

Micro-Klean™ RP Series

All-polypropylene Rigid Graded Porosity Cartridge Filters

Cleaner, Faster Flowing, Longer Lasting -

advancing depth filtration through technological innovation. 3M Purification Inc. Micro-Klean™ RP Series filters are manufactured using proprietary rigid extrusion bonded technology. These all-polypropylene depth filter cartridges offer premium benefits compared to competitive filters. These benefits include:

- Increased surface area for extended filter life
- Low initial pressure drop for enhanced flow
- High particle removal efficiencies at high flow rates (flux)

The filter's extended service life results in fewer filter change-outs, while its enhanced flow characteristics can typically reduce the number of filters required to achieve a given flow rate. These combined features of Micro-Klean RP Series filters can significantly reduce total filtration cost.



Features & Benefits

Advanced graded porosity design

- Longer service life
- Fewer filter change-outs

Rigid depth filter construction

- Helps protect against unloading of particles during service life

Grooved cartridge with extended surface area

- Promotes fuller utilization of the depth-matrix
- Longer filter life

All-polypropylene construction

- Compatibility in a wide range of applications and operating conditions
- Cleaner design with no adhesives, binders, surfactants, or lubricants

Materials of construction listed in FDA 21 CFR

- Complies with regulations for food & beverage contact

Core-less filter structure

- Ease of disposal

Continuous integral length filter element (up to 40" length)

- No bond joints to break
- Easy to install

Applications

Micro-Klean RP Series filters are suitable for a wide range of particle control and equipment protection applications in the Food & Beverage and Pharmaceutical industries. 3M Purification recommends testing under actual application conditions to determine the right product and retention rating.

Beverages	Bottled Water, Ready-to-Drink Beverages, Dairy Products, Juices, Soft Drinks, Process & Blending Water
Pharmaceuticals	Pre-Reverse Osmosis, Bulk Chemicals, Rinse Water, Active Pharmaceutical Ingredients

The unique manufacturing process of Micro-Klean RP Series filters combines superior process control with the quality assurance of an ISO-certified quality system to provide consistent product performance. This exclusive manufacturing process provides a high degree of fiber-to-fiber thermal bonding, without the use of binders, to produce a rigid, core-less, filter structure with the following properties:

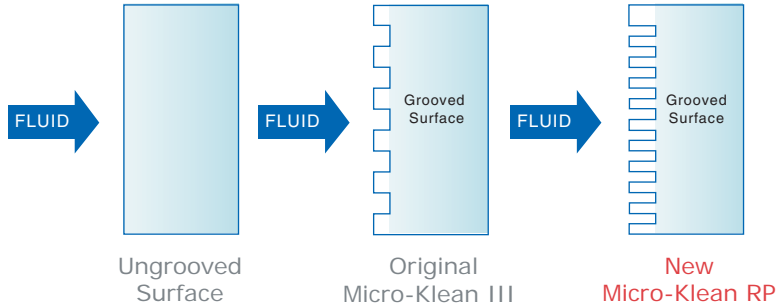
- ◇ Does not unload contaminants as differential pressure increases; a performance flaw in meltblown filters
- ◇ Allows grooves to be machined into the upstream surface, without tearing or melting the filter structure, providing more than double the effective surface area
- ◇ Exhibits exceptionally low differential pressure for a given filter rating

Consistent filtration throughout the service life of a depth-style filter depends on how well the filter's structure tolerates fluctuations in operating conditions - including contaminant loading and differential pressure.

Flexible structures, such as those found in meltblown and string-wound filters, tend to compress and change porosity with increased pressure, while rigid structures do not (see photo, "Compressible vs. Rigid Structures @ 35 psid"). Media compression can result in short filter life because the pores collapse and ultimately close. Media compression can also cause the filter to release already held particles. The robust Micro-Klean RP filter captures and retains contaminant within its rigid filter matrix, even under increasing differential pressure.

In addition to enhanced filtration efficiency and contaminant retention over the service life of the Micro-Klean RP filter, the unique depth filter structure provides greater flow at a given pressure. The Micro-Klean RP filter is self-supporting, unlike soft meltblown and wound filters that require core support, and is grooved to provide greater than twice the surface area. The increase in surface area prevents premature blinding of the outer surface by large particles and gels and promotes fuller utilization of the depth-matrix. The result is significantly longer life than competitive cartridges.



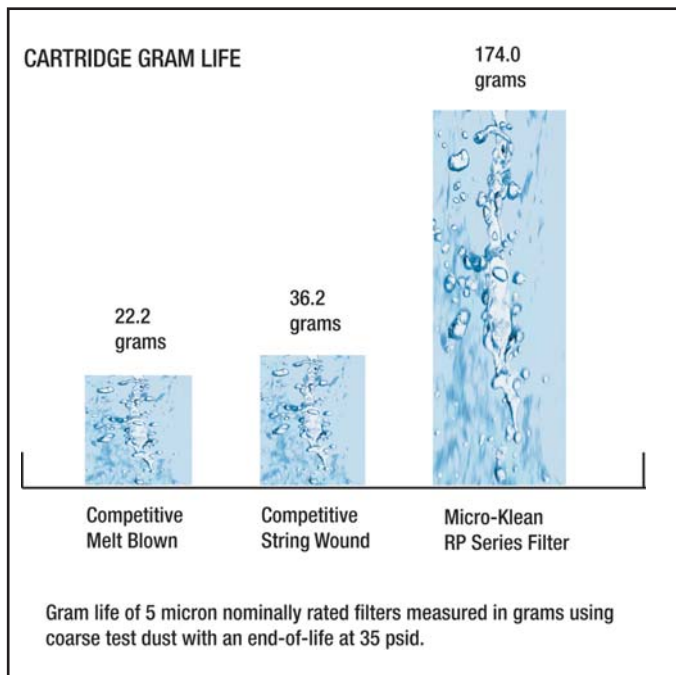
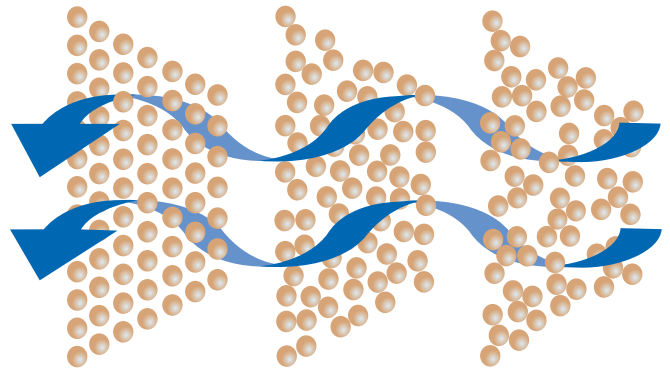


Increased Surface Area

The Micro-Klean RP Series filter is designed with deeper and more numerous grooves compared to the standard Micro-Klean Series filters, resulting in 34% more surface area. Compared to a conventional ungrooved filter, the surface area increase is 140%. This new design results in greater capacity and longer service life, driving down operating costs.

Graded Porosity

Micro-Klean RP Series filters use a graded porosity design that effectively traps larger particles toward the outer diameter of the filter structure and progressively smaller particles toward the inner diameter of the filter. This allows for even particle loading throughout the depth of the filter and helps to maximum filter service life.



Increased Capacity

When compared to conventional polypropylene “melt blown” and string-wound filters, Micro-Klean RP Series filters exhibit significantly greater particle capacity. In the graph at left, the capacity of the five micron nominally rated Micro-Klean RP Series filter was tested against comparably rated melt-blown and string-wound filters. The test was conducted using standardized test dust at a common concentration and flow rate. The test was concluded when the pressure drop reached 35 psid and the total captured particle weight per filter type was determined. As the graph shows, the Micro-Klean RP Series offers significantly greater capacity, resulting in longer filter service life.

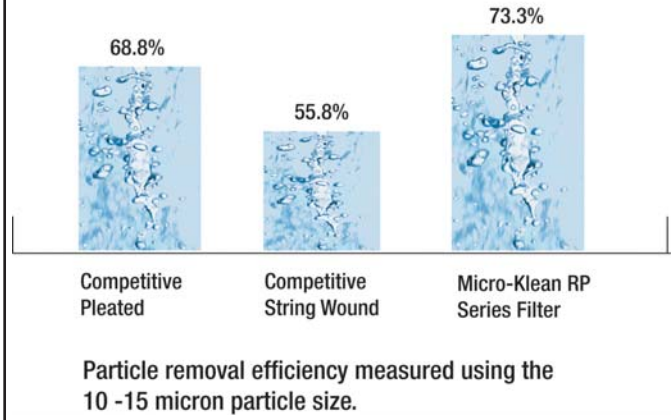
Greater Efficiency

When compared to conventional polypropylene pleated and string-wound filters, Micro-Klean RP Series filters exhibit significantly greater particle trapping efficiency. In the graph at right, the efficiency of the nominally rated five micron Micro-Klean RP Series filter was tested against comparably rated pleated and string-wound filters. The test was conducted using standardized test dust with particles between 10 and 15 microns at the same concentration and flow rate. Particle counts were taken upstream and downstream of the filters and the efficiencies were calculated using the following formula:

$$\text{Efficiency \%} = \left(\frac{\text{Particles upstream} - \text{Particles downstream}}{\text{Particles upstream}} \right) \times 100$$

As the Cartridge Efficiency graph shows, the Micro-Klean RP series offers significantly better efficiency, resulting in superior particle control.

CARTRIDGE EFFICIENCY



Flow Rates

The unique design and construction of the Micro-Klean RP Series filter allows for significantly lower pressure drop when compared to competitive elements. The Flow Chart below clearly demonstrates the Micro-Klean RP series flow advantage when compared to other five micron rated competitive melt-blown and string wound cartridge filters. For a given differential pressure, Micro-Klean RP Series filters yield flows up to ten times that of competitive filters, a significant advantage when sizing a system for a given process flow rate. Flow rate advantage translates into lower capital investment for filter housings and fewer cartridges to purchase. As shown in Table 1, a process with a water flow rate of 180 gpm and a maximum clean pressure drop of 0.5 psid, a Micro-Klean RP Series filter system requires significantly fewer cartridges and smaller filter vessels (compared to competitive filters) for greatly reduced capital costs.

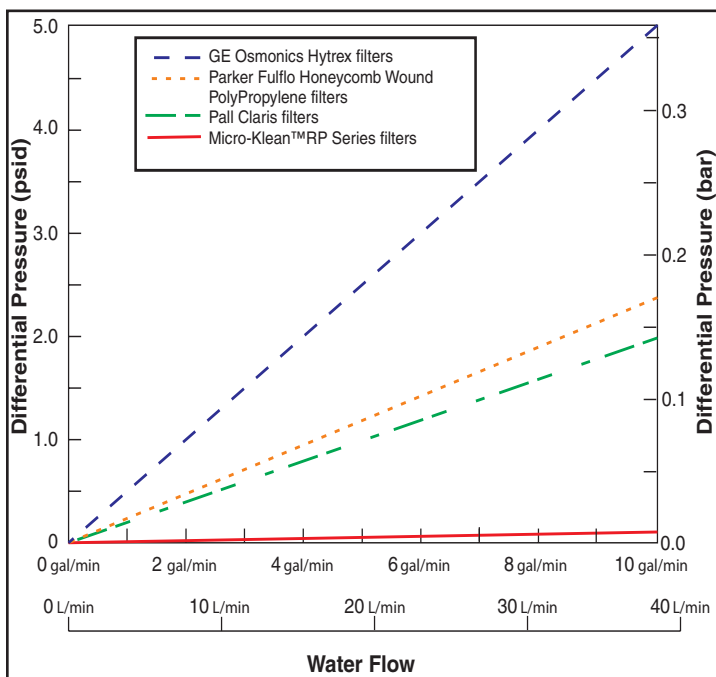


Table 1. Comparison of 5 Micron Filters in a Water System

Filter	30" Filters Required for a 180 gpm flow rate* with a clean pressure drop of 0.5 psid	Housing Diameter (Inches) Required for 30" Double Open End Filters
Micro-Klean RP Filters	12	12
Parker Fulflo® Honeycomb™ Wound Polypropylene Filters	29	20
Osmonics Hytrex® Filters	60	30
Pall Claris® Filters	24	16

*Based on the manufacturers' literature piece specifications as of 6/09

Filter System Sizing

To size a system of Micro-Klean RP Series filters, flow vs. differential pressure data is provided in Table 2.

Table 2. Micro-Klean RP Specific Pressure Drop (SPD)		
Nominal Rating (µm)	Specific Pressure Drop Per 10" Filter (psid/gpm-Cp)	Specific Pressure Drop per 10" filter (mbar/lpm-Cp)
5	0.035	0.637
25	0.018	0.328
50	0.010	0.182

To calculate a filter's clean pressure drop for Newtonian fluids, use the following formula in conjunction with the Specific Pressure Drop Values. The Specific Pressure Drop values may be effectively used when three of the four variables (Viscosity, Flow, Differential Pressure, and Cartridge Grade) are set. Care must be taken when sizing Micro-Klean RP Series filtration systems. Select a filter housing that will accept at least the required number of 10-inch filter elements, and ensure that the total system flow does not exceed the maximum housing flow rating.

$$\text{psid [mbar]}_{\text{clean}} = \frac{\left(\text{Total system} \right) \left(\text{Viscosity in} \right) \left(\text{SPD Value} \right)}{\text{Equivalent number of 10-inch cartridges within housing}}$$

gpm [lpm] CP (from Table 2)

Filter Cartridge Specifications

Table 3. Micro-Klean RP Filter Specifications	
Construction	
Filter Media	Polypropylene
Operating Conditions	
Maximum Operating Temperature	176° F (80°C)
Maximum Differential Pressure	15 psid @ 176°F (1.0 bar @ 80°C) 25 psid @ 140°F (1.7 bar @ 60°C) 60 psid @ 68°F (4.1 bar @ 20°C)
Recommended Change-out Differential Pressure	35 psid @ 68°F (2.4 bar @ 20°C)
Cartridge Dimensions	
Inside Diameter (nominal)	1.1" (28 mm)
Outside Diameter (nominal)	2.6" (66 mm)
Length (nominal) see ordering guide	9.75" - 40" (248 - 1016 mm)
Regulatory	
Micro-Klean RP filters meet the requirements of USP for the Biological Test for Plastics, Class VI-70°C. Materials used in the manufacture of Micro-Klean RP filters meet the requirements of United States FDA 21 CFR for food and beverage contact	

Chemical Compatibility

The 100% polypropylene construction provides excellent chemical compatibility in many demanding process fluid applications. Compatibility is influenced by process operating conditions. Micro-Klean RP Series cartridges should be tested under actual conditions to determine compatibility.

Table 4. Fluid Compatibility

Chemical	Temperature	Chemical	Temperature	Chemical	Temperature
Acetic Acid 20%	160°F (71°C)	Hydrogen Peroxide	100°F (38°C)	Sodium Carbonate	160°F (71°C)
Bleach 5.5%	120°F (49°C)	Nitric Acid 20%	120°F (49°C)	Sodium Hydroxide 70%	160°F (71°C)
Sulfuric Acid 70%	160°F (71°C)	Potassium Hydroxide	140°F (60°C)	Sulfuric Acid 20%	160°F (71°C)

Scientific Applications Support Services (SASS)

Dedicated technical support teams comprised of 3M Purification scientists and engineers are available to provide application specific recommendations for the most effective and economical filtration system. In addition to comprehensive testing and analyses conducted in advanced laboratories at 3M Purification, the SASS staff can also perform on site testing at customer's facilities. Contact your 3M Purification Distributor for more information.

Service Worldwide

3M Purification is a U.S. based multinational company with distribution and manufacturing sites worldwide. Global manufacturing sites together with trained stocking distributors and state of the art laboratory facilities bring quality solutions to challenging filtration applications.



3M Purification Filter Housings

3M Purification manufactures a full line of industry standard filter housings to meet most application requirements. Models are available for both gas and liquid service in a wide range of construction materials, from plastics to ASME Code with 316L stainless steel, to suit a variety of application needs. For more information about 3M Purification filter housings, please visit us at www.3mpurification.com, or consult your local 3M Purification distributor.

Express Series Housing

- Maximum design flexibility for a wide variety of system requirements
- ASME Code
- Choice of carbon steel, 304L or 316L stainless steel

SS Housing

- Available in a variety of sizes
- Accepts both single & double open end cartridges
- 316L stainless steel

CT Series

- Available in a variety of sizes & materials
- Mounting bracket available

AL Series

- Rugged economical design in cast iron & steel
- Easy assembly

CTG-Klean Filter System

- Enclosed system
- Uses disposable filter pack
- Easy-to-use, housing clean-up minimized

1BD Housing

- Available in cast iron & steel, or 304 stainless steel
- Built-in valve for duplex or single operation

VC Series

- Polyvinylchloride construction
- Available for 2- or 3-high cartridges

PC Housings

- Feature a removable cartridge pack for rapid change-out and easy cleaning
- ASME code

DC Series

- Available in a wide variety of sizes
- 304L stainless steel construction
- Accepts both DOE & SOE cartridges

1B Housing

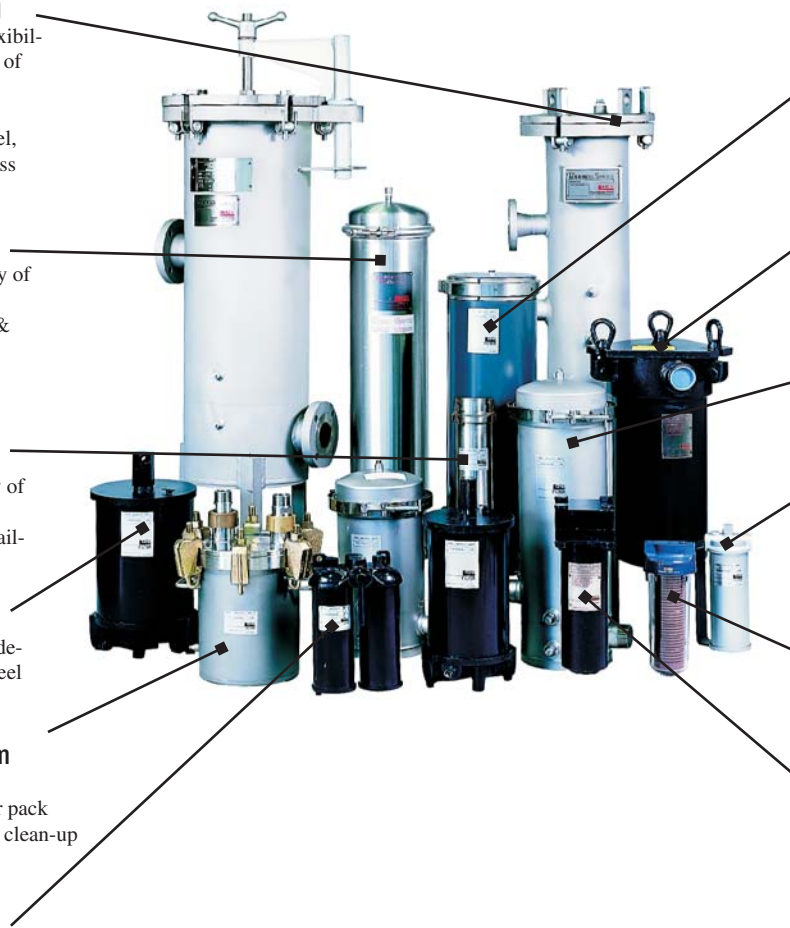
- Available in cast iron & steel, or 304 stainless steel
- Choice of 1- or 2-high cartridge models

1M Housing

- Lightweight plastic construction
- Choice of 1- or 2-high cartridge models

1H Housing

- Ideal for high pressure applications
- Durable steel construction



ES Series Housing

The ES series filter housing is a durable high volume filter housing constructed from 316L or 304L stainless steel, or carbon steel. With a cartridge capacity from 12- to 480- 10 inch filter elements, the ES filter housing can accommodate a wide range of flow requirements.

AL and CT Filter Housings

AL and CT filter housings offer a wide range of sizes from one cartridge to eighteen cartridges.

DC & SS Filter Housings

DC and SS filter housings offer a low cost alternative for low volume filtration. Constructed from reliable 304L stainless steel (Model DC) or 316L stainless steel (Model SS), these housings are available for a wide range of flow rates and applications.

Micro-Klean™ RP Series Ordering Guide

Cartridge type: RP Series	Length	Grade	Material	Surface	Packaging	Ring Support	End Modification	Gasket/O-ring
RP	09-9 3/4" 10-10" 19-19 1/2" 20-20" 29-29 1/4" 30-30" 39-39" 40-40"	B-5µm F-25µm L-50µm	18-Polypropylene	G-Grooved	2-bulk	0-none	N- none	N- none

Important Notice

3M Purification Inc. MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Since a variety of factors can affect the use and performance of a 3M Purification Inc. product in a particular application, some of which are uniquely within the user's knowledge and control, user is responsible for determining whether or not the 3M Purification product is fit for a particular purpose and suitable for user's method of application.

Limited Warranty

3M Purification Inc. warrants it this product to be free from defects in material and workmanship during normal use for a period of one (1) year from the date of shipment from the factory. If the Product(s) is (are) defective within this warranty period, your exclusive remedy and 3M Purification Inc.'s sold obligations shall be, at 3M Purification Inc.'s option, to replace or repair the Product(s) or refund the original purchase price of the Product(s) This warranty does not apply to failures that result from abuse, misuse, alternation or damage not caused by 3M Purification Inc. or failure to properly follow installation and use instructions.

Limitation of Liability: 3M Purification Inc. will not be liable for any loss or damage arising from the use of the Product(s), whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights which vary from state to state, or country to country.

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