

3M Purification

Product Brochure

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# Betapure™ NT-TE Series

Cartridges and Capsules

the next generation in depth  
filter technology

**3M**



## The next generation in depth filter technology

Betapure™ NT-TE Series filters are 3M Purification's advance in depth filtration technology. The all-polypropylene filter is constructed using a design that utilises flow enhancing filter media and an special flow pattern. The result is an absolute-rated filter with vastly superior on-stream life that provides more cost-effective filtration than conventional meltblown filter technologies. Betapure NT-TE filters are the leader in filtration performance.

## Betapure NT-TE filter construction

3M Purification designed the Betapure NT-TE filters to provide significantly superior service life while maintaining a consistent filtration efficiency. Betapure NT-TE filters achieve this through a design that allows uniform distribution of fluid flow and contaminant throughout the entire depth of the filter (see figure 1). Betapure NT-TE filter construction combines a polypropylene media with fluid distribution netting to form multiple layers. Critically positioned media flow channels allow greater movement of fluid from layer to layer. Three distinct media sections, made from multiple media/netting layers, are combined to form the filter.

The outer and middle sections contain multiple layers of interleaved filter media and fluid distribution netting. Within each media layer a portion of the fluid travels through the media while the balance of the fluid is delivered directly to the next distribution layer through the flow channels. The fluid distribution netting provides longitudinal and latitudinal flow paths to evenly distribute fluid flow across the surface of each successive media layer.

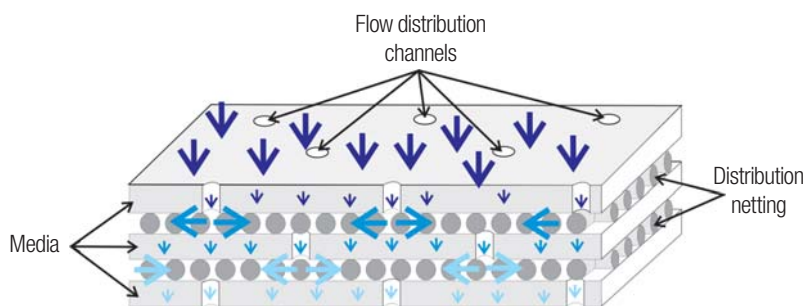


Figure 1: Betapure™ NT-TE Series filter construction

## Features and benefits

### Superior service life

- As much as 4 times greater contaminant holding capacity

### All-polypropylene depth filters

- Allow for broad chemical and temperature compatibility

### Ratings from 0.5 to 70 micron

- Suit a wide range of applications

### Absolute-rated performance

- Allows for consistent filtration quality

### Superior particle retention

- Exhibits superior particle retention under increasing differential pressure

### Approved for food contact use

-  Complies with European and US regulations

## The difference is performance

Flow channels appear in the outer and middle sections of the filter matrix, as seen in the cartridge cut-away. The size, number and location of the flow channels combined with the fluid distribution netting ensure that a uniform amount of contaminant is distributed to each layer within these two sections, while maintaining a consistent flow.

The number of media flow channels decrease from the outer to middle sections to ensure even contaminant loading throughout the entire filter matrix. Extensive laboratory testing has demonstrated that 3M Purification has developed the optimal filter cartridge design.

The inner section, supported by a rigid polypropylene core and equal to approximately one third of the filter's depth, contains no flow channels and is the final qualifying section ensuring absolute-rated performance.

The even distribution of contaminated fluid throughout the depth of the cartridge is the key to Betapure NT-TE filters exceptionally long service life, low pressure drop and increased cost effectiveness.



Cut-away of the Betapure™ NT-TE Series filter cartridge showing the three sections of media layers and core

## The result

### Superior filter service life

Extensive testing has demonstrated that competitive filters of equivalent removal ratings subjected to the same contaminant load plug more quickly than Betapure NT-TE filters. The result is significantly shorter service life and unpredictable filtration efficiencies. Betapure NT-TE filters provide a service life improvement of up to 3 times greater than competitive products (see graph 1 on following page).

### Lower pressure drop

The design and construction of the Betapure NT-TE filter allow for significantly lower pressure drops compared to equivalently rated meltblown depth filters. Based on published data, a Betapure NT-TE filter system with a given flow would use up to 75% fewer cartridges than competitor C, 68% fewer than competitor B and 42% fewer than competitor A. To underscore the Betapure NT-TE filter cost benefit, use the example in table 1 below as a guideline.

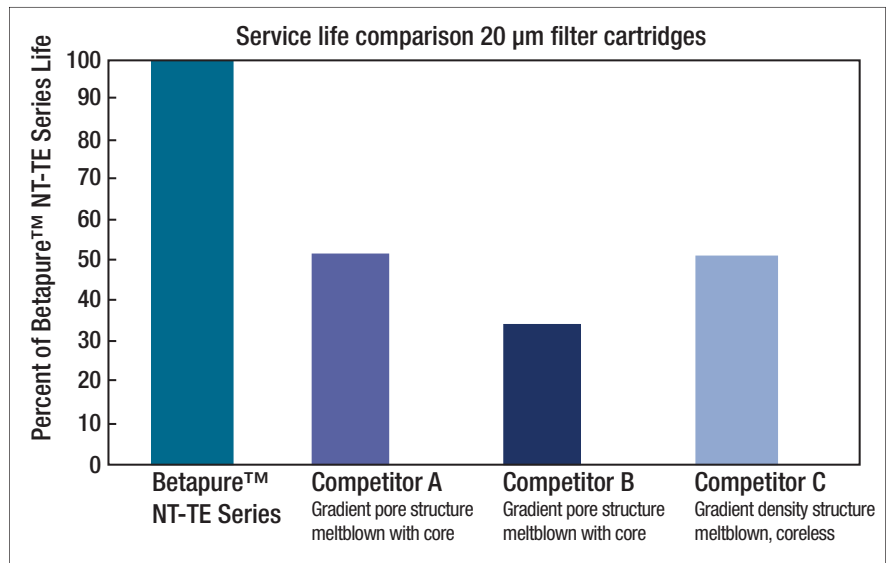
Table 1: Grade comparison of 5 micron* filters in a 416 lpm (110 gpm) system				
	Betapure™ NT-TE Series Filters	Competitor A	Competitor B	Competitor C
Flow (lpm) / 10" cartridge at 69 mbar	11.7	6.8	3.8	3.0
Number of filters for a 416 lpm flow rate	12 - 30" cartridges	21 -30" cartridges	37 - 30" cartridges	43 -30" cartridges
* Based on the manufacturers published rating.				

For the same initial cartridge differential pressure, a 416 lpm system using Betapure NT-TE filters require significantly fewer cartridges. This results in lower capital investment for the filter housing and fewer cartridges to purchase.

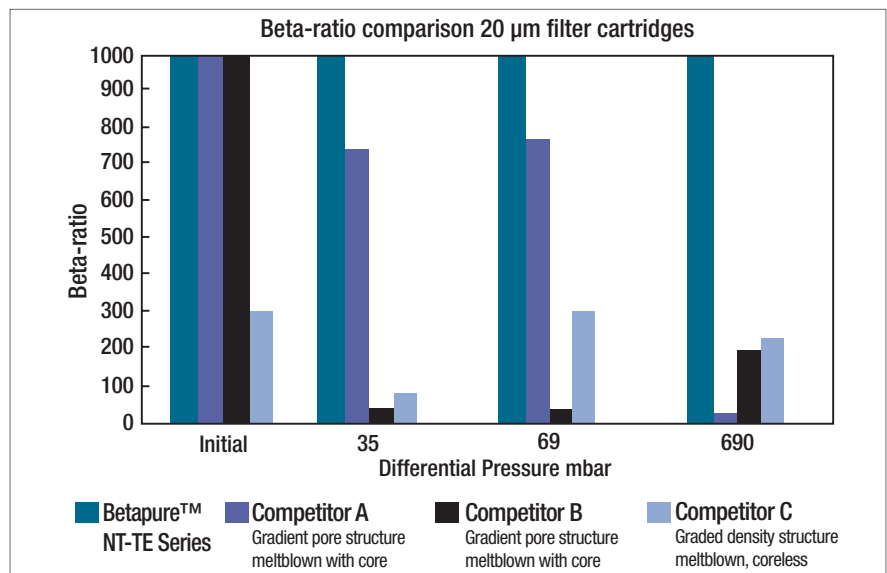


### The confidence of consistency

Betapure NT-TE filters utilise an advanced design and construction to achieve a level of filtration consistency unattainable by competitive filters. Combined with an exceptionally long service life, the Betapure NT-TE filter's consistent performance, as illustrated by comparative Beta-ratio vs. differential pressure (graph 2), provides predictable results throughout the usable filter life. Filters A, B and C show a degradation in the Beta-ratio as mbar increases. These filters exhibit a pattern of either unloading previously held particles or a loss of filtration efficiency. The result of this inconsistent performance is a reduction in finished product quality, product yield and an increase in total filtration cost.



Graph 1: Betapure™ NT-TE filters deliver longer service life



Graph 2: Beta-ratios demonstrate the Betapure™ NT-TE filter's ability to perform consistently throughout its life

### Your benefit: total filtration cost reduction

The Betapure NT-TE filter's performance and superior life advantage allow direct cost savings by reducing the number of filters used. In addition, the resulting reduction in filter change-out frequency decreases direct labour and filter disposal costs. Betapure NT-TE filters - providing performance and value.

## Absolute Betapure NT-TE filter cartridges

Consistent filtration performance, time after time, from start to finish - the goal of every filter user, the solution provided by Betapure NT-TE filters. Absolute removal ratings for Betapure NT-TE filters are determined using a filter performance test developed by 3M Purification to comply with the general procedures outlined in ASTM STP 975. 3M Purification defines absolute rating as the particle size (x) providing an initial Beta-ratio ( $\beta_x$ ) = 1000. At this Beta-ratio, the removal efficiency is equal to 99.9%. Betapure NT-TE filter ratings are specified in table 2.

## Applications

Betapure™ NT-TE's construction provides benefits to customers in a wide range of end-use filtration applications. High quality filtration along with total filtration cost reductions are very attractive benefits to customers in diverse industries.

### Chemical and hydrocarbon processing

- Acids
- Bleach (sodium hypochlorite)
- Polyethylene and polypropylene manufacture
- Amine sweetening
- Water flood

### Fine chemical and electronics

- Pre-RO filtration of high silt density, index incoming water
- Copper sulphate plating bath filtration in printed circuit board construction
- Colour screen filtration for CRT production

### Coatings

- Film and paper coatings
- Photographic film
- Lens coatings and magnetic media
- Can coatings
- High quality paints and ink

### Industrial

- Machine tool lubrication
- Chemicals
- Detergents and waste water
- Textiles
- Plating baths
- Pulp and paper
- Process water and ground water remediation

### Food and beverages

- Bottled water
- Ready-to-drink beverages
- Alcoholic beverages
- Dairy products
- Juices

Table 2: Betapure™ NT-TE filter ratings

Grade designation	Absolute rating in micron
T005	0.5*
T010	1
T020	2
T030	3
T050	5
T100	10
T200	20
T300	30
T400	40
T500	50
T700	70
* extrapolated	



### 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. 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 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.



## Betapure™ NT-TE Series specifications

Materials of construction			
Filter media, netting, core, end connector and capsule body		Polypropylene	
Optional support ring		Stainless steel or polysulfone	
Gaskets & O-ring options (see ordering guide)		Silicone, fluorocarbon, EPR, nitrile, PTFE-encapsulated fluorocarbon and polyethylene	
Operating conditions cartridges			
Maximum operating temperature		82 °C	
Maximum differential pressure		3.4 bar at 30 °C 2.0 bar at 55 °C 1.0 bar at 82 °C	
Recommended change-out differential pressure		2.4 bar at 30 °C	
Operating conditions capsules			
Maximum operating pressure		5.2 bar at 40 °C	
Maximum forward differential pressure		2.4 bar at 40 °C	
Recommended change-out differential pressure		2.4 bar at 30 °C	
Cartridge dimensions		Capsule dimensions	
Inside diameter	1 3⁄32" nominal (28 mm)	Nominal length (inches)	2 ½ and 5
Outside diameter	2 ½" nominal (64 mm)	Diameter (inches)	3
Length (inches)	9 ¾, 10, 19 ½, 20, 29 ¼, 30, 39 & 40	Width to Vent (inches)	2 ¾
Regulatory compliance			
Betapure™ NT-TE Series filter cartridges comply with the requirements of Regulation (EC) 1935/2004 for their intended food contact applications. All materials of construction are listed in the FDA CFR Title 21. Contact 3M Purification for further information.			



## Cartridge flow rates

Flow vs. differential pressure in water is depicted for each Betapure NT-TE filter grade in the graph below. Detailed information for calculating flows for fluids with other viscosities is located in the table to the right. Use the formula at the right in conjunction with the values from columns 3 or 4 in table 3. The specific pressure drop values may be effectively used when three of the four variables (viscosity, flow, differential pressure and cartridge grade) are set.

$$\frac{\Delta p \text{ in mbar (psi)}}{\text{Clean}} = \frac{\left( \frac{\text{Total system}}{\text{lpm}} \right) \left( \frac{\text{Viscosity in}}{\text{cP}} \right) \left( \frac{\text{Value from}}{\text{table}} \right)}{\left( \frac{\text{Number of equivalent single length}}{\text{cartridges in housing}} \right)}$$

## Capsule flow rates

In table 4 are the maximum recommended flow rates for Betapure NT-TE capsules by end fitting. Consult 3M Purification for more 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 ensure correct selection.

## Scientific Application Support Services (SASS)

Providing the key to customer collaboration, the global 3M Purification SASS organization is a team of multi-disciplinary scientists and engineers that provide the vital link between 3M Purification's filtration knowledge base and customer needs. With complete access to 3M Purification technology and its research and development, members of the SASS group provide on-site bench-scale tests and assist with customer scale-up to the full manufacturing process. When processing requirements are encountered, SASS is expertly equipped to identify filtration solutions using either the broad array of existing 3M Purification filter products or by working with 3M Purification R&D to design a custom solution for the application.

**Table 3: Betapure™ NT-TE filter cartridge flow rates**

Grade	Absolute rating (µm)	Specific pressure drop per 10" cartridge*
		mbar/lpm/cPs
T005	0.5	81.9
T010	1	45.5
T020	2	15.9
T030	3	8.0
T050	5	5.9
T100	10	2.5
T200	20	1.2
T300	30	0.91
T400	40	0.76
T500	50	0.52
T700	70	0.45

\* Specific aqueous pressure drop at ambient temperature for a single length equivalent (10") cartridge. For multiple cartridge lengths, divide the total flow by the number of equivalent lengths. For liquids other than water, multiply the specific pressure drop value provided in the table by the viscosity in centipoises.

**Table 4: Betapure™ NT-TE capsule maximum recommended flow by end fitting**

End fitting	Max. recommended flow rate (lpm)	Housing pressure loss (mbar)
1½" sanitary flange	22.7	68.9
3/8" FNPT	22.7	68.9
½" hose barb	11.4	103.4
¼" MNPT	5.7	165.5
Tapered hose barb	1.9	151.7

## Betapure™ NT-TE Series capsules - Ordering guide

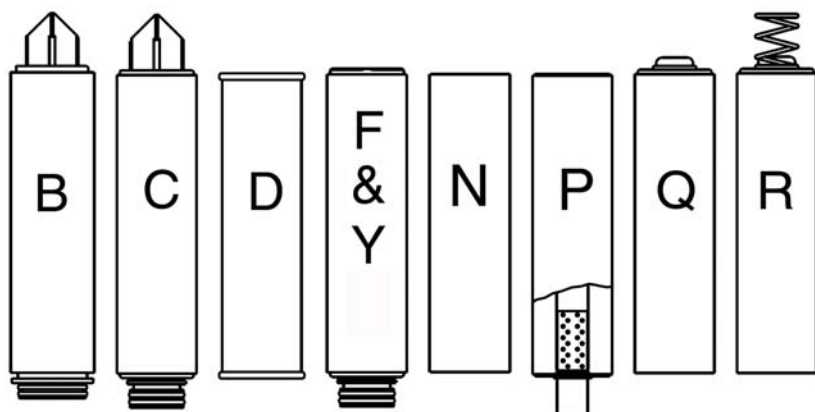
Filter type	Code	Grade Rating (µm)	Configuration	Nominal length	End modification	Vent O-ring option	Packaging option
Betapure™ NT-TE Series	T005	0.5	C - Capsule	01 - 2 ½"	A - 1½" sanitary flange	A - Silicone B - Fluorocarbon C - EPR	01 - Single pack
	T010	1		02 - 5"	B - 1/2" (14 mm) hose barb		03 - 3-pack
	T020	2			C - 1/4" MNPT		20 - 20-pack
	T030	3			D - 3/8" FNPT		
	T050	5			E - 1/4" - 5/16" - 3/8" tapered hose barb		
	T100	10					
	T200	20					
	T300	30					
	T400	40					
	T500	50					
	T700	70					

## Betapure™ NT-TE Series filter cartridges - Ordering guide

Filter type	Length	Grade Code	Rating (µm)	Packaging option	Support ring option	End modification	Gasket/O-ring material
NT = Betapure™ NT-TE Series	06 - 5"¹	T005	0.5	S = Standard	For end modification D, N, P, Q and R  0 - None	B - 226 O-ring with spear	For end modification B, C, D, F, M, Q, R and Y  A - Silicone B - Fluorocarbon C - EPR D - Nitrile K - PTFE-encapsulated fluorocarbon
	09 - 9 ¾*	T010	1			C - 222 O-ring with spear	
	10 - 10"	T020	2			D - DOE with polypropylene end caps	
	19 - 19½*	T030	3		For end modification B, C, F, M and Y  0 - None 1 - Polysulfone 2 - Stainless steel	F - 222 O-ring with flat cap	For end modification N, P, Q and R  G - Polyethylene
	20 - 20	T050	5			N - Unmodified DOE	
	29 - 29 ¼*	T100	10			P - Polypropylene core extender	
	30 - 30"	T200	20			Q - SOE, end cap without spring	
	39 - 39*	T300	30			R - SOE, end cap with spring	
	40 - 40"	T400	40			Y - Single O-ring (40" length only)	
		T500	50				
		T700	70				

\* Only available for D, N and P versions

## Betapure™ NT-TE filter cartridge end modifications



### 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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