility with a wide range of filter housings (see ordering guide).

## Features & Benefits

### Absolute-rated, depth cartridge filters from 10-60 micron.

- Distinct particle size cutoff at the specified removal rating.
- Reproducible effluent quality throughout the filter's life.

### Beta 1000 rated throughout the cartridge life.

- No bypass or unloading at high differential pressure.
- Consistent product quality throughout the filter's life.

### Grooved surface with true graded-density structure.

- Significantly longer life.
- Dramatic cost savings with optimized yields.

### No metal or plastic cores.

- Reduced disposal costs.
- Disposal should comply with federal, state, and local regulations.

### Available with integral spring end-cap.

- Eliminates the need for spring & seal assemblies.
- User friendly design provides positive seal.



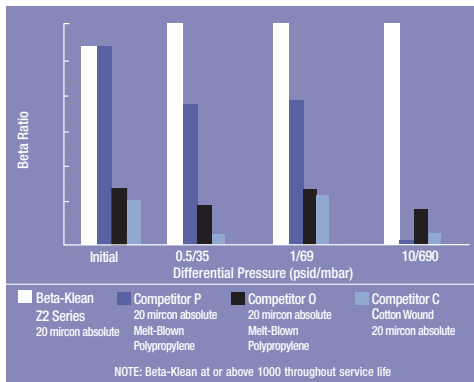
## Applications

Beta-Klean filter cartridges provide consistent reproducible filtration performance and longer life while meeting or exceeding quality specifications in a wide variety of industrial processing applications. The Beta-Klean Z2 Series is particularly well suited for high viscosity fluids and differential pressures to 70 psid (4.8 bar).

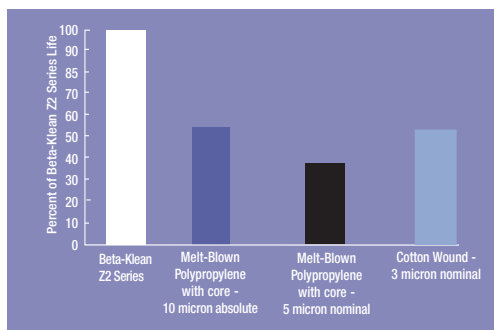
The Beta-Klean Z2 filter is not designed for and should not be used in Food & Beverage or Pharmaceutical applications. Please contact 3M Purification for the appropriate filters for these applications.

<b>Chemicals</b>	High Purity, Electronic, Organic, Inorganic, Monomers, Polymers, Resins, and Catalysts
<b>Water</b>	Process, Pre-RO, Boiler Feed, Cooling Tower, and Waste Water
<b>Coatings</b>	Paint, Varnish, Lacquer, Inks, Adhesives, and Wood Preservatives
<b>General Industrial</b>	Heating and Cooling Fluids, Brines, Detergents, Fuel Oils, Cutting Oils, and Agricultural Fluids

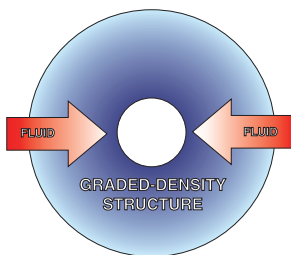
**Graph 1: Beta Ratio Comparison of Filter Cartridges Rated at 20 Micron**



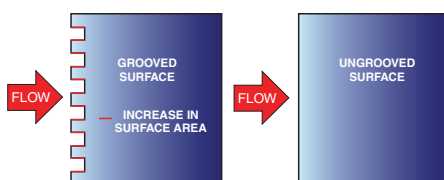
**Graph 2: Relative Life 10 Micron Beta-Klean vs. Competitive Filters of Comparable Efficiency**



**Figure 1: Beta-Klean Graded Density Structure**



**Figure 2: Surface Area Comparison**



## Absolute Beta-Klean

Absolute Beta-Klean removal ratings are determined for the entire cartridge life using a filter performance test developed by 3M Purification that complies with the general procedure outlined in ASTM STP 975.

3M Purification defines Absolute Rating as “ the particle size (x) providing an initial Beta Ratio ( $\beta_x$ ) = 1000.” At this Beta Ratio the removal efficiency is equal to 99.9%. Beta Ratio ( $\beta_x$ ) is defined by the following equation:

$$\beta_x = \frac{\text{Cumulative Number of Particles Larger than x in the Influent Challenge}}{\text{Cumulative Number of Particles Larger than x in the Effluent}}$$

Beta-Klean filters achieve a minimum Beta<sub>x</sub> ( $\beta_x$ ) value of 1000 at the specified ratings seen in Table 1.

**Table 1: Beta-Klean Z2 Series Ratings**

Grade Designation	$\beta_x = 1000$ (X - Absolute Micron Rating)
Z2 100	10
Z2 200	20
Z2 300	30
Z2 400	40
Z2 600	60

## Beta-Klean — Consistent Performance

The initial Beta Ratio for all grades of Beta-Klean filter cartridges is equal to or greater than 1000, and each cartridge performs at or above this initial value throughout its usable (all the way to plugging) life! This defines Beta-Klean filter cartridges’ absolute filtration performance. The Beta Ratio vs. Differential Pressure Graph 1 illustrates how competitive filters do not achieve the consistent performance of Beta-Klean filter cartridges. The Graph shows a decrease in Beta Ratio as the differential pressure increases are exhibiting either unloading of previously held contaminants or a loss of filtration efficiency. This inconsistent performance results in a reduction in finished product quality, product yield, and an increase in total filtration cost.

As illustrated in Graph 1, the performance of melt-blown polypropylene (Competitor P) degrades rapidly after a small (0.5 psi) increase in differential pressure, indicating contaminant unloading and a loss of filtration efficiency typical of a compressible structure. Competitor O’s melt-blown never approaches a Beta Ratio of 1000, and it shows a decreasing Beta Ratio at high differential pressure. The generic cotton wound, Competitor C, exhibits erratic performance caused by media movement under increasing pressure.

## Significant Life Advantage

The data in Graph 2 was developed through extensive filter performance testing. The data are based on contaminant added values comparing filter elements of comparable particle removal efficiencies. **Beta-Klean exhibits consistent Beta Ratios at all differential pressures.**

## Rigid Graded-Density Beta-Klean

Beta-Klean filter cartridges are manufactured using an exclusive process to achieve a true graded-density structure. A proprietary manufacturing process results in progressively more fibers towards the center core region creating a graded-density structure. Each fiber is locked in place by a thermosetting resin binder to create a rigid depth filter matrix that traps larger particles near the outer surface and smaller particles near the cartridge’s inside diameter. The overall effect is to greatly improve cartridge service life

by retaining particles and deformable contaminants in decreasing particle size ranges as the contaminant particles progress through the cartridge.

### High Surface Area Beta-Klean

Beta-Klean cartridges also feature an optimized groove pattern to increase the surface area by over 65% when compared to ungrooved cylindrical cartridges. The grooved surface prevents premature blinding of the outer surface by large particles and allows full utilization of the depth structure. Maximum surface area with a true graded-density structure means that Beta-Klean can provide significantly greater service life than competitive filter cartridges. Extensive laboratory testing demonstrates that Beta-Klean can provide up to 5 times greater life than competitive filters of comparable efficiency.

### Reproducible Cost Effective Filtration

Beta-Klean filter cartridges are manufactured to rigid specifications and subjected to stringent process and quality controls to provide consistency in filtration performance and, ultimately, end-user process consistency — run after manufacturing run.

Table 2 - Beta-Klean Z2 Series Product Specifications

Absolute Rating (micron)	Grade	Fiber	Resin
10	Z2 100	Cellulose/Glass	Melamine Formaldehyde
20	Z2 200		
30	Z2 300		
40	Z2 400	Cellulose	
60	Z2 600		
Operating Parameters			
Maximum Operating Temperature		Standard (Media Only) Polyethylene Foam Gasket Polypropylene End Fitting	250° F (121° C) 200° F (93° C) 180° F (82° C)
Maximum Differential Pressure	70 psid (4.8 bar) @ 68° F (20° C)		
Recommended Change-Out Differential Pressure	35 psid (2.4 bar)		
Dimensions			
Inside Diameter	1 1/16" (26.9 mm)		
Outside Diameter	2 19/32" (65.9 mm)		
Cartridge Length	9 3/4" through 40" (248 - 1016 mm)		

### Beta-Klean Flow Rates

Flow information for Beta-Klean in aqueous fluids is located in Table 3.

Table 3 - Beta-Klean Z2 Series Flow Rates

Grade	Absolute Rating (µm)	Specific Δp/10" Cartridge <sup>1</sup>		Recommended Maximum Aqueous Flow Rate <sup>2</sup> per 10" Cartridge	
		psi/gpm	mbar/lpm	gpm	lpm
Z2 100	10	0.35	6.37	4	15.1
Z2 200	20	0.19	3.46	4	15.1
Z2 300	30	0.11	2.00	5	18.9
Z2 400	40	0.10	1.82	5	18.9
Z2 600	60	0.09	1.64	6	22.7

<sup>1</sup> Specific aqueous pressure drop at ambient temperature for a single equivalent 10" cartridge. For multiple cartridge lengths, divide total flow by the number of single length equivalents.

<sup>2</sup> Optimal efficiency and life is achieved at aqueous flow rates less than the maximum flow indicated.

For liquids other than water, use the following formula in conjunction with the values from column 3 of Table 3. The specific pressure drop values may be effectively used when three of the four variables (Viscosity, Flow, Differential Pressure, and Cartridge Grade) are set.

### Beta-Klean Z2 Series Chemical Compatibility

Table 4 shows the Beta-Klean filter cartridges' wide range of chemical compatibility. Beta-Klean filter cartridges exhibit excellent resistance to water, organic solvents, and petroleum products.

Table 4 - Beta-Klean Z2 Series Chemical Compatibility

Category	Fluid		Rating
	Example		
Water	Process		R-212°F
	Pre-RO		
	Boiler Feed		
	Waste Water		
Fatty Acids - Oils	Detergents		R-200°F
	Mineral Oil		R-212°F
	Industrial Vegetable Oils		R
	Silicone Oils		L
Organic Solvents	MEK		R
	Benzene		
	Toluene		
	Xylene		
	Alcohols		
	Dimethyl Formamide (DMF)		
Petroleum	Lube Oil		R
	Fuel Oil		
	Waxes		
Acids	Acetic (100%)		N
	Tannic 10%		R-140°F
	Hydrochloric (Muriatic) Acid 5%		N
	Sulfuric 50%		N
	Sulfuric 5%		R-100°F
	Nitric 10%		R-70°F
Brines & Aqueous Salt Solutions	Sodium Chloride 10%		R
	Sodium Sulfate		
	Sodium Nitrate 5%		
Bases	Sodium Hydroxide 5%		R
	Calcium Hydroxide		R-100°F
	Ammonium Hydroxide 30%		R-100°F
Oxidizers	Hydrogen Peroxide 90%		N
R=Generally recommended up to 250° F (121° C) unless otherwise noted.			
N=Not recommended			
L=Likely compatible, test before use			

The data presented in Table 4 is for general guidance only. Testing under specific application conditions is recommended. For various end modifications and multi-length cartridges, consult your local distributor or 3M Purification Inc.

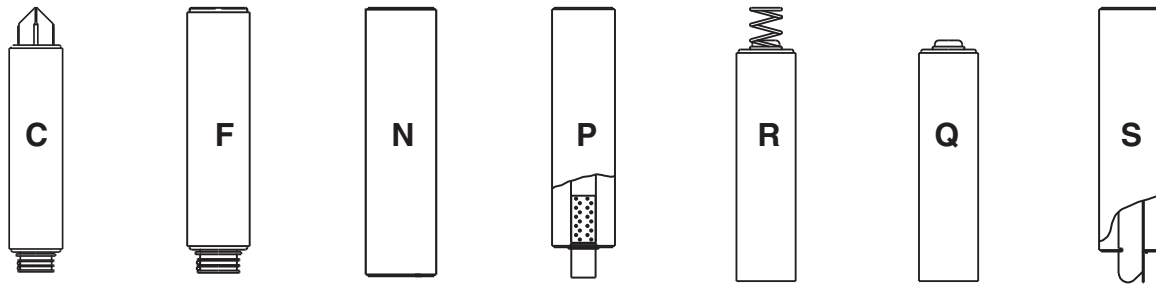
# Beta-Klean™ Z2 Series Ordering Guide

Ctg. Type	Length*	Grade	Surface	Packaging	Temperature Option	End Modification	Gasket/O-Ring
BK - Beta-Klean	09 - 9 3/4" 10 - 10" 19 - 19 1/2" 20 - 20" 29 - 29 1/4" 30 - 30" 39 - 39" 40 - 40"	Z2 100 Z2 200 Z2 300 Z2 400 Z2 600	G - GROOVED U - UNGROOVED	1 - STANDARD SHRINK WRAP 2 - BULK PACK	S - STANDARD	C - 222 O-RING & SPEAR F - 222 O-RING & FLAT CAP N - NONE P - POLYPROPYLENE CORE EXTENDER Q - SAME AS "R" WITHOUT SPRING R - END CAP WITH STAINLESS SPRING S - SS CORE EXTENDER	A - SILICONE B - FLUORO-CARBON C - EPR D - NITRILE G - VOLARA GASKET** N - NONE**

\* Lengths are multiples of either 9 3/4" or 10"

\*\*Available in N,P,Q,R, and S end modifications

## Beta-Klean™ Z2 Series Cartridge End Modifications



### 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 this product 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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Your Local Distributor:



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