

# Betapure™ BK Series Filters

## Betapure™ BK Series Absolute Rated Filter Cartridge



### Betapure™ BK Series Filters – The Clear Solution

3M Purification Inc. continues an 80 year tradition of innovative cost effective solutions to challenging industrial filtration applications with Betapure™ BK series. Betapure BK series is a truly absolute rated, rigid (non-compressible) resin bonded filter cartridge.

Consistent quality and performance at absolute ratings from 5 to 70 m make Betapure BK series the clear choice in the confusing world of indistinguishable “me-too” cartridge filters.

### Consistent Performance

Absolute rated rigid structure Betapure BK series provides consistent performance. Unlike many competitors, Betapure BK series does not unload or lose filtration efficiency throughout its usable life!

### Significant Life Advantage

Betapure BK series’s rigid graded-porosity grooved structure provides a significant life advantage over the competition!

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.

### Absolute Betapure™ BK Series

Absolute Betapure BK series removal ratings are determined for the entire cartridge life using a new filter performance test developed by 3M Purification that complies with the general procedure outlined in ASTM 975. A copy of 3M Purification’s Technical Report summarizing absolute rating of Betapure BK series cartridges and the test methodology is available by requesting 3M Purification literature number LITDMPC2.795.

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:

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

Betapure BK series filters achieve a minimum Betax ( $\beta_x$ ) value of 1000 at the specified ratings seen in Table 1.

## Betapure™ BK Series Features & Benefits

### Absolute rated cartridge filters from 5 - 70 microns

- Absolute filtration efficiency at the specified reduction rating
- Consistent production yields with absolute contaminant retention

### Rigid resin bonded structure

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

### Grooved surface with true graded-porosity internal structure

- Significantly longer life
- Cost effective filtration with optimized yields

### 300 °F high temperature option

- Choice of temperature compatible options
- Inventory one product for many applications

### No metal or plastic cores

- Easy disposal, suitable for incineration or shredding
- Disposal cost reduction

### Available with polypropylene or polyester end modifications

- Retrofit any industrial housing
- Usable in existing filter housings



**Table 1. – Betapure™ BK Series Absolute Ratings**

Grade Designation	$\beta_x = 1000$ (x = Absolute Micron Rating)
Z8 050	5
Z8 070	7
Z8 100	10
Z8 140	14
Z8 150	15
Z8 200	20
Z8 300	30
Z8 400	40
Z8 500	50
Z8 700	70

### High Temperature Betapure™ BK Series

Standard Betapure™ BK series provides consistent performance at temperatures to 250 °F (121 °C) and differential pressures to 70 psid (4.8 bar). High temperature (HT) Betapure BK series extends the temperature rating to 300 °F (149 °C) for those non-aqueous processes that require service under extreme conditions.

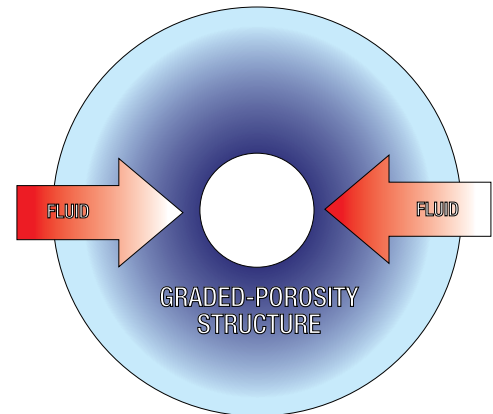
### Betapure™ BK Series – Consistent Performance

The initial Beta Ratio for all grades of Betapure BK series 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 Betapure BK series’ absolute filtration performance. The Beta Ratio vs. Differential Pressure Graphs 1 and 2 illustrate how competitive filters do not achieve the consistent performance of Betapure BK series. Filters that show 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 Graphs 1 and 2, 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. In Graph 1, the generic cotton wound, Competitor C, exhibits erratic performance caused by media movement under increasing pressure, and, in Graph 2, it exhibits minimal ability to retain contaminant throughout the test. In Graph 1, melt-blown Competitor O never approaches a Beta Ratio of 1000, and it shows a decreasing Beta Ratio at high differential pressure. Resin bonded Competitor F, as shown in Graph 2, exhibits very low Beta Ratios at low differential pressures indicating poor performance. Above 1.0 psid, the contaminant builds a cake which accounts for the subsequent increase in Beta Ratio. Betapure BK series exhibits consistent Beta Ratios at all differential pressures.

### Rigid Graded-Porosity Betapure™ BK Series

Betapure BK series filter cartridges are manufactured using an exclusive process that achieves a true “graded-porosity” fiber structure with a clean and smooth inside diameter. Each fiber is locked in this arrangement by a thermosetting resin binder to create a rigid structure, eliminating the need for a metal or plastic center core. Larger particles are trapped in the outer area and finer particles towards the inner area. Figure 1 illustrates how in a graded-porosity structure the overall effect is to classify and retain particles by size as they progress through the cartridge.



**Figure 1. – Betapure™ BK Series Graded-Porosity Structure**

## High Surface Area Betapure™ BK Series

Betapure™ BK series cartridges also feature an optimized groove pattern that increases the surface area by over 65% when compared to smooth cylindrical cartridges (see Figure 2). 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-porosity structure means that Betapure BK series can provide 3 times or greater service life than competitive filter cartridges.

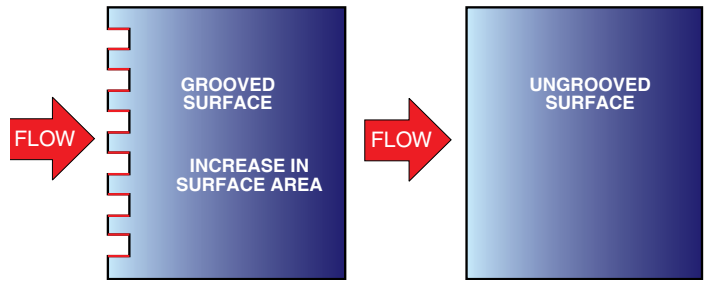
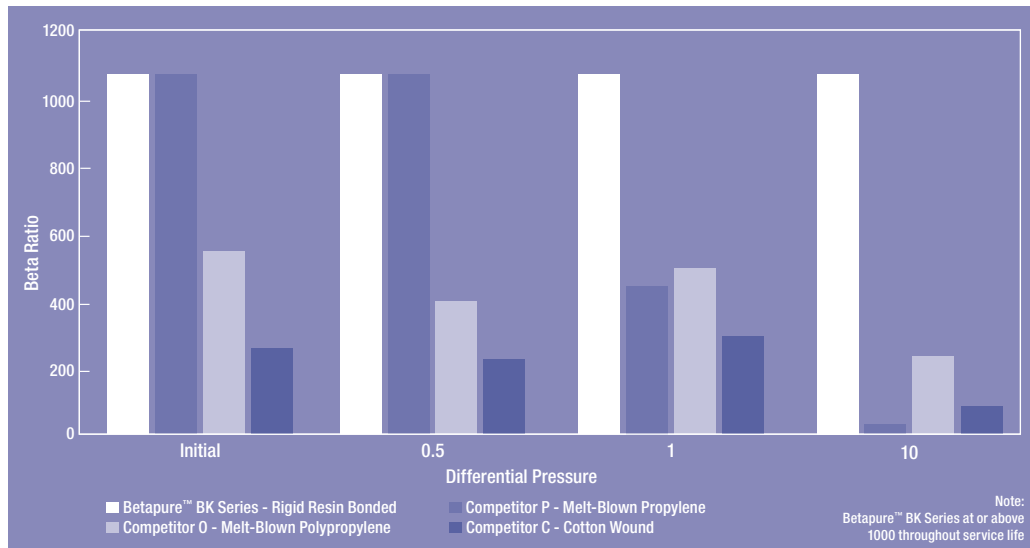
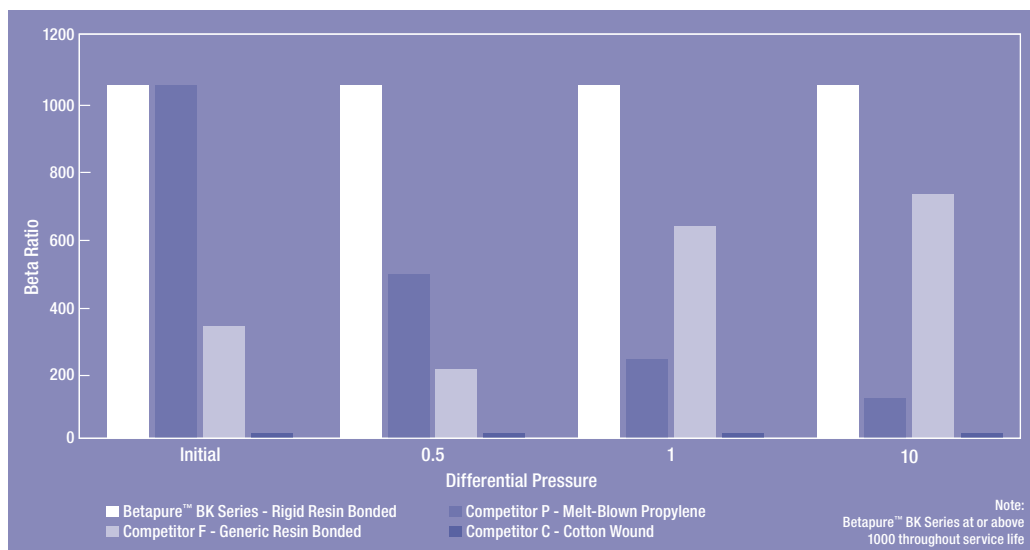


Figure 2. – Surface Area Comparison

Graph 1. - Beta Ratio Comparison Of Filter Cartridges Rated At 20 Microns



Graph 2. - Beta Ratio Comparison Of Filter Cartridges Rated At 70 Microns



## Betapure™ BK Series Product Specifications

Absolute Rating (µm)	Grade	Fiber	Resin
5	Z8050	Acrylic/Glass/Cellulose	Phenolic
7	Z8070		
10	Z8100		
14	Z8140		
15	Z8150		
20	Z8200	Acrylic/Cellulose	
30	Z8300		
40	Z8400		
50	Z8500		
70	Z8700		
Cartridge End Modifications			
Standard Temperature	Polypropylene bonding with polypropylene end modifications		
High Temperature	Thermoset epoxy bonding with polyester end modifications		
Operating Parameters			
Maximum Operating Temperature	Standard – 250 °F (121 °C) With polyethylene gasket – 200 °F (93 °C) With polypropylene end modifications – 180 °F (82 °C)		
	High Temperature Option – 300 °F (149 °C) with or without polyester end modifications, non-aqueous applications		
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)		

## Betapure™ BK Series Applications

Betapure™ BK series provides consistent reproducible filtration performance and longer life while meeting or exceeding quality specifications in a wide variety of industrial processing applications. Betapure BK series is particularly well suited for high viscosity fluids, high temperature processes, and differential pressures to 70 psid (4.8 bar).

- Petroleum Products - gas, oils, gasoline, kerosene, lube oil, fuel oil, waxes
- Chemical/Petrochemical - acids, bases, organic solvents, catalysts, monomers, polymers, glycols
- Water - process water, produced water, boiler feed, demineralized feed, pre-reverse osmosis system, waste water
- General Industrial - paint, varnish, lacquer, inks, coatings, emulsions, magnetic media, resins, detergents, adhesives, machine tool coolants, cutting oils, parts washers
- Brines and aqueous salt solutions

## Betapure™ BK Series Flow Rates

Table 2. – Betapure™ BK Series Flow Rates

Grade	Absolute Rating (µm)	Specific Pressure Drop Per 10" Cartridge <sup>1</sup>		Recommended Maximum Aqueous Flow Rate <sup>2</sup> Per 10" Cartridge	
		psi/gpm	mbar/lpm	gpm	lpm
Z8 050	5	0.75	13.6	3	11.4
Z8 070	7	0.33	5.98	3	11.4
Z8 100	10	0.20	3.64	4	15.1
Z8 140	14	0.16	2.89	4	15.1
Z8 150	15	0.27	4.88	4	15.1
Z8 200	20	0.13	2.34	5	18.9
Z8 300	30	0.08	1.44	5	18.9
Z8 400	40	0.06	1.10	6	22.7
Z8 500	50	0.05	0.89	7	26.5
Z8 700	70	0.03	0.55	7	26.5

<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.

Table 2 provides flow information for Betapure™ BK series filters in aqueous fluids.

For liquids other than water, multiply the specific pressure drop value (in column 3) by the viscosity in centipoise. The specific pressure drop values may be effectively used when three of the four variables (Viscosity, Flow, Differential Pressure, and Cartridge Grade) are set.

### Betapure™ BK Series Chemical Compatibility

Table 3 shows Betapure BK series's wide range of chemical compatibility. Betapure BK series exhibits excellent resistance to petroleum products, organic solvents, water, acids, brines and aqueous salt solutions. Betapure BK series is not recommended for strong acids or bases at temperatures over 100 °F (38 °C).

**Table 3. – Chemical Compatibility**

Fluid		Rating
Category	Example	
Petroleum	Gasoline	R
	Kerosene	R
	Diesel Fuel	R
	Lube Oil	R
	Fuel Oil	R
	Waxes	R
Organic Solvents	MEK	R
	Benzene	R
	Toluene	R
	Xylene	R
	Alcohols	R
	Glycols	R
	Dimethyl Formamide (DMF)	N
	Amines (DEA, MDEA, MEA) 20% - 50% up to 160 °F (71 °C)	L
Water	Process - to 212 °F	R
	Produced - to 212 °F	R
	Boiler Feed - to 212 °F	R
	Demineralizer Feed - to 212 °F	R
	Potable Water	N
	WFI	N
Organic Acids	Acetic (100%)	R
	Tannic 10%	R
Inorganic Acids	Hydrochloric (Muriatic) Acid 5%	R
	Sulfuric 50%	R
	Sulfurous 5-10%	R
	Nitric	R
Brines and Aqueous Salt Solutions	Sodium Chloride	R
	Sodium Sulfate	R
	Sodium Nitrate	R
Weak Alkalis	Aluminum Hydroxide	R
	Ferric Hydroxide	R
	Magnesium Hydroxide	R
Fatty Acids – Oils	Detergents	R
	Mineral Oil	R
	Industrial Vegetable Oils	R
	Silicone Oils	R
Oxidizers	Hydrogen Peroxide 90%	R

R = Generally Recommended up to 250 °F (121 °C) unless otherwise noted. N = Not Recommended L = Likely Compatible, test before use.

# Betapure™ BK Series Ordering Guide

Cartridge Type	Length*	Grade	Surface	Packaging**	Temperature Option	End Modification	Gasket/O-ring
BK - Betapure™ Series	09 - 9 ¾" 10 - 10" 19 - 19½" 20 - 20" 29 - 29¼" 30 - 30" 39 - 39" 40 - 40"	Z8050 Z8070 Z8100 Z8140 Z8150 Z8200 Z8300 Z8400 Z8500 Z8700	G – Grooved U – Ungrooved	1 – Standard Shrink Wrap 2 – Bulk Pack	S – Standard H – High Temp.	C - 222 O-ring & Spear F - 222 O-ring & Flat Cap K - 222 O-ring, Retaining Clip & Flat Cap N - None P - Polypropylene Core Extender S - SS Core Extender	A - Silicone B - Fluorocarbon C - EPR D - Nitrile G - Volara Gasket*** N - None Y - Nylon Flat Gasket

\* Lengths are multiples of either 9 3/4" or 10". \*\* All 39" and 40" cartridges poly bagged. \*\*\*Required for grades Z8050 through Z8140

## Notes on End Modification Ordering

### Double Open-End (DOE) Cartridges

DOE without end modification or gasket: N - N

DOE with flat gasket: N - G

### Single Open-End (SOE) O-ring Style End Modifications

C - Code 8 style end modification (222) double o-ring connector with locating spear for use with standard plug-in style housing diaphragms and positioning plates.

F - Code 3 style end modification (222) double o-ring connector with flat cap for use with standard plug-in style housing.

K - 222 style o-ring connector with one o-ring and retaining clip for use with the 7PC housing

### Core Extenders - For proper alignment and cartridge centering in competitive housings

P - Polypropylene extender for applications where compatible

S - Stainless Steel extender for chemical compatibility and for high temperatures > 180 °F (82 °C)

## 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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### 3M Purification Inc.

400 Research Parkway  
Meriden, CT 06450  
U.S.A.

Phone (800) 243-6894  
(203) 237-5541  
Fax (203) 630-4530  
www.3Mpurification.com

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