

# 3M Purification



## Betapure™ PK Series Filter Systems for Oil & Gas Processing

Betapure™ PK series cartridges are easy to use filters manufactured from cellulose fibers, glass fibers, and a chemically resistant thermosetting resin to produce a durable, rigid filter structure. Standard Betapure PK series cartridges are grooved to significantly increase the surface area and extend service life in fluid filtration applications. Both grooved and smooth-surface Betapure PK series filters are available with absolute ratings from 10 to 60 microns. Cartridge configurations include standard industrial 2 5/8" OD, 336 style 3" OD, PG style 4 1/2" OD, and the PR internal o-ring style, in lengths from from 9 3/4" to 72" with a wide range of end-treatments to ensure that Betapure PK series filter cartridges can easily retrofit installed filter housings. Standard diameter industrial Betapure PK series products include polyethylene foam gaskets for positive sealing in double open end housings. 3M Purification offers cartridges in the single open end style that employ integral polypropylene caps and springs to eliminate separate spring and seal assemblies.

### Applications

- Waterflood
- Amine
- Fuel Gas
- Lube Oil

### Features & Benefits

#### Absolute-rated cartridge filters from 10 - 60 microns

- 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 truegraded-porosity structure

- Significantly longer life
- Dramatic cost savings with optimized yields

#### "336" cartridge elastomer sealing system

- User-friendly, maintains integrity at high differential pressure
- Fast filter change-out and consistent product quality

#### No metal or plastic cores

- Easy disposal, suitable for incineration or shredding
- Reduced disposal costs

#### Available in 2 5/8" OD, 3" OD, and 4 1/2" OD and lengths to 72"

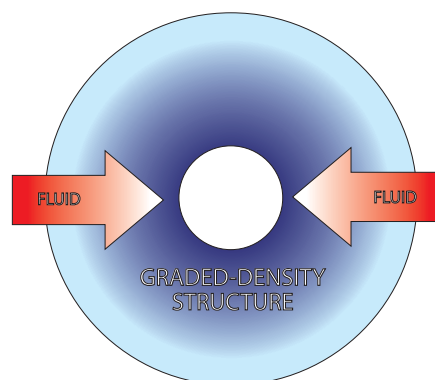
- Broad range of configurations for custom sizing
- Retrofit existing housings and current applications

### Significant Life Advantage and Consistent Performance

The rigid graded porosity grooved structure of a Betapure PK series cartridge provides a significant life advantage over competitive products. Absolute rated Betapure PK series filters provide consistent performance at all times. Unlike many competitors, the rigid Betapure PK series structure does not unload or lose filtration efficiency throughout its usable life. (See Graph 1 on page 2).

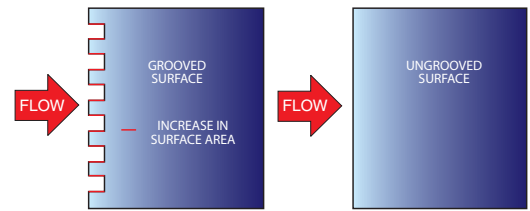
### Rigid Graded-Porosity Betapure™ PK series Structure

Betapure PK series filter cartridges are manufactured using a 3M Purification process that results in a progressively more dense center core region creating a graded-porosity 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.



## Rigid Graded-Porosity Betapure™ PK series Structure

Betapure PK series 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-porosity structure means that Betapure PK series can provide significantly greater service life than competitive filter cartridges.



## Absolute Betapure™ PK Series

Absolute removal ratings for Betapure™ PK series are determined using a filter performance test developed by 3M Purification to comply with the general procedures outlined in ASTM 975. 3M Purification defines absolute rating as the particle size (x) providing an initial Beta Ratio (Bx) = 1000. At this Beta ratio the removal efficiency is equal to 99.9%. Beta Ratio (Bx) is defined by the following equation:

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

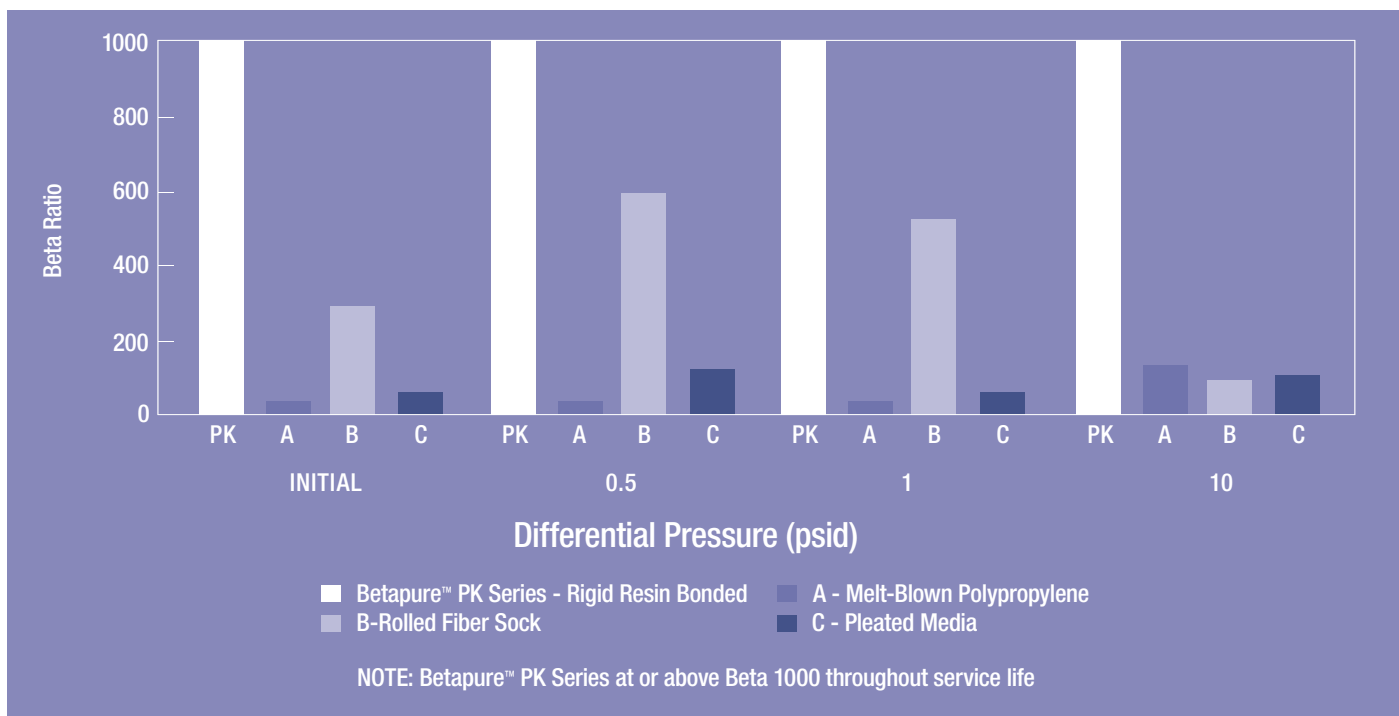
Betapure PK series filters achieve a minimum Beta (Bx) value of 1000 at the ratings specified in Table 1.

Grade Designation	Absolute Rating ( μm)
M100	10
M200	20
M300	30
M400	40
M600	60

Table 1 Betapure™ PK Series Absolute Ratings

## Betapure™ PK Series - Consistent Performance

The initial Beta Ratio for all grades of Betapure PK series filter cartridges is equal or greater than 1000, and Betapure PK series cartridges perform at or above this initial value throughout the usable life. This defines the Betapure PK series absolute filtration performance. The Beta Ratio vs. Differential Pressure in Graph 1 illustrates how competitive filters do not achieve the consistent performance of Betapure PK 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.



Graph 1. - Beta Ratio vs Differential Pressure

As illustrated in Graph 1, the performance of the Rolled Fiber Sock cartridges (Competitor B) exhibits contaminant unloading and a loss of filtration efficiency as differential pressure increases from 1 to 10 psid. The Melt-Blown (Competitor A) and the Pleated Cellulose/Polyolefin (Competitor C) filters exhibit minimal contaminant retention through the test duration.

# Betapure™ PK Series Product Specifications

## Betapure™ PK Series Chemical Compatibility

Betapure PK series is well suited for organic solvents including amines and glycols. Table 3 contains specific recommendations.

Rating & Materials Of Construction			
Absolute Rating (µm)	Grade	Fiber	Resin
10	M100	Cellulose / Glass	Melamine
20	M200		
30	M300	Cellulose	
40	M400		
60	M600		

Operating Parameters		
Maximum Operating Temperature	Standard (Media Only)*	121°C
	With Polyester End Fittings	
	With Polyethylene Foam Gasket	93°C
	With Elastomer Seal or	82°C
Maximum Differential Pressure	Polypropylene End Fittings 70 psid (4.8 bar) @ 20°C	
Recommended Change-out Differential Pressure	35 psid (2.4 bar)	

Dimensions				
	PG Style	PR Style	336 Style	Standard Industrial Style
ID	3 1/8" (79.4 mm)	1 15/32" (37.3 mm)	1 15/32" (37.3 mm)	1 1/16" (27 mm)
OD	4 1/2" (114.3 mm)	2 25/32" (70.6 mm)	2 25/32" (70.6 mm)	2 19/32" (65.9mm)
Length	24" to 72" (610 - 1829 mm)	39" (990.6 mm)	36" (914 mm)	9 3/4" to 40" (248 - 1016 mm)

Table 2. - Betapure™ BK Series Product Specification

Fluid		Rating
Category	Example	
Organic Solvents	Amines (DEA, MDEA, MEA) 20% - 50% up to 160°F (71°C)	R
	Glycols	R
	MEK	R
	Benzene	R
	Xylene	R
	Alcohols	R
	Dimethyl Formamide (DMF)	R
Petroleum	Gasoline	R
	Kerosene	R
	Diesel Fuel	R
	Lube Oil	R
	Fuel Oil	R
	Waxes	R
Water	Process (212 F/100°C)	R
	Produced (212 F/100°C)	R
	Boiler Feed (212 F/100°C)	R
	Demineralizer Feed (212 F/100°C)	R
Organic Acids	Acetic (100%)	N
	Tannic 10%	N
Inorganic Acids	Hydrochloric (Muriatic) Acid 5%	N
	Sulfuric 50%	N
	Sulfurous 5-10%	N
	Nitric	N
Brines and Aqueous Salt Solutions	Sodium Chloride	R
	Sodium Sulfate	R
	Sodium Nitrate	R
Weak Alkalis	Aluminum Hydroxide	N
	Ferric Hydroxide	N
	Magnesium Hydroxide	N
Fatty Acids - Oils	Detergents	R
	Mineral Oil	R
	Silicone Oils	R
R = Generally Recommended up to 250°F (121°C) unless otherwise noted.		
N = Not Recommended		

Table 3. - Chemical Compatibility

## Betapure™ PK Series Flow Rate Recommendations

For liquids other than water, use the following formula in conjunction with the values from column 3 of Table 4. The specific pressure drop values may be effectively used when three of the four variables (Viscosity, Flow, Differential Pressure, and Cartridge Grade) are set.

$$\frac{\text{psid}}{\text{clean}} = \frac{(\text{Total system gpm}) \quad (\text{Viscosity in Cp}) \quad (\text{Value from table})}{\left( \text{Number of Equivalent Single Length Cartridges in housing} \right)}$$

The recommendations in Table 4 are 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. Refer to 3M Purification publication GF.G02.788 for additional information.

### Betapure™ PK series Waste Management

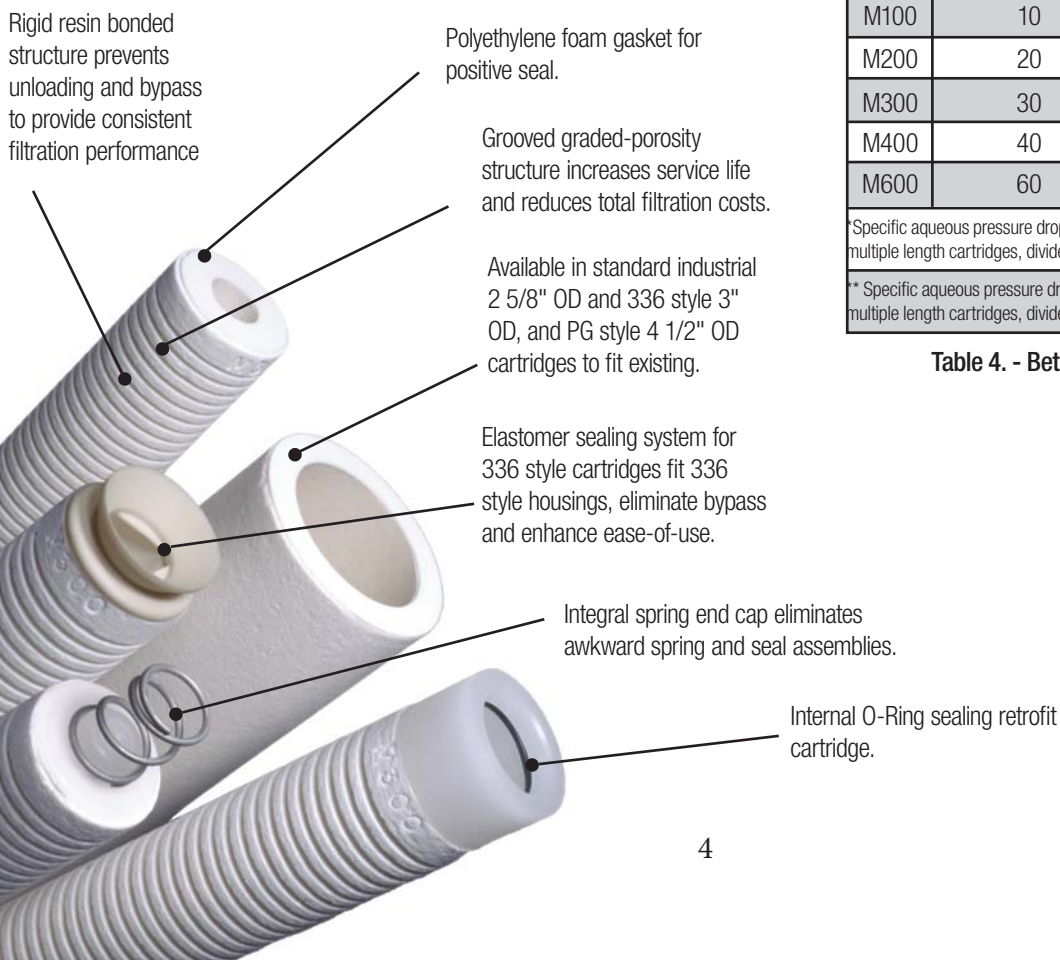
Betapure PK series filter cartridges contain no metal or plastic cores. They can be incinerated, shredded, or crushed after use to reduce overall disposal costs. For more information about Betapure PK series disposal, refer to 3M Purification literature CF.TD2.

Standard Industrial Cartridges		
Grade	Absolute Rating	Specific p/10" Element * (psi/gpm)
M100	10	0.35
M200	20	0.19
M300	30	0.11
M400	40	0.10
M600	60	0.09
336 Style Cartridges		
Grade	Absolute Rating	Specific p/36" Element * (psi/gpm)
M100	10	0.06
M200	20	0.04
M300	30	0.03
M400	40	0.02
M600	60	0.015
PG Style Cartridges (4 1/2" OD)		
Grade	Absolute Rating	Specific p/12" Element * (psi/gpm)
M100	10	0.12
M200	20	0.06
M300	30	0.03
M400	40	0.02
M600	60	0.01
PR Style Cartridges (Internal O-Ring)		
Grade	Absolute Rating	Specific p/39" Element * (psi/gpm)
M100	10	0.06
M200	20	0.04
M300	30	0.03
M400	40	M400
M600	60	0.015

\* Specific aqueous pressure drop ( p ) for a 10" equivalent length cartridge. For multiple length cartridges, divide total flow by the number of 10" equivalents.

\*\* Specific aqueous pressure drop ( p ) for a 12" equivalent length cartridge. For multiple length cartridges, divide total flow by the number of 10" equivalents.

Table 4. - Betapure™ PK Series Flow Rates



# Betapure™ PK Series Ordering Guide

## Standard Dimension Industrial Cartridges (2 5/8" OD)

Cartridge Type	Cartridge Length	Grade Description		Surface Type	Packing Option	End Modification	Gasket Material
		Grade	Absolute Rating (µm)				
PT (2 5/8" OD)	09 - 9 3/4"	M100	10	G - Grooved	2 - Bulk	C - 222 O-ring & Spear	A - Silicone
	10 - 10"	M200	20	U-Ungrooved		F - 222 O-ring & Flat Cap	B - Fluorocarbon
	19 - 19 1/2"	M300	30			N - None	C - EPR
	20 - 20"	M400	40			P - Polypropylene Core Extender	D - Nitrile
	29 - 29 1/4"	M600	60			R - Closed Cap with Stainless Spring	N - None*
	30 - 30"					S - Stainless Steel Core Extender	G - PE Foam*
	39 - 39"					Q - Same as "R" without Spring	
	40 - 40"					Y - Single O-ring (40" length only)	

### 336 Style Cartridges (3" OD)

Cartridge Type	Cartridge Length	Grade Description		Surface Type	Packing Option	End Modification	Gasket Material
		Grade	Absolute Rating (µm)				
PK (3" OD)	35 - 35 1/2"	M100	10	G - Grooved	2 - Bulk	V - Elastomer Compression Seal (Double Open End)	S - Elastomer Compression Seal
	36 - 36"	M200	20	U-Ungrooved		W - Elastomer Compression Seal 72 - 72" * M400 40 (Single Open End)	
	37 - 36 1/2"	M300	30				
	72 - 72"	M400	40			R - Closed Cap with Spring	G - PE Foam
		M600	60				

### PG Style Cartridges (4 1/2" OD)

Cartridge Type	Cartridge Length	Grade Description		Surface Type	Packing Option	End Modification	Gasket Material
		Grade	Absolute Rating (µm)				
PG (4 1/2" OD)	24 - 24"	M100	10	U-Ungrooved	2 - Bulk	N - None	G - PE Foam
	36 - 36"	M200	20				N - None
	71 - 71"	M300	30				
	72 - 72"	M400	40				
		M600	60				

### PG Style Cartridges (4 1/2" OD)

Cartridge Type	Cartridge Length	Grade Description		Surface Type	Packing Option	End Modification	End Fitting	O-Ring Material
		Grade	Absolute Rating (µm)					
PR	39 - 39"	M100	10	G - Grooved	2 - Bulk	S - Standard, Polypropylene	1 - 1.9" ID O-ring 2 - 2.2" ID O-ring	B - Fluorocarbon
		M200	20	U-Ungrooved		H - High Temperature, Polyester		C - EPR
		M300	30					D - Nitrile
		M400	40					
		M600	60					

**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 BE RESPONSIBLE FOR DAMAGES OF ANY NATURE WHATSOEVER RESULTING FROM THE USE OF OR RELIANCE UPON INFORMATION.

It is your responsibility to determine if additional testing or information is required and if this product is fit for a particular purpose and suitable in your specific application.

**Limitation of Liability**

3M Purification Pty Limited will not be liable, to the extent permitted by law, for any loss or damage from the use of the Product(s), whether direct, indirect, special, or consequential, regardless of the legal theory asserted, included warranty, contract, negligence or strict liability.

**3M Purification Pty Limited**

140 Sunnyholt Road  
Blacktown NSW 2148  
AUSTRALIA

Tel. 1300 367 362

Fax. 1800 671 599

[www.3mpurification.com.au](http://www.3mpurification.com.au)

**New Zealand**

PO BOX 33-246

North Shore 0740

Auckland, NEW ZEALAND

Tel. 0800 362 886

Fax. 0800 362 880

[www.3m.com/nz](http://www.3m.com/nz)