3M Purification

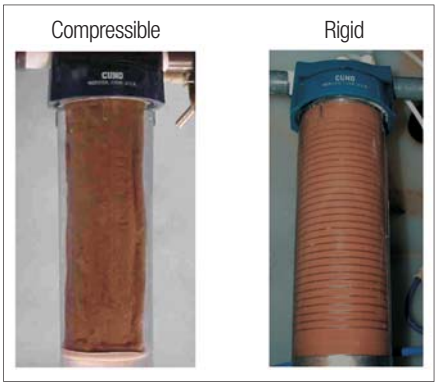
Product brochure

Micro-Klean™ RT Series filter cartridges

All-polypropylene rigid thermal-bonded filters

- ☑ New name for CUNO PolyKlean
- ☑ Consistent filtration throughout the life of the filter for superior quality effluent
- ☑ Up to ten or more times the service life of competitive filters
- ☑ Low operating pressure drop achieves the required flow using fewer filter elements

Picture 1: Compressible vs. rigid cartridge structure at 2.4 bar

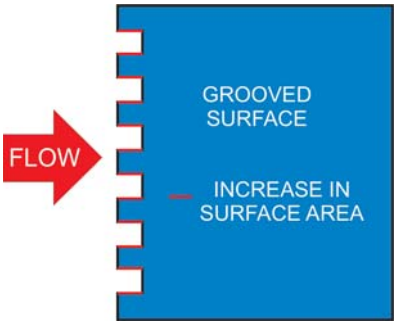


Advancing depth filtration through technological innovation

Micro-Klean™ RT filters, formerly known as CUNO PolyKlean, the product of 3M Purification's Rigid Extrusion Bonded technology (REBel), are all-polypropylene depth filter cartridges offering premium features including:

- consistent particle removal efficiencies throughout the filter's life,
- increased surface area for extended filter life and
- low initial pressure drop for enhanced flow.

The Micro-Klean RT filter manufacturing process combines the superior process control with the quality assurance enabled by an ISO certified quality system to provide consistent product performance. 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. The combined premium features of Micro-Klean RT filters can *significantly reduce total filtration cost.*



Micro-Klean RT filter construction

The REBel technology facilitates the extrusion of polypropylene fibres that are used to manufacture the Micro-Klean RT rigid filter cartridge. The 3M Purification manufacturing process provides a high degree of fibre-to-fibre thermal bonding, without the use of binders, to produce a rigid, coreless filter structure. This filter structure:

- does not unload contaminants with increasing differential pressure like typical 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 and
- 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 (picture 1). 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™ RT 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 RT filter, the depth filter structure provides a significant increase in the filter's contaminant holding capacity and provides greater flow at a given pressure.

The Micro-Klean RT 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 utilisation of the depth-matrix. The result is significantly longer life than competitive cartridges.

Micro-Klean RT filter performance

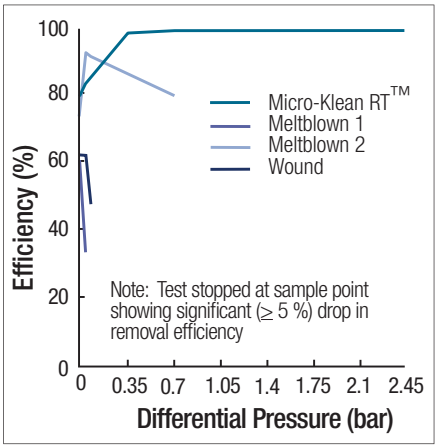
Micro-Klean RT filters manufactured using REBel technology exhibit superior filtration characteristics. The rigid construction allows for enhancements to performance that can be measured and compared to other filter structures with equivalent removal ratings.

Consistent removal efficiency

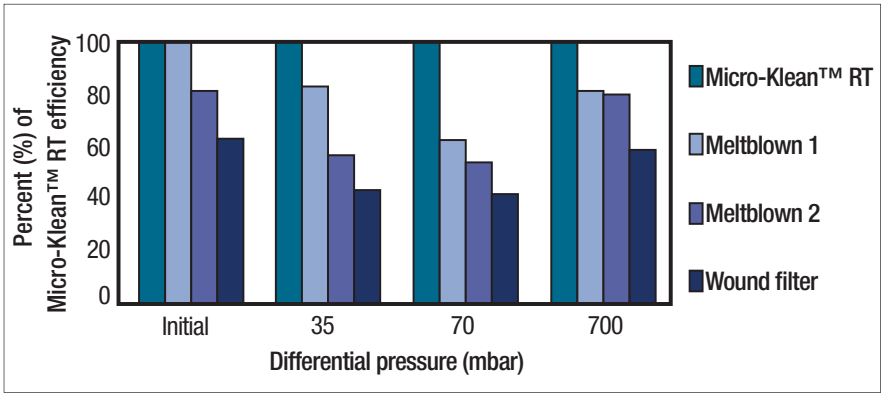
Graph 1 depicts the removal efficiency of Micro-Klean RT filters and typical meltblown and wound structures. Note that the Micro-Klean RT filter exhibits excellent filtration efficiency to its recommended change-out pressure (2.4 bar), while the other structures exhibit significant drops in removal efficiency at much lower differential pressures (about 0.7 bar). The rigid Micro-Klean RT structure resists deformation, filter by-pass, compression and particle unloading.

To further demonstrate the Micro-Klean RT filter's removal consistency, efficiency at four sampling points (initial, 35 mbar, 70 mbar and 700 mbar) was measured. All equivalently rated filters were tested under the same conditions to enable direct comparison. As shown in graph 2, comparing the efficiency of the test filters to the Micro-Klean RT filter's efficiency, Micro-Klean RT filters display a stable, consistently higher contaminant removal throughout the duration of the test. Note that other filter structures shown, meltblown and string-wound, provide erratic removal and can not provide predictable performance even under controlled conditions of uniform contaminant loading and pressure.

Graph 1: Efficiency comparison of filter cartridges



Graph 2: Efficiency comparison of filter cartridges rated at 5 micron



Features and benefits

Rigid depth filter construction
- Eliminates unloading at high differential pressure
- Efficient removal of deformable materials
- Consistently superior particle removal throughout filter life

Enhanced dirt holding capacity
- Fewer filter change-outs
- Long filter life

Grooved cartridge with extended surface area
- Promotes fuller utilisation of the depth-matrix
- Long filter life

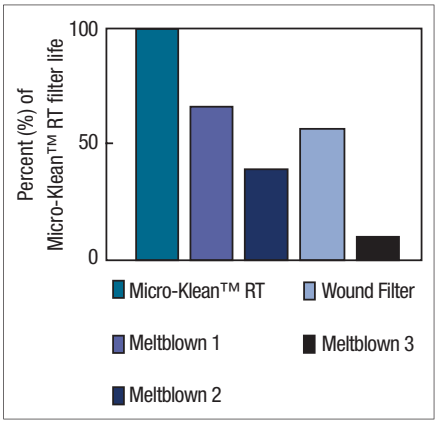
All polypropylene construction
- Compatibility in a wide range of applications
- No adhesives, binders, surfactants, lubricants

Approved for food contact use
- Complies with European and US regulations

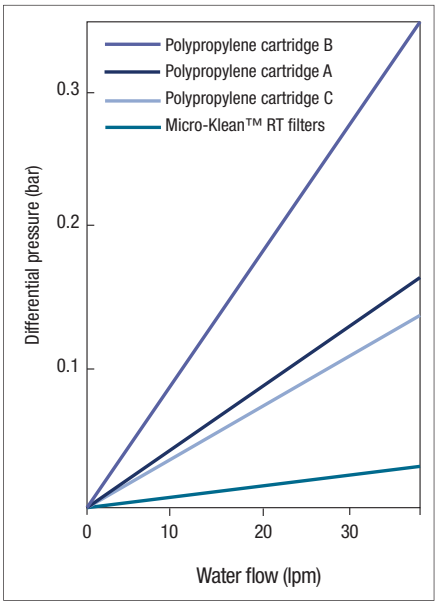
Coreless filter structure
- Ease of disposal via incineration or shredding

Continuous integral length element (up to 40")
- No bond joints to break
- Easy to install

Graph 3: Life comparison of filter exhibiting similar efficiency



Graph 4: Flow vs. differential pressure (see note* in table 1)



Superior service life

Extensive testing of Micro-Klean™ RT filters has demonstrated an appreciable advantage in service life. Graph 3 compares rigid Micro-Klean RT filters to other filters of equivalent efficiency. All filters were challenged under identical conditions. Comparison of test results, when test filters are subjected to the same contaminant load up to 1.4 bar, shows the relative life of the test filters. As depicted, Micro-Klean RT filters typically provide nearly twice the life of its closest competitor and up to 10 times or more the life of other filters.

Lower initial differential pressure

At a constant flow rate, the design and construction of the Micro-Klean RT element allows for significantly lower pressure drop when compared to competitive elements. Graph 4 clearly demonstrates the Micro-Klean RT flow advantage when compared to other 5 µm rated competitive meltblown and wound cartridges. This translates into specifying significantly fewer Micro-Klean RT elements when sizing a system for a given process flow rate. For example, in a process with a water flow rate of 40 m³/h and a maximum clean pressure drop of 35 mbar, based on the manufacturers' literature flow specifications, table 1 shows that a Micro-Klean RT filter system requires significantly fewer cartridges and smaller filter vessels for greatly reduced operating and capital costs.

Table 1:
Comparison of 5 µm filters in a water system

Filter cartridge	30" filters required for a 40 m³/h flow rate*	Housing diameter in cm required for 30" double open end filters
Micro-Klean™ RT	12	30 cm
Polypropylene Cartridges A	29	50 cm
Polypropylene Cartridges B	60	75 cm
Polypropylene Cartridges C	24	40 cm

*Based on the literature piece specifications

Micro-Klean RT filter flow rates

The Micro-Klean RT extrusion-bonded filter gives flows up to ten times that of competitive filters. This is a significant flow vs. differential pressure advantage and translates into lower capital investment for filter housings and fewer cartridges to purchase. To size a system of Micro-Klean RT filters, flow vs. differential pressure data is provided in table 2.

Table 2:
Micro-Klean™ RT filter specific pressure drop (SPD)

Nominal rating (µm)	Specific pressure drop per 10" filter (mbar/lpm - cP)
1	1.330
5	0.765
10	0.455
25	0.273
50	0.182
75	0.109

To calculate 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™ RT filtration systems. Select a filter housing that will accept at least the required number of 10" filter elements and ensure that the total system flow does not exceed the maximum housing flow rating.

$$\text{psid [mbar] clean} = \frac{(\text{Total system lpm})(\text{Viscosity in cP})(\text{SPD value from table 2})}{(\text{Equivalent number of 10" cartridges in housing})}$$

Filter applications

Food and beverages

- Bottled water
- Ready-to-drink beverages
- Juices
- Alcoholic beverages
- Dairy products
- Process and blending water
- Edible oils

Pharmaceuticals

- Pre-reverse osmosis
- Bulk pharmaceutical chemicals
- Rinse water
- Active pharmaceutical ingredients
- Particle control in WFI

Chemical

- PE-PP
- Intermediate grade chemicals
- PVC-VCM
- Herbicides and pesticides

Electronics

- PCBs
- CMP slurry manufacturing
- FPD
- TFT-LCD
- Pre-RO
- CD/DVD

Industrial

- Plating
- Desalination plants
- Pulp and paper
- Additives
- Process cooling water
- Parts washing
- Peroxide
- Mechanical seals

Coatings

- Resin manufacturers (water and solvent)
- Trade, architectural paint
- Ink

Oil and Gas

- Amine and glycol
- Pre-filtration in waterflood
- Process cooling water
- Completion fluid

Micro-Klean RT specifications

Table 3: Micro-Klean™ RT filter cartridge specifications	
Construction	
Filter media, end connector	Polypropylene
Gaskets and O-ring options (see ordering guide)	Silicone, fluorocarbon, EPR, nitrile and polyethylene
Operating conditions	
Maximum operating temperature	60 °C
Maximum differential pressure	1.7 bar at 60 °C
	4.1 bar at 20 °C
Recommended change-out differential pressure	2.4 bar at 20 °C
Cartridge dimensions	
Inside diameter (nominal)	28 mm
Outside diameter (nominal)	66 mm
Length (nominal) see ordering guide	9 ¾" - 40" (248 - 1016 mm)
Regulatory compliance	
Micro-Klean™ RT Series filter cartridges comply with the requirements of Regulation (EC) 1935/2004 for their intended food contact applications. 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. The filters meet the requirements of USP for the Biological Test for Plastics, Class VI. Contact 3M Purification for further information.	

Chemical compatibility

The 100% polypropylene construction provides excellent 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 compatibility.

Table 4:
Fluid compatibility

Chemical	Temperature	Chemical	Temperature	Chemical	Temperature
Acetic Acid 20%	60 °C	Hydrogen Peroxide	38 °C	Sodium Carbonate	38 °C
Alkanolamines	60 °C	Methyl Ethyl Ketone	21 °C	Mineral Oil	21 °C
Ammonium Hydroxide 10%	60 °C	Sulphuric Acid 20%	60 °C	Sodium Hydroxide 70%	60 °C
Bleach 5.5%	21 °C	Sulphuric Acid 70%	38 °C	Nitric Acid 20%	38 °C
Ethylene Glycol	60 °C	Potassium Hydroxide	60 °C	Urea	60 °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 Incorporated, the SASS staff can also perform on site-testing at customer's facilities. Contact your 3M Purification representative your local distributor for more information.

Worldwide service

3M Purification is a U.S. based multinational company with distribution and manufacturing sites worldwide, which is part of the 3M Corporation. 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 wide range of filter housings. Housings that accommodate from a single filter element, to many hundreds, available in a broad choice of materials, and a flexibility of design ensure that 3M Purification has a filter housing to suit your needs.

CH Series filter housings

The CH Series filter housing is a durable high volume filter housing constructed from 304 or 316L stainless steel. With a cartridge capacity from 3 to 460 equivalent lengths (standard range), the CH filter can accommodate a wide range of flow requirements. For more information or special housings, ask your local 3M Purification representative.

CTG System filter housings

The CTG System series design provides a totally enclosed system using separate pressure vessel and filter pack to isolate process fluid from the housing. This system virtually eliminates the costs involved with filter change-out while protecting the environment and operator from exposure to the process fluid. For more information, ask your local 3M Purification representative.

DS filter housings

DS filter housings offer a cost-effective alternative for low volume filtration. Constructed from 316L stainless steel, systems are available for a wide range of flow rates and applications. For more information, ask your local 3M Purification representative.

Micro-Klean™ RT Series

Micro-Klean™ RT Series filter cartridges - Ordering guide

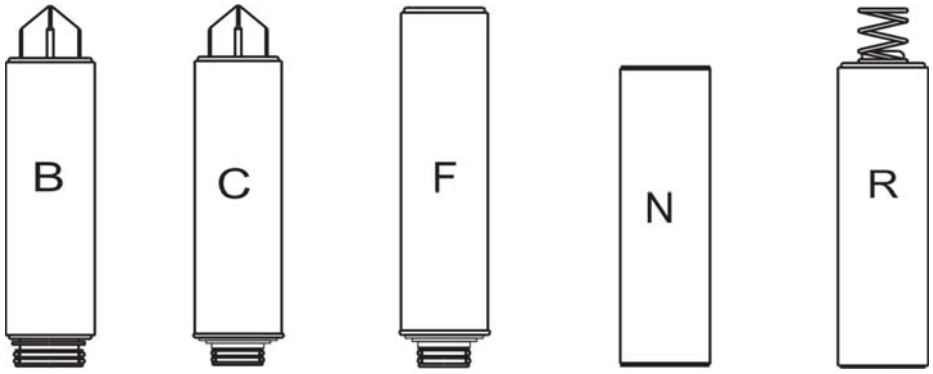
Cartridge type	Length	Grade	Material	Surface	Packaging	Ring support	End Modification	Gasket/ O-ring
RT - Micro-Klean™ RT	**09** - 9 3/4" * **10** - 10" **19** - 19 1/2" * **20** - 20" **29** - 29 1/4" * **30** - 30" **39** - 39 * **40** - 40"	**Y** - 1 µm **B** - 5 µm **C** - 10 µm **F** - 25 µm **L** - 50 µm **Q** - 75 µm	**16** - polypropylene	**G** - grooved **U** - ungrooved	**6** - bulk/ polybag E version	**0** - none	**B** - 226 O-ring and spear **C** - 222 O-ring and spear **F** - 222 O-ring and flat cap	**A** - silicone **B** - fluorocarbon **C** - EPR **D** - nitrile **H** - clear silicone
							N - none **R** - cap with spring	**G** - polyethylene **N** - none

*Available with NN or NG end modifications only

Reference example: RT 19 C 16 G 60 NG

Note: Micro-Klean RT is new name for CUNO PolyKlean.

Available configurations



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.

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