

# LENNTECH

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# Betapure™ P Series

## Filter Cartridges for Oil and Gas Processing

Filtration and separation systems are a key element in the efficient operation of Oil and Gas applications. Betapure P Series filter systems, formerly known as Petro-Klean, combine the finest cartridge media with easy to use housings for the most cost effective solution to gas processing filtration.

### Reduce or Eliminate Foaming

Prevention of foaming reduces expensive amine and glycol carry-over and replacement costs. Absolute-rated Betapure P filtration maintains solution quality by eliminating the solids that contribute to foaming.

### Prevent Fouling of Heat Exchangers and Reboilers

A high level of solids which can be deposited on the rich/lean heat exchanger surfaces lead to fouling, higher temperatures and ultimately heat exchanger tube replacement.

Absolute-rated Betapure P filtration minimises reboiler cleaning, improves heat exchange efficiencies and reduces or eliminates costly repairs to heat exchangers and reboilers in amine and glycol systems.

### What is Betapure P?

Betapure P is an easy to use filter cartridge manufactured from cellulose fibres, glass fibres and a chemically resistant thermosetting resin to produce a durable, rigid filter structure. Betapure P Series cartridges are grooved to significantly increase the surface area and extend service life. Large diameter 336 style Betapure P Series filter cartridges eliminate troublesome spring and seal assemblies by incorporating a self-energizing elastomer seal to fit 336" style housings.

Standard diameter industrial Betapure P Series products include polyethylene foam gaskets for positive sealing in double open end housings and single open end cartridges employing polypropylene caps and springs that eliminates spring and seal assemblies.

Betapure P Series cartridges are simple to install and ensure a positive seal for consistent performance during the most demanding upset conditions or pressure spikes.



## Applications

Betapure P Series cartridges have been designed specifically for use in various applications in the oil and gas processing industries, i.e.:

- Amine sweetening
- Glycol dehydration systems
- Fuel Gas
- Lube oil applications
- Process and equipment protection
- Refining (kerosene, gasoline, diesel...)
- Water flood
- Enhanced oil recovery

## Features and Benefits

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

- Distinct particle size cut-off 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 optimised yields

### A "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, 4 1/2" OD and various other lengths to 72"

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

Figure 1: Betapure P Series graded density structure

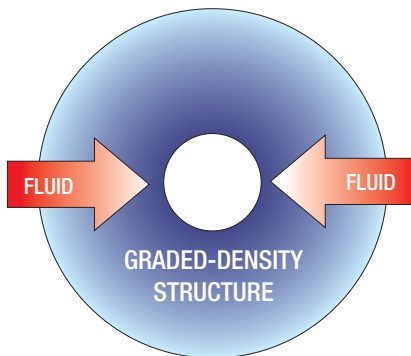
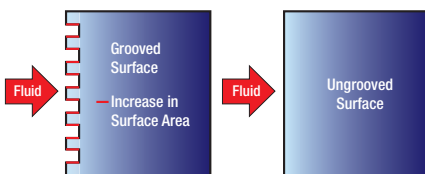
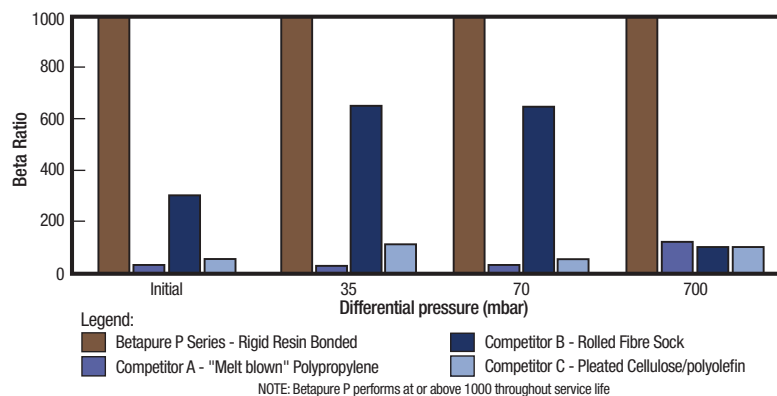


Figure 2: Surface area comparison



### Consistent performance

The initial Beta-Ratio for all grades of Betapure P Series filter cartridges is equal to or greater than 1000 and Betapure P Series cartridges perform at or above this initial value throughout the usable (all the way to plugging) life. This defines Betapure P 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 P. 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 Comparison 10 µm Cartridges

As illustrated in Graph 1, the performance of the Rolled Fibre Sock cartridges (Competitor B) exhibits contaminant unloading and a loss of filtration efficiency as differential pressure increases from 70 to 700 mbar. The Melt-Blown (Competitor A) and the Pleated Cellulose/Polyolefin (Competitor C) filters exhibit minimal contaminant retention through the test duration.

### Significant Life Advantage and Consistent Performance

The rigid graded density grooved structure of Betapure P Series provides a significant life advantage over competitive products. Users of Betapure P in amine sweetening applications benefit from service life improvement 2 to 4 times greater than competitive products with amine clarity completely restored. Absolute rated Betapure P provides consistent performance at all times. Unlike many competitors, Betapure P Series does not unload or lose filtration efficiency throughout its usable life.

### Rigid graded density Betapure P

Betapure P Series filter cartridges are manufactured using an exclusive process to achieve a true graded-density structure. The 3M Purification manufacturing process results in a progressively more dense centre core region creating a graded-density structure. Each fibre 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 Betapure P

Betapure P Series cartridges also feature an optimised 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 utilisation of the depth structure. Maximum surface area with a true graded-density structure means that Betapure P can provide significantly greater service life than competitive filter cartridges.

## Product Specifications

### Cartridge End Modifications

- Standard DOE with or without gasket
- Single open end with 222 O-ring & Spear
- Single open end with 222 O-ring & Flat Cap
- Closed cap with stainless steel Spring (R)
- For 336 style: (DOE or SOE) with compression seal
- For PG style DOE with or without gasket

### Operating Conditions

- Maximum operating temperature:
  - Standard (Media Only) with Polyester end fittings: 121 °C
  - With Polyethylene foam gasket: 93 °C
  - With Elastomer Seal or Polypropylene end fittings: 82 °C
- Maximum differential pressure: 4.8 bar at 20 °C
- Recommended change-out differential pressure: 2.4 bar

## Flow Rates

Table below provides flow information for Betapure P Series in aqueous fluids.

Grade	Absolute rating (µm)	Standard Industrial Cartridges		336 Style Cartridges (3"OD)	
		Specific Δp per 10" element (mbar for each litre/min)*	Recommended max. flow per 10" element (litre/min)**	Specific Δp per 36" element (mbar for each litre/min)*	Recommended max. flow per 36" element (litre/min)**
M100	10	6.3	15.1	1.1	60.5
M200	20	3.4	15.1	0.7	60.5
M300	30	2.0	18.9	0.5	75.7
M400	40	1.8	18.9	0.4	75.7
M600	60	1.6	22.7	0.27	90.8
Grade	Absolute rating (µm)	PG Style Cartridges (4 ½"OD)		PR Style Cartridges (Internal O-ring)	
		Specific Δp per 12" element (mbar for each litre/min)*		Specific Δp per 39" element (mbar for each litre/min)*	
M100	10	2.2		1.1	
M200	20	1.1		0.7	
M300	30	0.5		0.5	
M400	40	0.4		0.4	
M600	60	0.2		0.27	

\* Specific aqueous pressure drop (Δp) for a 10" equivalent length cartridge.  
 For multiple length cartridges, divide total flow by the number of 10" equivalent.  
 \*\* Optimal efficiency and service 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 "Specific Δp per element (mbar for each litre/min)" of flow rates table. The specific pressure drop values may be effectively used when three of the four variables (Viscosity, Flow, Differential Pressure, and Cartridge Grade) are set.

$$\Delta p_{\text{clean}} = \frac{\left( \frac{\text{Total system}}{\text{l/min}} \right) \left( \frac{\text{Viscosity in}}{\text{Cp}} \right) \left( \frac{\text{Value from}}{\text{table}} \right)}{\left( \text{Number of equivalent Single Length Cartridges in housing} \right)}$$

## Chemical compatibility

Betapure P Series is well suited for organic solvents including amines and glycols. In the Table on the right specific recommendations.

## Betapure P waste management

Waste management is a key issue in oil and gas processing industries. Betapure P Series filter cartridges contain no metal or plastic cores. They can be incinerated, shredded, or crushed after use to reduce overall disposal costs.

Ratings & Material of Construction			
Absolute Rating (µm)	Grade	Media	Resin
10	M 100	Cellulose / Glass	Melamine
20	M 200		
30	M 300	Cellulose	
40	M 400		
60	M 600		

Chemical Compatibility		
Fluid Category	Fluid Example	Rating
Organic Solvents	Amines (DEA, MDEA, MEA) 20% - 50% up to 70 °C	R
	Glycols	R
	MEK (Methyl Ethyl Ketone)	R
	Benzene	R
	Xylene	R
	Alcohols	R
Petroleum	Dimethyl Formamide (DMF)	R
	Gasoline	R
	Kerosene	R
	Diesel Fuel	R
	Lube Oil	R
	Fuel Oil	R
Water (100 °C)	Waxes	R
	Process	R
	Produced	R
	Boiler Feed	R
Organic Acids	Demineraliser Feed	R
	Acetic (100%)	N
Inorganic Acids	Tannic (10%)	N
	Hydrochloric (Muriatic) Acid 5%	N
	Sulphuric 50%	N
	Sulphurous 5-10%	N
Brines and Aqueous Salt Solutions	Nitric	N
	Sodium Chloride	R
	Sodium Sulphate	R
Weak Alkalis	Sodium Nitrate	R
	Aluminium Hydroxide	N
	Ferric Hydroxide	N
Fatty Acids - Oils	Magnesium Hydroxide	N
	Detergents	R
	Mineral Oil	R
	Silicone Oils	R

R = Generally Recommended up to 121 °C unless otherwise noted.  
 N = Not recommended

The recommendations in this brochure are for general guidance only. Testing under specific application conditions is recommended. For various end modifications and multi-length cartridges, consult your local 3M Purification representative or distributor.

## Betapure P Series Ordering Guide

### 1. Standard dimension industrial cartridges (2 5/8" OD)

Cartridge Type	Cartridge Length	Absolute Grade	Surface Type	Packaging	End Modification	Gasket Material
PT - (2 5/8" OD)	09 - 09 3/4" 10 - 10" 19 - 19 1/2" 20 - 20" 29 - 29 1/4" 30 - 30" 39 - 39" 40 - 40"	M100 - 10 µm M200 - 20 µm M300 - 30 µm M400 - 40 µm M600 - 60 µm	G - Grooved U - Ungrooved	2 - bulk	C - Code 8 (222 O-ring & spear) F - Code 3 (222 O-ring & flat cap) N - None (D.O.E.) P - Polypropylene Core Extender R - Close cap with stainless spring S - Stainless Steel Core Extender Q - Same as "R" without Spring Y - Single O-ring (40" length only)	A - Silicone (MVQ*) B - Fluorocarbon (FPM*) C - EPR (EPDM*) D - Nitrile (NBR*) N - None** G - Polyethylene Foam**

\* ISO Designation  
\*\* For End Modification N, P, R and S only.

### 2. 336 style cartridges (3" OD)

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

\* with gasket material S only.

### 3. PG style cartridges (4 1/2" OD)

Cartridge Type	Cartridge Length	Absolute Grade	Surface Type	Packaging	End Modification	Gasket Material
PG - (4 1/2" OD)	24 - 24" 36 - 36" 71 - 71" 72 - 72"	M100 - 10 µm M200 - 20 µm M300 - 30 µm M400 - 40 µm M600 - 60 µm	U - Ungrooved	2 - bulk	N - None (D.O.E.)	N - None G - Polyethylene Foam

### 3. PR style cartridges (Internal O-ring)

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

\* ISO Designation

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