3M Science. Applied to Life.™

Betafine™ PPG & PTG Series Pharmaceutical Grade Pleated Polypropylene Filters

Betafine™ PPG & PTG Series Filters for Pharmaceutical & Biological Applications

The 3M Purification Inc. Betafine™ PPG and PTG series filters represent a major advance in pleated filter technology and performance. Building on 3M Purification Inc.'s history of filter design innovation, this absolute-rated, graded-porosity 100% polypropylene pleated filter features Advanced Pleat Technology (APT) that increases the usable filtration surface area while maintaining standard filter dimensions. The result is a filter that dramatically enhances service life.

Advanced Pleat Technology

The service life of a pleated filter is often dictated by the accessible surface area. Conventional pleated filters may offer a large gross surface area, but when the media is packed too tightly into the cartridge, only part of the surface area is usable resulting in both flow restrictions and limited contaminant holding capacity. The "blind" or unusable area commonly occurs near the inside diameter (see Figure 1) where the pleats are packed most tightly. The Betafine PPG and PTG series filter is manufactured using a staggered pleat configuration that, when combined with a novel support material, provides more open space between the pleats.

The APT staggered pleats with increased open area allow for greater contaminant loading between pleats at the inside diameter, while the reduced length pleats take advantage of existing open space closer to the filter's outside diameter. The result is a fully used surface area that provides superior service life.

Features & Benefits

Advanced Pleat Technology Construction for High Surface Area as compared to competitive filters

- Higher product throughputs for prolonged service life
- Lower total filtration operating costs
- Lower pressure drops for higher flow rates

Absolute-rated Filter Performance

- Higher product quality and yields

Graded-porosity Multi-layer Filter Media

- Capture of contaminant throughout the filter media to help maximize filter life
- Higher contaminant holding capacity

Polypropylene Construction Free of Adhesives & Surfactants

- Very low extractable levels for optimum filtrate purity
- Broad chemical compatibility for most aggressive process applications

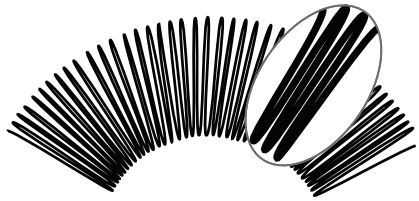
100% Integrity Tested Versions Available

- Prequalification and consistency in critical applications
- Suitable for final filtration in many applications

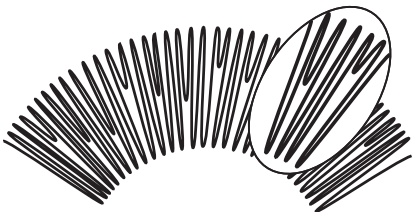
Applications

Betafine™ PPG & PTG Series filters serve a broad range of prefiltration and clarification applications in pharmaceutical, biological, and bioprocess manufacturing where economy and reliability are critical. Recommended applications include:

Pharmaceutical, Biological & Bioprocessing	Parenterals (SVP & LVP), membrane protection, opthalmics, orals, topicals, vaccines & serum
	Tissue culture media, fermentation feeds & intermediates
	Rinse fluids & pharmaceutical fine chemicals
	Blood plasma fractionation
	Reagents & buffers, high purity water systems, air & gas pre- and final filtration
	Diagnostics
	Cosmetics manufacturing



Conventional pleat designs, with full-depth densely packed pleats, fill the upstream pleat surface with contaminant that quickly constrict flow at the pleat's inside diameter.

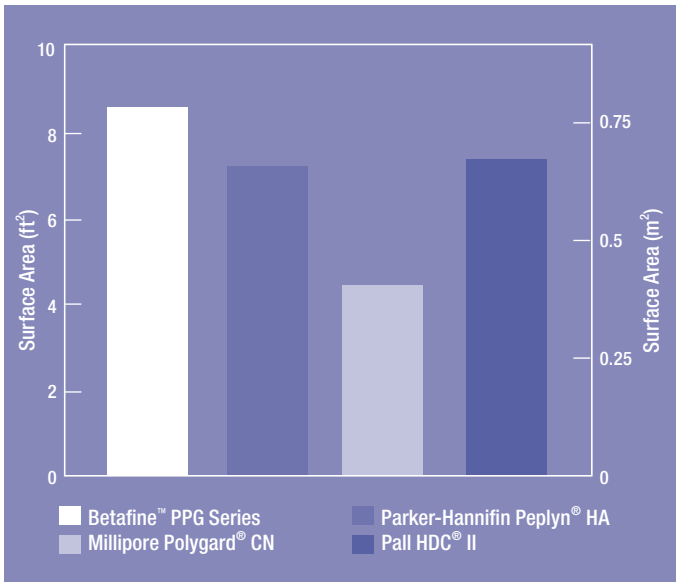


The Betafine™ PPG and PTG series filter's Advanced Pleat Technology utilizes a configuration designed to increase the accessible surface area for significantly greater filter media use.

Figure 1. Advanced Pleat Technology Provides Increased Surface Area vs. Conventional Pleat Designs

Engineered for Pharmaceuticals & Bioprocessing

Constructed from polypropylene media and support materials, the Betafine™ PPG and PTG series filter has ultra-low extractable levels and broad fluid compatibility, providing an ideal choice for a broad range of pharmaceutical applications. Betafine PPG and PTG series filters can be used for general prefiltration, clarification, or as a final filter in appropriate applications. All component materials meet the requirements of USP 24 Biological Safety Test for Plastics — Class VI — 70 °C. Betafine PPG and PTG filter cartridges may be autoclaved or steamed-in-place (*in situ*). Betafine PPG and PTG series filters are supplied with Certificates of Quality detailing the product attributes and qualification testing. Model PTG is integrity tested prior to shipment for applications where "factory integrity tested" help provide added reliability.



Graph 1. Surface Area Comparison of Betafine™ PPG Series 0.6 µm Filter Cartridge vs. Competing 0.6 µm Rated Filters

- Reliable — all component materials meet the requirements of USP 24 Biological Safety Test for Plastics — Class VI — 70 °C.
- Sterilizable — may be autoclaved or steamed-in-place (*in situ*)
- Certificate of Quality — details the product attributes and qualification testing

The Betafine™ PPG & PTG Series Filter Advantage

In applications such as biological feed streams, serial filtration is often employed for economical filterability. A typical configuration (Figure 2) could be a 0.6 µm rated Betafine PPG or PTG prefilter upstream of a 0.2 µm rated sterile membrane filter cartridge. In those instances where greater membrane protection is required, a 0.6 µm or a 0.2 µm rated Betafine PPG or PTG filter may provide longer final membrane life than competitive 0.6 µm rated products. The high surface area of Betafine PPG and PTG series filters coupled with graded-porosity construction allows the process to run for extended periods of time before filter plugging and change-out.

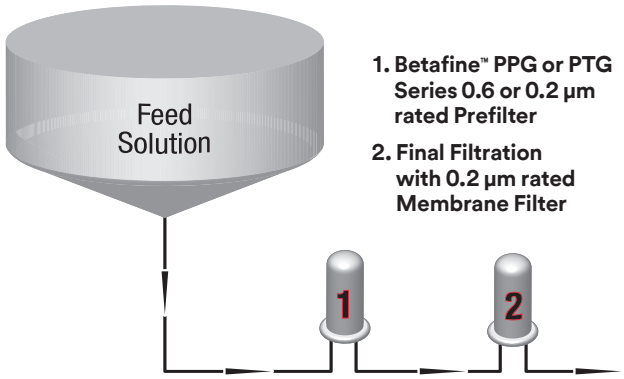
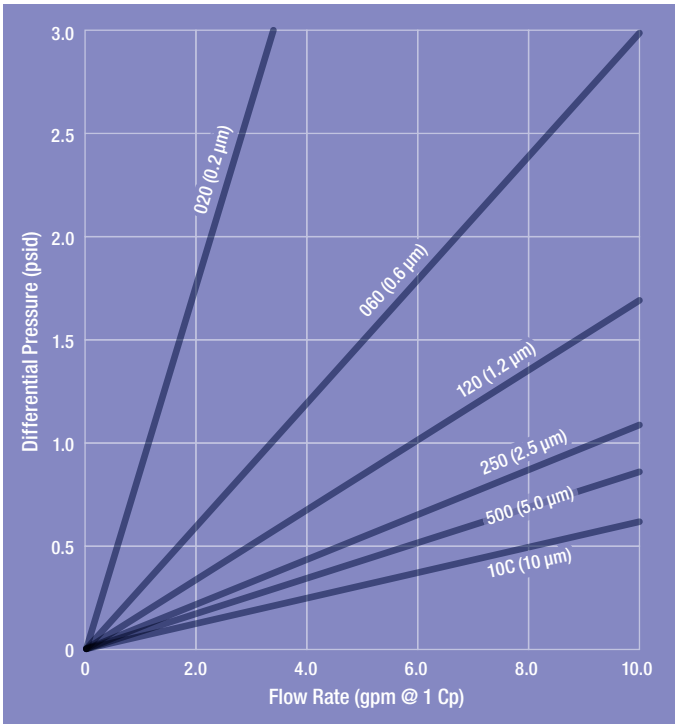


Figure 2. Membrane Protection with Betafine™ PPG & PTG Series Filters



Graph 2: Clean Water Flow per 10" Betafine™ PPG and PTG Series Filter Cartridge at Ambient Temperature (20 °C)

Graded-Porosity — the Key to Longer Life

The Betafine™ PPG and PTG series filter's graded-porosity media structure reduces particles sequentially by size — the larger particles by the more open, outer medium and the smaller particles by the tighter, inner medium. The outer medium acts as a prefilter, while the inner provides the absolute removal specified by the filter rating. This construction effectively spreads the contaminant through the depth of the filter media resulting in high contaminant capacity with lower pressure drop for longer service life as compared to competitive filters.

Chemical Compatibility

Polypropylene construction provides chemical compatibility in many demanding process fluid applications. Compatibility is influenced by process operating conditions; in critical applications, cartridges should be tested under actual conditions to determine the correct selection.

Betafine™ PPG & PTG Series Filter Cartridge Flow Rate Characteristics & Sizing Options

Flow vs. differential pressure for clean water is depicted in Graph 2 for each Betafine PPG and PTG series filter cartridge grade. Ideally, filter systems should be sized at an initial differential pressure of 0.5 to 1 psid (0.04 to 0.07 bar). Low flow rates further help extend the life of the filter system. In most applications, doubling the filter area (reducing the flow rate per unit area by one-half) help result in two and one-half times the throughput.

- Reduced cartridge change-out frequency — for a given process flow rate, the graded-porosity structure and maximum filter area decrease filter cartridge change-out frequency by 30 to 50 percent or more depending on the application.
- Reduced filter housing costs — for new applications, the low pressure drops of the Betafine PPG and PTG series filter cartridge allow smaller or fewer housings to be specified. Fewer filter cartridges and smaller housings help provide lower capital and consumables costs, year after year.

Photo 1. Betafine™ PPG & PTG Series pleated filter media detail

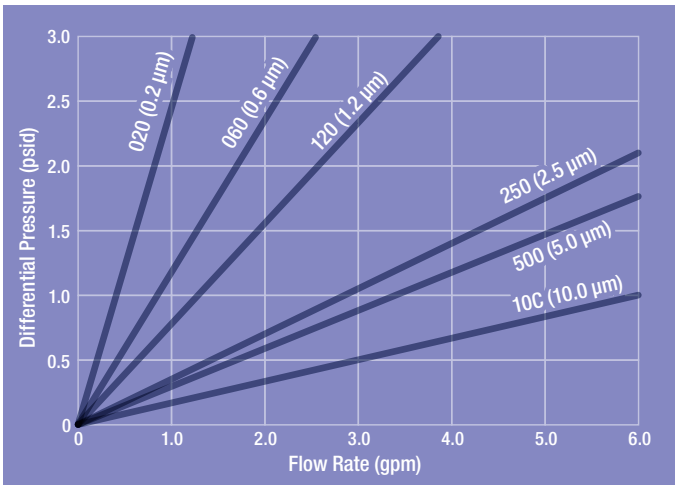
Betafine™ PPG Series Filter Capsule & Mini-cartridge Flow Rate Characteristics & Sizing Options

Graphs 3-7 are typical clean water flow rates for Betafine™ PPG series filter capsules with 1.5" sanitary flange connections or in the mini-cartridge configuration. Other end connections may affect maximum flow rates (see Table 1 below).

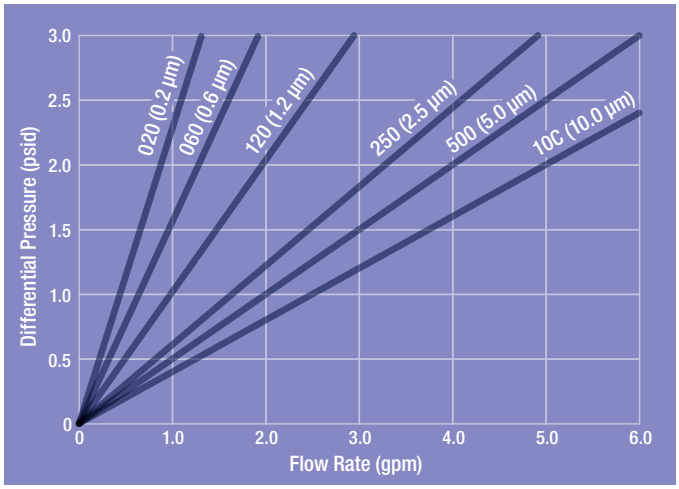
Table 1. Betafine™ PPG Series Filter Capsules Maximum Recommended Flow Rate By End Connection

End Connection	Maximum Recommended Flow Rate (gpm)	Housing Pressure Loss (psid)*
1.5" Sanitary Flange	6.0	1.0
0.375" FNPT	6.0	1.0
0.5" Hose Barb	3.0	1.5
0.25" MNPT	1.5	2.4
Tapered Hose Barb	0.5	2.2

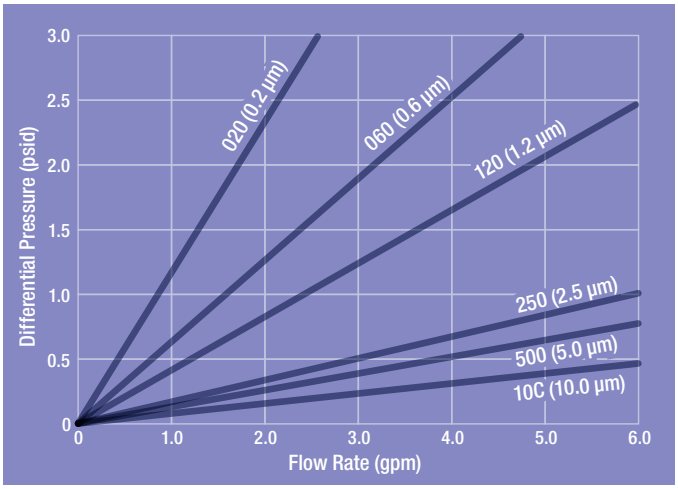
* At maximum recommended flow rate



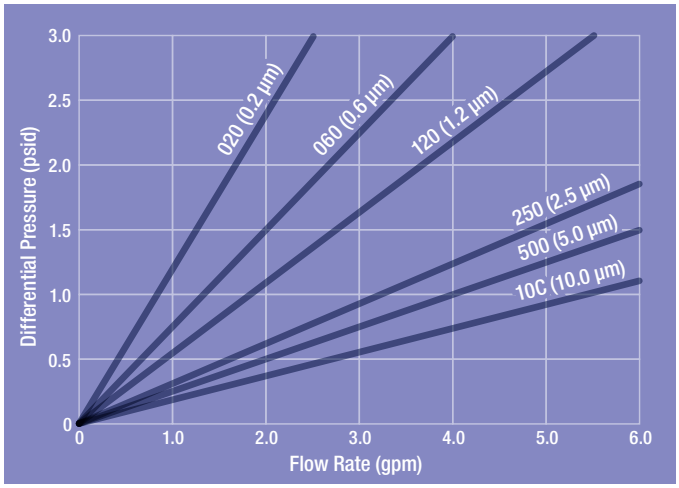
Graph 5: Clean Water Flow per 2.5" Mini-cartridge at Ambient Temperature (20 °C)



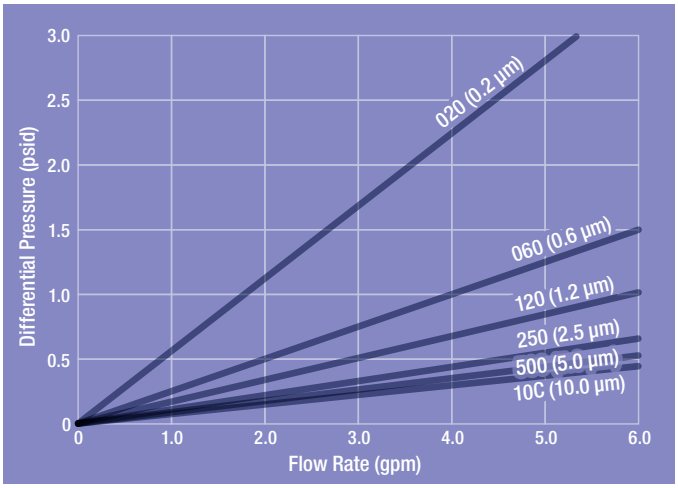
Graph 3: Clean Water Flow per 2.5" Disposable Capsule with Sanitary Flange at Ambient Temperature (20 °C)



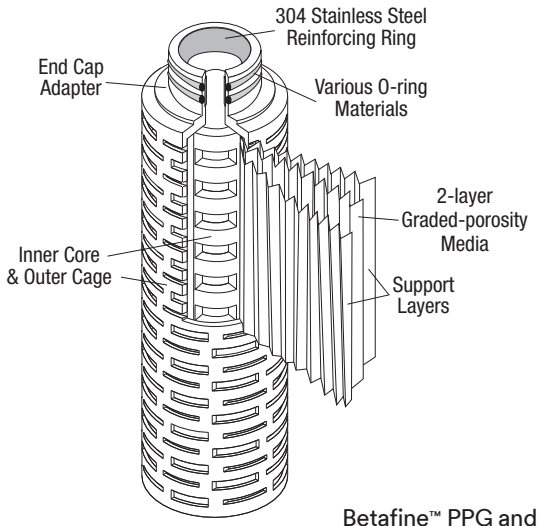
Graph 6: Clean Water Flow per 5" Mini-cartridge at Ambient Temperature (20 °C)



Graph 4: Clean Water Flow per 5" Disposable Capsule with Sanitary Flange at Ambient Temperature (20 °C)



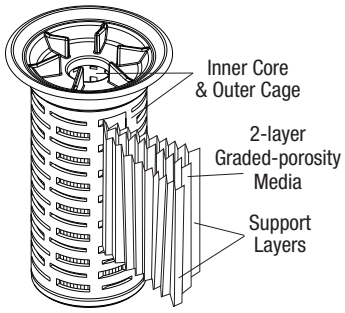
Graph 7: Clean Water Flow per 10" Capsule at Ambient Temperature (20 °C)



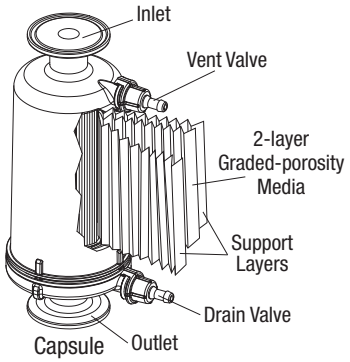
Standard Cartridge

Betafine™ PPG and PTG series filter cartridges are available in 10" through 40" lengths with a variety of end modifications and O-ring options to meet hardware and process requirements.

Betafine™ PPG series 2.5" and 5" mini-cartridges can be installed in existing Pall Sealkleen™ housings or 3M Purification Inc. mini-cartridge housing (70-0201-8886-1).



Mini-cartridge



Capsule

Betafine™ PPG and PTG series series filter capsules are available in 2.5", 5", 10", 20" and 30" configurations. Filter capsules may be autoclave sterilized. As with Betafine PPG & PTG series filter cartridges, the filter capsules have been specially designed to provide optimum flow rates.

Note: Capsules are not recommended for continuous compressed gas service.

Quality & Reliability

Betafine™ PPG and PTG series filters are manufactured within an ISO 9001:2008 registered quality system to help provide reliable operation and PTG Series filters are integrity tested prior to shipment. All materials of construction comply with the requirements of the Food and Drug Administration's (FDA) Code of Federal Regulations (CFR), Title 21 parts 170-199 for contact with food and parts 211.72 and 210.3 (b)(6) for a non-fiber releasing filter. All filter components have been tested in accordance with USP 24 Biological Safety Test for Plastics — Class VI — 70 °C. All Betafine PPG and PTG series filters are shipped with a Certificate of Quality affirming compliance with rigid manufacturing quality specifications. Supporting Drug Master File (DMF) documentation is on file with the United States Food and Drug Administration (FDA). A complete Betafine PPG and PTG series Regulatory Support File (70-0201-8827-5) is available upon request.

Quality Management & ISO Standards

3M Purification Inc. I has maintained its leadership in fluid purification and filtration by continually providing superior products and technical support. 3M Purification Inc. filtration systems are designed and manufactured to the most stringent industry standards to provide the reliability of 3M Purification Inc. systems that our customers have come to expect.

3M Purification Inc. has established a global quality management program which encompasses all facets of its operations. An essential part of the program is the creation of multi-function teams whose combined expertise is devoted to continuous improvement of processes, procedures and quality systems. In addition, the program has the active support and participation of senior management. 3M Purification is fully committed to the tenets of the quality management program and provides a support system for the quality process. The majority of 3M Purification Inc. manufacturing plants are ISO 9001:2008 registered. At 3M Purification Inc., quality is defined by the never-ending pursuit for continuous improvement in products, services, and personnel.

Scientific Applications Support Services (SASS)

3M Purification Inc.'s years of experience are synonymous with quality, performance and high-level technical support. The cornerstone of 3M Purification Inc.'s philosophy is service to customers, not only in product quality and prompt delivery, but also in validation assistance, applications support and in the sharing of scientific information. 3M Purification Inc.'s Scientific Applications Support Services (SASS) group works closely with customers to solve difficult separations problems and to recommend the most economical and efficient filter system. SASS Specialists are skilled in performing on-site testing and relating test results to full-scale manufacturing operations.

Operating Parameters and Specifications

	Standard Cartridge				Mini-cartridge		"C" Capsule*		"J" Capsule*		
Filter Rating	0.2 – 10.0 µm										
Dimensions											
Nominal Length	10"	20"	30"	40"	2.5"	5"	2.5"	5"	10"	20"	30"
- With End Connection A	N/A						5"	7.5"	N/A		
- With End Connection B							5.5"	8"			
- With End Connection C							5"	7.5"			
- With End Connection D							5"	7.5"			
- With End Connection E							5.25"	7.75"			
Outer Diameter	2.80"				3.25"		3"		4"		
Width to Vent	N/A						2.75"		N/A		
Grade 020 Surface Area	8.1 ft^2	16.2 ft^2	24.3 ft^2	32.4 ft^2	1.4 ft^2	2.9 ft^2	1.4 ft^2	2.9 ft^2	8.3 ft^2	16.6 ft^2	24.9 ft^2
Grade 060/120/250 Surface Area	8.8 ft^2	17.6 ft^2	26.4 ft^2	35.2 ft^2	1.5 ft^2	3.2 ft^2	1.5 ft^2	3.2 ft^2	9.2 ft^2	18.4 ft^2	27.6 ft^2
Grade 500 Surface Area	8.6 ft^2	17.2 ft^2	25.8 ft^2	34.4 ft^2	1.4 ft^2	3.0 ft^2	1.4 ft^2	3.0 ft^2	8.7 ft^2	17.4 ft^2	26.1 ft^2
Grade 10C Surface Area	5.5 ft^2	11.0 ft^2	16.5 ft^2	22.0 ft^2	0.9 ft^2	1.9 ft^2	0.9 ft^2	1.9 ft^2	6.1 ft^2	12.2 ft^2	18.3 ft^2
Materials of Construction											
Filter Media	Graded-porosity Pleated Polypropylene										
Media Support Layers	Polypropylene										
Inner Core & Outer Cage											
End Cap Adapters & Adapters											
Adapter Reinforcing Ring	304 Stainless Steel				N/A						
Cartridge Gasket & O-rings	Silicone, Fluorocarbon, Ethylene Propylene (EPR), Nitrile										
Capsule Vent & Drain O-rings	N/A						Silicone, Fluorocarbon, EPR		Silicone, EPR		
Operating Conditions											
Maximum Forward Differential Pressure	60 psid (4 bar) @ 77 °F (25 °C)										
Maximum Reverse Differential Pressure	60 psid (4 bar) @ 77 °F (25 °C)				N/A						
Maximum Forward Operating Pressure	N/A				60 psid (4 bar) @ 104 °F (40 °C)						
					35 psid (2.4 bar) @ 175 °F (80 °C)		N/A				
Recommended Change-out Differential Pressure	35 psid (2.4 bar)										
Maximum Operating Temperature	130 °F (60 °C) continuous 175 °F (80 °C) short term						104 °F (40 °C) Do not in situ steam				

* Not for continuous compressed gas service.

Betafine™ PPG & PTG Series Filter Ordering Guide

Cartridges

Code	Grade Code/ Absolute Rating[1]	Configuration Code	Nominal Length Code	End Modification Code	Gasket/O-ring Material Code
PPG **PTG**[2]	**020**[3] (0.2 µm) **060** (0.6 µm) **120** (1.2 µm) **250** (2.5 µm) **500** (5.0 µm) **10C** (10.0 µm)	**B** — Cartridge	**01** 10" **02** 20" **03** 30" **04** 40"	**B** — 226 O-ring & Spear **C** — 222 O-ring & Spear **D** — Double Open End (DOE), Flat Gasket — 10" **E** — DOE, Flat Gasket — 9.75" **F** — 222 O-ring & Flat Cap	**A** — Silicone **B** — Fluorocarbon **C** — EPR **D** — Nitrile **H** — Clear Silicone

1 Retention ratings determined by 3M Purification Inc. test method. The 0.2 µm rating has been extrapolated.
For more information, contact your 3M Purification Inc. representative.
2 Available in grades 020, 060 & 120 only.
3 Grade 020 not available in D & E end modifications.

Capsules & Mini-cartridges

Code	Grade Code/ & Absolute Rating[1]	Configuration Code	Nominal Length Code	End Connection Code	Vent O-ring Material Code	Packaging Code
PPG **PTG**	**020**[3] (0.2 µm) **060** (0.6 µm) **120** (1.2 µm) **250** (2.5 µm) **500** (5.0 µm) **10C** (10.0 µm)	**C** — Capsule	**01** 2.5" **02** 5"	**A** — 1.5" Sanitary Flange **B** — 0.5" (14 mm) hose barb **C** — 0.25" MNPT **D** — 0.375" FNPT **E** — 0.25"– 0.3125"– 0.375" Tapered Hose Barb	**A** — Silicone **B** — Fluorocarbon **C** — EPR	**01** — Single Pack
		J — Capsule	**01** 10" **02** 20" **03** 30"	**A** — Sanitary Fitting	**A** — Silicone **C** — EPR	**01** — Single Pack
		M — Mini-cartridge	**01** 2.5" **02** 5"	**A** — Standard	**N** — None	**06** — Six Pack

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.**

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.

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