PNM filters are validated cartridge and capsule filters made using long-proven, absolute rated, Nylon 6,6 membrane. These filters are used for the sterilization of water, solvents and aqueous liquids. Pore sizes range from 0.10 to 0.65 µm and the filter sizes scale from laboratory to full production using identical materials to ensure consistent results.

The PNM filter’s broad chemical compatibility makes it a good fit for the filtration of solvents and other harsh chemicals. These filters are optimized for flow, high retention and chemical compatibility. They are flushed to remove manufacturing debris and reduce extractables. Products are 100% integrity tested. PNM capsules are available pre-sterilized.

Critical Process provides unrivaled delivery times, technical consulting before purchasing, and very competitively priced high-performance products. Our comprehensive testing & analysis and validation services support your team whenever they need it. Your process experts partnering with our filtration experts is how we deliver your company’s solution right the first time.

PNM sterilizing filters are recommended for:
- SVPs & LVPs
- Diagnostics
- Buffers
- WFI, Water Purification
- Non-protein solutions
- Chemicals
### Maximum Operating Parameters

<table>
<thead>
<tr>
<th></th>
<th>CARTRIDGES</th>
<th>CAPSULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Operational Pressure</td>
<td>N/A</td>
<td>80 psi at 68 °F (5.52 bard at 20 °C)</td>
</tr>
<tr>
<td>Gases Operational Pressure</td>
<td>N/A</td>
<td>60 psi at 68 °F (4.14 bard at 20 °C)</td>
</tr>
<tr>
<td>Operating Temperature (water)</td>
<td>180 °F at 30 psid (82 °C at 2.07 bard)</td>
<td>110 °F at 30 psid (43 °C at 2.07 bard)</td>
</tr>
<tr>
<td>Forward Differential Pressure</td>
<td>80 psid at 68 °F (5.52 bard at 20 °C)</td>
<td>80 psid at 68 °F (5.52 bard at 20 °C)</td>
</tr>
<tr>
<td>Reverse Differential Pressure</td>
<td>50 psid at 68 °F (3.45 bard at 20 °C)</td>
<td>50 psid at 68 °F (3.45 bard at 20 °C)</td>
</tr>
<tr>
<td>Recommended Changeout Pressure</td>
<td>35 psid (2.41 bard)</td>
<td>35 psid (2.41 bard)</td>
</tr>
</tbody>
</table>

### Sanitization & Sterilization

- **Filtered Hot Water***: 90 °C (194 °F), 30 minutes, multiple cycles, max 3 psid forward flow, N/A
- **Inline Steam***: 275 °F (135 °C), 30 min, 25+ cycles, N/A
- **Autoclave***: 250 °F (121 °C), 30 min, 25+ cycles
- **Chemical Sanitization**: Performed using industry standard concentrations of hydrogen peroxide, peracetic acid, and other selected chemicals.

*Cartridge Filters – For all elevated temperature procedures above, a stainless-steel support ring is required.

### Filtration Area (Nominal)

<table>
<thead>
<tr>
<th></th>
<th>CAPSULES</th>
<th>CARTRIDGES AND CAPSULES</th>
<th>CARTRIDGES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.08cm</td>
<td></td>
<td>12.7cm</td>
<td>25.4cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25.4cm</td>
<td>50.8cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50.8cm</td>
<td>76.2cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76.2cm</td>
<td>101.6cm</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 ft²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 ft²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.0 ft²</td>
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<tr>
<td>14.0 ft²</td>
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<td>28.0 ft²</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>0.11m²</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0.31m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.65m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.30m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.95m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.60m²</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Integrity Testing

<table>
<thead>
<tr>
<th>PORE SIZE</th>
<th>DIFFUSION TEST PRESSURE*</th>
<th>BUBBLE POINT MINIMUM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>µm</td>
<td>PSI</td>
<td>GARG</td>
</tr>
<tr>
<td>0.10</td>
<td>48</td>
<td>3.31</td>
</tr>
<tr>
<td>0.22</td>
<td>35</td>
<td>2.41</td>
</tr>
<tr>
<td>0.45</td>
<td>20</td>
<td>1.38</td>
</tr>
<tr>
<td>0.65</td>
<td>15</td>
<td>1.03</td>
</tr>
</tbody>
</table>

**DIFFUSION SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Length</th>
<th>2”</th>
<th>5”</th>
<th>10”</th>
<th>20”</th>
<th>30”</th>
<th>40”</th>
</tr>
</thead>
<tbody>
<tr>
<td>mL/min</td>
<td>≤ 2.1</td>
<td>≤ 7.1</td>
<td>≤ 15</td>
<td>≤ 30</td>
<td>≤ 45</td>
<td>≤ 60</td>
</tr>
</tbody>
</table>

* All specifications are for water wetted membrane
** Test pressure exceeds operational limits of capsule filters. Use the Diffusion Test method.
Critical Process Filtration, Inc.

Validation
PNM filters are validated using test procedures that comply with ASTM F 838-15(ae1) protocols for the determination of bacterial retention in filters used for liquid filtration. The challenge level is a minimum of $10^7$ organisms per cm$^2$ of filter media. CPF filters have $> 7$-log removal when challenged with the organisms listed below (0.10μm and 0.22μm meet the FDA definition of sterilizing grade filters).

- 0.10μm: *Brevundimonas diminuta*
- 0.22μm: *Brevundimonas diminuta*
- 0.45μm: *Serratia marcescens*
- 0.65μm: *Saccharomyces cerevisiae*

Endotoxins
The levels of bacterial endotoxins in aqueous extracts from PNM filters are below current USP limits as specified for water for injection.

Extractables
PNM filters typically exhibit low levels of non-volatile residues.

TOC and Conductivity
PNM filters conform with TOC standards of USP <643> and the water conductivity standards of USP <645> after an appropriate flush with purified water.

Toxicity Compliance
The materials used to construct PNM filters are non-toxic and meet the requirements for the MEM Elution Cytotoxicity Test and the requirements for Biological Reactivity Tests in the current version of the United States Pharmacopeia (USP) for Class VI - 121 °C Plastics.

Non-Fiber Releasing
PNM filters comply with Title 21 CFR sections 210.3 (b)(6) and 211.72, for non-fiber releasing filters.

FDA Compliance
Materials meet the requirements listed by the FDA as appropriate for use in articles intended for repeated food contact as specified in Title 21 CFR sections 174.5, 177.1500, 177.1520, 177.1630, 177.2440, and 177.2600 as applicable.

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### Construction Materials

<table>
<thead>
<tr>
<th>Filtration Media</th>
<th>Nylon 6,6 Membrane with polyester support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Support</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>End Caps, Center Core, Outer Support Cage, Capsule Housing</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Sealing Method</td>
<td>Thermal Bonding</td>
</tr>
<tr>
<td>O-Rings/Gaskets</td>
<td>Buna, Viton® (or FKM), EPDM, Silicone, FEP Encapsulated Silicone, FEP Encapsulated Viton (or FKM)</td>
</tr>
</tbody>
</table>

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Flow rates for Cartridge filters are per 10-inch length. The test fluid is water at ambient temperature.

Flow rates for Capsule filters are tested using a 2" capsule filter with 1" sanitary inlet and outlet ports. The test fluid is water at ambient temperature. Flow rates for larger capsules will scale with filtration area. Rates will vary based on end configuration of the capsule.
PNM Filters Ordering Information

Fill in the corresponding codes in the boxes below to build your Part Number.

To consult with one of our technical team members, request a quote or place an order: call (603) 880-4420 or contact us here.

Cartridge Filters

PNM  PNM  000

Pore Size Code
-10 = 0.10 μm
-20 = 0.22 μm
-40 = 0.45 μm
-60 = 0.65 μm

SS Ring
S = Ring
N = No Ring

Length
05 = 5 in. (12.7 cm)
97 = 9.75 in. (24.8 cm)
01 = 10 in. (25.4 cm)
02 = 20 in. (50.8 cm)
03 = 30 in. (76.2 cm)
04 = 40 in. (101.6 cm)

O-Ring/Gasket Code
S = Silicone
B = Buna
V = Viton (or FKM)
T = FEP Encapsulated Viton (or FKM)
E = EP
R = FEP Encapsulated Silicone

End Cap Code*
0 = Flat Gasket, DOE
1 = Flat Gasket/Plug
2 = 2-222 O-ring/Plug
3 = 213/119 Internal O-ring DOE
4 = 213/119 Internal O-ring/Plug
5 = 2-222 O-ring/Flat
6 = 2-222 O-ring/Flat
7 = 020 O-ring/Plug
8 = 2-222 O-ring/Spear
9 = 2-222 O-ring/Spear
21 = 2-223 O-ring/Flat
22 = 2-223 O-ring/Spear
23 = 2-222 O-ring 3 Tab/Flat
24 = 2-222 O-ring 3 Tab/Spear
25 = Short 2-222/Plug

*Additional end configurations available

Capsule Filters

CP  PNM  000

Pore Size Code
-10 = 0.10 μm
-20 = 0.22 μm
-40 = 0.45 μm
-60 = 0.65 μm

Pre-Sterilized or Not
S = Pre-Sterilized
G = Gamma Stable
N = Not Sterilized

Length
A = 2”
B = 5”
C = 10”
D = 20”
E = 30”

Inlet
A = 1/4” Female NPT
B = 1/4” Male NPT
C = 3/8” Female NPT
D = 1/2” Female NPT
E = 1/2” Male NPT
F = 1” Sanitary
G = Hose Barb*
H = 1 ½” Sanitary with side vent
I = ½” Single Stepped Barb with side vent

Outlet
A = 1/4” Female NPT
B = 1/4” Male NPT
C = 3/8” Female NPT
D = 1/2” Female NPT
E = 1/2” Male NPT
F = 1” Sanitary
G = Hose Barb*
H = 1 ½” Sanitary with side vent
I = ½” Single Stepped Barb with side vent
IB = ½” Single Stepped Barb with filling bell and side vent

Side Vent Options
1 = Luer Lock
2 = Bleed Valve

O-Ring
(Sbleed Valves Only)
S = Silicone
E = EP
V = Viton
B = Buna
K = FFKM

*Fits hoses/tubes with inner diameter 11/32 to 9/16 inches