High-Purity Chemicals in Electronic Applications
Training guide for filtration products
For technical or application support related to our fluid filtration solutions, please call our toll free number 877 784 2234 or email bioscience.na@parker.com
Contents

Introduction ......................................................................................................................................2
HP Chemical Schematic ..................................................................................................................3
Selection Process ............................................................................................................................4
Understanding the application : Ultra-Pure Water (UPW) ............................................................5
: High-Purity Solvents Isopropyl Alcohol (IPA) ..............................................................................6
: High-Purity Acids & Bases Hydrofluoric Acid ..............................................................................7
: High-Purity Acids & Bases Sulfuric Acid .......................................................................................8
: High-Purity Acids & Bases Hydrogen Peroxide ............................................................................9
Services : Technical Support Group (TSG) ....................................................................................10
High-Purity Chemicals
Selection Matrix ............................................................................................................................11
Products ........................................................................................................................................12-13
Introduction
Provisioning a cost-effective filtration technology that ensures consistent quality and process optimization

High-purity chemicals and materials are essential in manufacturing microelectronics devices that are enabling advances in work, life science, communications, transportation, efficient lighting, entertainment, shopping, and many other areas that affect our lives.

Parker’s proven product range and applications experience in the manufacturing of these high-purity chemicals, chemistries, and solvents allows our customers to meet the high-purity requirements that enable constant technical advancement of their customers. While each application is unique, we can often divide high-purity applications into the following broad processes:

- Ultra-pure water is needed to enable production of liquid high-purity chemical, or to dilute concentrated chemical into the concentration required by the customer.
- Specialty chemical-vapor filtration which is unique to polysilicon production.
- Distillation in some processes may be done in a very aggressive, high-temperature environment requiring a special filtration solution.
- Venting of tanks with hydrophobic filters to relieve gas pressure build-up.
- Anhydrous and other industrial liquid raw materials may require filtration from tankers, pipelines, or other large vessels before they are introduced to the high-purity manufacturing system.
- Pre-filtration or clarification through the manufacturing process is typical and necessary to guarantee quality specifications throughout the process.
- Final package filtration is the last particle barrier and the final critical filtration step in the high-purity manufacturing process.

Given the variations of these processes for high-purity chemicals, chemistries, and solvents, it is critical to consider the operating parameters when selecting filtration for each stage of manufacturing.

As our customers require fewer and smaller particles and the need for lower metal extractables increases, it is essential for us to fully understand their applications and process demands. In addition to helping our customers achieve their final specification, we must recommend filtration solutions that minimize process downtime and reduce product waste. The total cost of ownership must be considered without compromising the quality of the end product.

Market Applications
- High-purity concentrated acids
- High-purity acid blends
- High-purity bases
- High-purity alkaline solutions
- High-purity solvents
- Some photoresists and polyimides
- Anti-reflective coatings
- Developers – negative and positive
- Organic solvents used to strip photoresist polymer
- CMP base chemicals – acids or bases
- High-purity plating solutions
- Trichlorosilane – vapor and liquid
High-Purity Chemical Application Overview

High-Purity Solvents
High-purity solvents begin as general or industrial grade versions before undergoing a series of filtration, and sometimes, distillation steps. While most think of commonly used solvents like IPA or acetone, other mostly polar solvents are used in various microelectronics processes. Both metal ion and particle specifications will vary according to the application and customer. Parker’s filters meet a wide range of solvent filtration needs and enable the solvent manufacturer to meet the needs of their customers.

High-Purity Acids & Bases
High-purity acids & bases are critical to the cleaning and etching of microelectronic devices, especially semiconductors. Parker’s lineup of filters are well suited for achieving the challenging particle and ionic specifications the chemical companies need to meet. Filtration is progressive, getting tighter throughout the process. Materials of construction must not only be highly compatible and provide good performance, but must also offer outstanding value. While polypropylene may be compatible in a particular acid or base for one manufacturer, it may not be suitable for another whose end user customers require ultra low metal extractables. Parker can meet the needs of both customers.

Ultra-Pure Water Process
The use of polypropylene depth filters or high-flow pleated filters on the deionization system is used to treats incoming water and protects the RO system. Trap filters ensure that the make-up process water is ultra-pure by preventing downstream contamination of source water sediment or ion exchange bead migration.

For detailed products in each process application, see pages 5 - 9.
Selection Process
Identifying customer needs

In order to meet filtration specifications, physical and chemical conditions of the process have to be considered.

It is therefore essential that a methodical process for identifying the customer’s needs is followed.

The SELECT process builds on principles used to select the optimized filtration solution for the high-purity chemical manufacturer.
Ultra-Pure Water (UPW)

Ultra-Pure Water (UPW) is essential in the manufacturing processes of most chemicals, chemical blends, and solvents. Chemical companies with high-purity chemical processes use UPW in the manufacturing process or to control concentrations per their customer’s specification.

Converting typical city or lake water into UPW requires several steps. Reverse osmosis (RO) is the first major step used to remove contaminants from the mains water. Parker filters are used prior to the RO systems to protect the RO membrane from large particles.

Ion exchange converts the post-RO water to UPW water with a combination of cation and anion resins used to remove positive and negative ions. Filters are used to remove any particles that could come off the ion exchange resin beds.

Final filters may be used for last chance particle capture from the system to ensure the very best UPW quality.

Post RO, most filters used are hydrophilic with a polypropylene structure. It’s important to note that some companies may decide to use all-fluoropolymer filters if they use an aggressive line sanitization method, like ozone, to kill any bacteria in the line.

<table>
<thead>
<tr>
<th>Core Filter(s)</th>
<th>Location</th>
<th>Purpose</th>
<th>Features</th>
<th>Benefits</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abso-Mate</td>
<td>1</td>
<td>Incoming mains water &amp; pre-RO</td>
<td>Polypropylene depth media</td>
<td>Capture large particles in raw materials</td>
<td>Protection of reverse osmosis system</td>
</tr>
<tr>
<td>Poly-Mate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poly-Mate Plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyflow-G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proflow II-E</td>
<td>2</td>
<td>Storage tank air vent</td>
<td>Hydrophobic PTFE membrane</td>
<td>Venting of air</td>
<td>Prevent unwanted pressure buildup</td>
</tr>
<tr>
<td>Proflow II-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clariflow-WE</td>
<td>3</td>
<td>Post ion exchange resin capture</td>
<td>Hydrophilic PES membrane (no wetting needed)</td>
<td>Capture fine particles coming off ion exchange beds</td>
<td>Protect downstream equipment and added process</td>
</tr>
<tr>
<td>Clariflow-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clariflow-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clariflow-E</td>
<td>4</td>
<td>Final filtration step</td>
<td>Hydrophilic PES membrane (no wetting needed)</td>
<td>Tightest particle removal to meet UPW standards</td>
<td>Final filtration step to help meet final particle specification</td>
</tr>
<tr>
<td>Clariflow-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*UPW refers to ultra-pure deionized water used in Microelectronics manufacturing
Isopropyl Alcohol (IPA) is the most common solvent used in semiconductor manufacturing. It may be used to rinse wafers in certain processes where water contact is not desirable. IPA is also used to dry wafers and other Microelectronics devices since it will not streak or leave watermarks. While there are different methods of manufacturing IPA, a common one is through the combination of propene and sulfuric acid to create sulfate esters. Parker melt blown and pleated depth filters may be used to filter these raw materials.

The hydrolyzation process combines the sulfate esters and Ultra-Pure Water (UPW). A hydrophilic filter may be used to filter incoming UPW. As the newly created IPA leaves the hydrolyzer, it may pass through filtration prior to other process steps including distillation.

The number of distillation steps will depend on the level of purity required. Though not shown here, some manufacturers may use filters during or between distillation steps. Following distillation, a series of filtration steps may be used to further reduce inline particle size and quantity.

Final package filtration is a last chance particle removal step. This is typically where inline particle counters will be used to monitor particle size and quantity. Here, filters will be tighter than upstream filters in the manufacturing process. Micron rating will depend on the end user particle specification.
High-Purity Acids & Bases

Hydrofluoric Acid

High-purity hydrofluoric (HF) acid begins with the mixing and chemical interaction of sulfuric acid and dry fluorspar (CF2). The result of mixing those in a rotary kiln is HF gas. The HF gas is condensed then distilled to form anhydrous hydrofluoric acid.

In this diagram, the industrial anhydrous HF is delivered via tanker or pipeline to become ultra-pure HF commonly used in semiconductor wafer etch and clean processes. Parker membrane filters with either HDPE or PFA structures may be used throughout the manufacturing process.

Distillation is an important step in producing ultra-pure hydrofluoric acid. The aggressive nature of the acid combined with temperatures high enough to vaporize the HF make this a challenging filter application. For that reason, only 100% fluoropolymer filters can be used.

The HF vapor can pass through the PTFE membrane, then re-condense in to a purer form with ultra low contaminants. As the ultra-pure concentrated HF exits the distillation process, a filtration step to remove additional particles may be present.

From here, the ultra-pure concentrated HF may be blended with ultra-pure water to various desired concentrations.

Parker filters ensure process consistency and enable the HF manufacturer to meet the final particle specification for their end user customers.

It’s important to note that while polypropylene filters, like Parker’s Proflow-II-E, could be used in dilute HF, both HDPE and PFA are considered to be more chemically robust and would typically be recommended.
High-Purity Acids & Bases
Sulfuric Acid

Sulfuric acid is highly used with either hydrogen peroxide or ozonated UPW to create an intended exothermic reaction. The added energy to this aggressive acid is ideal for removing hard-baked photoresists and most organic contaminants from the surface of silicon production wafers.

A common method of creating sulfuric acid begins by mixing oleum and steam to produce sulfur trioxide vapor. Filters may be used to remove large particles and provide protection to the evaporator.

The SO3 is condensed then vaporized again just before entering a series of purifier columns. The number of purifiers will depend on the H2SO4 specification. Exiting the absorber column is pure concentrated sulfuric acid.

The pure concentrated acid is cooled and carefully diluted into usable concentrations. From there, the acid goes through a series of membrane filtration steps, each succeeding step tighter than the previous until particle specifications are met and the product is packaged for the end user.

<table>
<thead>
<tr>
<th>Core Filter(s)</th>
<th>Location</th>
<th>Purpose</th>
<th>Features</th>
<th>Benefits</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoroflow</td>
<td>1</td>
<td>Steam filter</td>
<td>100% fluoropolymer construction</td>
<td>Temperature rating up to 180°C</td>
<td>Protection of absorption process</td>
</tr>
<tr>
<td>Fluoroflow-HSA</td>
<td>2</td>
<td>High temperature acid vaporization</td>
<td>100% fluoropolymer construction</td>
<td>Temperature rating up to 180°C</td>
<td>Protect and enhance distillation process</td>
</tr>
<tr>
<td>Fluoroflow-Select</td>
<td>3</td>
<td>DI water</td>
<td>Hydrophilic PES membrane</td>
<td>Removal of particles in UPW down to 0.02 microns</td>
<td>Provide consistent source of UPW</td>
</tr>
<tr>
<td>Chemflow-PE</td>
<td>4</td>
<td>Stage/pre-filtration/blending</td>
<td>PTFE membrane on either HDPE, PFA or PP support structure</td>
<td>Fine particle removal</td>
<td>Process particle control</td>
</tr>
<tr>
<td>Chemflow-PE Select</td>
<td>5</td>
<td>Final package</td>
<td>PTFE membrane on either HDPE, PFA or PP support structure</td>
<td>Fine particle removal</td>
<td>Final filtration step to help meet final product particle specification</td>
</tr>
</tbody>
</table>
Hydrogen peroxide is made in a series of steps. A hydrocarbon-based "work-solution" is fed to the hydrogenator along with a stream of hydrogen where hydrogenation occurs over a bed of Ni or Pd catalysts.

The first filtration step is used to capture catalyst particles from the hydrogenated fluid. In the oxidizer, oxygen-rich air is introduced to the work solution to reverse the previous reaction. The resulting work-solution contains about 40% H₂O₂ by weight as it goes into the liquid extractor.

Water is fed into the extractor and since the H₂O₂ is miscible in water while the solvent is not, the water-peroxide layer can be removed and sent to the purification columns. In the purification columns, the water-peroxide mixture is further concentrated and purified. For UHP hydrogen peroxide, multiple columns may be used.

### Core Filters

<table>
<thead>
<tr>
<th>Core Filter(s)</th>
<th>Location</th>
<th>Purpose</th>
<th>Features</th>
<th>Benefits</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abso-Mate</td>
<td>1</td>
<td>Incoming raw materials</td>
<td>Polypropylene depth media</td>
<td>Capture large particles in raw materials</td>
<td>Protection of evaporator</td>
</tr>
<tr>
<td>Poly-Mate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poly-Mate Plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyflow-G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemflow-PE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemflow-PE Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profflow II-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profflow II-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clariflow-WE</td>
<td>3</td>
<td>DI water</td>
<td>Hydrophilic PES membrane</td>
<td>Removal of particles in UPW down to 0.02 microns</td>
<td>Provide consistent source of UPW to liquid reactor</td>
</tr>
<tr>
<td>Clariflow-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clariflow-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemflow-PE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemflow-PE Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profflow II-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profflow II-E Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoroflow</td>
<td>4</td>
<td>Final Package</td>
<td>PTFE membrane on either HDPE, PP or PFA support structure</td>
<td>Fine particle removal</td>
<td>Final filtration step to help meet product specifications</td>
</tr>
</tbody>
</table>
In these industries, manufacturers and end-users face stringent environmental and operational compliances, where the trend is to ensure low Volatile Organic Compounds (VOC) exposure and spillage of hazardous waste while providing a more user-friendly process environment. Combined with the market demands for high quality products, this means that the raw materials and chemistries used in formulations result in higher manufacturing costs.

Parker is committed to providing comprehensive technical support of our products through our global sales network and dedicated technical support group. Our team of trained scientists, engineers and technicians is available to answer questions on the capabilities of our products, assist customers to select, specify and design filtration systems to meet specific user requirements, and provide a range of advisory and troubleshooting services.

We provide technical support to assist in training operators on a wide range of activities related to using our products, system sizing and performance optimization.

Results can be utilized to manipulate pre and final filter trains to achieve the desired throughput and quality without over processing.

Services Overview

- **Laser particle size analysis**: Quantitative particle counting can give an indication of the expected workload of a filter system. This can identify the need for prefiltration or the use of an alternative technology.

- **Particulate analysis**: Identification of the particulate loading within a process fluid or the analysis of filtrate through various filtration grades and materials can identify the optimum filtration system. Specific particulates can also be identified through light microscopy and SEM to establish the contaminant source.

- **Advanced analytical analysis**: Energy-dispersive X-ray spectroscopy (EDS/EDX) and Fourier Transfer infra red (FTIR) spectroscopy can be conducted to characterize retained materials on a filter media, aiding in identification of the source of blockage material. Identification of metal ion extractables can be done with Inductively coupled plasma mass spectrometry (ICP-MS).

- **Filterability index analysis**: Small-scale trials can be conducted with sample volumes of product under controlled laboratory or process conditions. This method is used to determine the optimum multi-stage filter system or determine the filter size required for a process batch or a continuous process. This allows the system to be specifically sized and designed to give optimum economies in both hardware installation and replacement element cost.

- **Existing system optimization**: Where a process is altered through increased operational demand, for example through extension of a production campaign, higher production volumes or an increased number of product changes, Parker offers support to ensure the system remains appropriate for these changed process demands.

- **Fault diagnosis**: Often filtration is a critical step or control point within a process, therefore, when finished product quality is not achieved the filter is often the first point of call. The Parker TSG group can provide a reactive service to enable rapid ‘root cause’ analysis and assist in minimizing the risk of recurrence.
<table>
<thead>
<tr>
<th>Ultra-Pure Water</th>
<th>Acid/Base Production and Blending</th>
<th>Solvent Production and Blending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point of entry</td>
<td>Raw material or industrial grade chemicals</td>
<td>Raw material or industrial grade chemicals</td>
</tr>
<tr>
<td>Pre-RO protection</td>
<td>Steam</td>
<td>Stage or Pre-filtration</td>
</tr>
<tr>
<td>Resin trap</td>
<td>Coalescing</td>
<td>Blending</td>
</tr>
<tr>
<td>Final filter</td>
<td>Distillation</td>
<td>Final packaging</td>
</tr>
<tr>
<td></td>
<td>Venting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stage or Pre-filtration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blending</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final packaging</td>
<td></td>
</tr>
</tbody>
</table>

**High-Purity Water**
- Use for high-purity water production and blending.

**Acid/Base Production and Blending**
- Use for acid/base production and blending.

**Solvent Production and Blending**
- Use for solvent production and blending.

---

**Selection Matrix**

- Polyflow
- Polyflow-G
- Polyflow-Plus
- Polyflow-Select
- Chemflow-PE
- Chemflow-XF
- Chemflow-Select
- Clariflow-E
- Clariflow-WE
- Clariflow-Select
- Floroflow
- Floroflow-HSA
- Floroflow-XF
- Floroflow-Select

---

**Applications**

- Ultra-Pure Water (UPW)
- High-Purity Solvents Isopropyl Alcohol (IPA)
- High-Purity Acids & Bases Hydrofluoric Acid
- High-Purity Acids & Bases Sulfuric Acid
- High-Purity Acids & Bases Hydrogen Peroxide

---

**Services**

- Introduction
- Schematic
- Selection Process
- Product Overview
PTFE Membrane Filter Cartridges

**Chemflow®-PE**
- Good flow rates
- Good lifetime
- Wet-pack option for quick installation
- PTFE/PP construction for chemical resistance
- 100% integrity tested in cleanroom environment

Chemflow-PE provides a low metals, economical alternative to all-fluoropolymer cartridges. Ideally suited for final packaging of high-purity chemicals and solvents and most lower temperature chemical delivery and wet process (>60°C) applications.

**Chemflow®-PE Select**
- High flow rates
- Long lifetime
- Wet-pack option for quick installation
- PTFE/HDPE construction for chemical resistance
- 100% integrity tested in cleanroom environment

The addition of the SELECT pleat technology provides a high-flow, low metals, and economical alternative to all-fluoropolymer high-surface area cartridges. Ideally suited for final packaging of high-purity chemicals and solvents and many low temperature chemical delivery and wet process (>60°C) applications.

**Fluoroflow**
- Economical all-fluoropolymer cartridge
- High particle retention
- Wet-pack option for quick installation
- All-fluoropolymer for maximum chemical resistance
- 100% integrity tested in cleanroom environment

Fluoroflow is an economical all-fluoropolymer solution for low to medium flow high-purity chemical applications that require the highest chemical resistance. This filter is ideally suited for nearly all high-purity chemical and solvent manufacturing applications including those requiring a high temperature rating (>150°C).

**Fluoroflow®-HSA**
- Increased filtration area for longer life
- High particle retention
- Wet-pack option for quick installation
- All-fluoropolymer for maximum chemical resistance
- 100% integrity tested in cleanroom environment

This cartridge is a high surface area all-fluoropolymer solution for medium flow high-purity chemical applications that require the highest chemical resistance and desire longer life. This filter is ideally suited for nearly all high-purity chemical and solvent manufacturing applications including those requiring a high temperature rating (>150°C).

**Fluoroflow®-XL**
- Extra-high filtration area in a 3.25” wide cartridge
- High flow rates for maximum bath turn-over
- Wet-pack option for quick installation
- Ultraclean option for absolute cleanliness
- 100% integrity tested in cleanroom environment

Fluoroflow-XL is ideal for high-loading, aggressive, high-purity processes where performance is dependent on high flow, efficient particle removal, and ultra-low metal extractables.

**Fluoroflow®-XF**
- Highest flow rates in the industry for a 2.75” wide cartridge
- Long lifetime
- Wet-pack option for quick installation
- PTFE/HDPE construction for chemical resistance
- 100% integrity tested in cleanroom environment

The asymmetric PTFE membrane provides unmatched flow rates and on-stream life to help improve throughput and reduce filtration costs. Ideally suited for final packaging of high-purity chemicals and solvents and many low temperature chemical delivery and wet process (>60°C) applications.

**Proflow™ II-E**
- Economical, high-purity chemical and solvent filtration
- Good liquid and gas flow rates
- Wet-pack option for quick installation
- PTFE/PP construction for chemical resistance
- 100% integrity tested in cleanroom environment

Proflow-II-E uses a PTFE membrane with high purity polypropylene supports to provide an economical yet high-purity filtration solution for high-purity chemical, solvent and gas applications. This filter is ideal for many high-purity chemical and solvent manufacturing applications.

**Proflow™ II-E Select**
- Economical, high-purity chemical and solvent filtration
- High surface-area SELECT pleating for excellent liquid flow rates
- Wet-pack option for quick installation
- PTFE/PP construction for chemical resistance
- 100% integrity tested in cleanroom environment

An economical, yet high-performance filter cartridge for high-purity chemical and solvent applications, the Proflow II-E Select uses a PTFE membrane along with polypropylene supports. With SELECT pleating, liquid flow rates are increased by up to 50% versus our standard Proflow II-E.

---

**Selection Matrix**

<table>
<thead>
<tr>
<th>Application</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Peroxide</td>
<td>Ultra-Pure Water (UPW)</td>
</tr>
<tr>
<td>Acids &amp; Bases</td>
<td>High-Purity Acids &amp; Bases Hydrofluoric Acid</td>
</tr>
<tr>
<td>High-Purity Hydro/fluoric Acid</td>
<td>High-Purity Acids &amp; Bases Sulfuric Acid</td>
</tr>
<tr>
<td>Water (UPW)</td>
<td>High-Purity Acids &amp; Bases Hydrogen Peroxide</td>
</tr>
</tbody>
</table>

---

**Introduction**

**Schematic**

**Selection Process**

**Applications**

**Ultra-Pure Water (UPW)**

**High-Purity Acids & Bases Hydrofluoric Acid**

**High-Purity Acids & Bases Sulfuric Acid**

**Services**

**Selection Matrix**

**Product Overview**
Pleated Depth Filter Cartridges

**Abso-Mate®**
- Non-fiber releasing and low extractables
- Single-piece construction eliminates bypass concerns
- All-polypropylene construction offers wide chemical compatibility with most chemicals
- Absolute rated for consistent and reliable performance (99.98%)
- 100% integrity tested in cleanroom environment
- Rating down to 0.02 microns
- DI water and dilute acids and bases
- Good flow rate
- High-retention hydrophilic PES membrane
- Clariflow®-E

**Polyflow®**
- High-retention depth matrix for economical prefiltration
- High flow rate and long service life reduce processing time
- Wide variety of configurations and ratings
- Broad chemical compatibility allows use in most applications
- Thermally bonded virgin polypropylene construction minimizes extractables
- Thermally bonded, absolute rated 100% virgin polypropylene to provide absolute filtration.
- Polyflow-G’s high dirt-loading, random-fiber polypropylene depth media provides consistent particle retention and protection of upstream filters.

**Fulflo® Poly-Mate™**
- All Polypropylene maximizes chemical resistance
- Pleated surface area offers extended service life, low pressure drop and high flow capacity
- One-piece, continuous to 40 inches length, integrally sealed pleated filter media
- Non-fiber releasing polypropylene construction
- A unique combination of polypropylene melt blown and spun-bonded pleated media provides retention ratings of 0.5 to 60 μm at 99% efficiency.
- Polyflow-Membrane-Select is a higher surface area, all-polypropylene filter cartridge ideal for use in certain electronics applications such as the manufacturing of high-purity solvents and most G or I-line photoresists. Every cartridge is fabricated in a clean room environment, preflushed with 18 megohm-cm ultrapure DI water, and 100% integrity tested.

**Polyflow® Membrane Select**
- Highly retentive polypropylene membrane
- Unique SELECT pleating technology for higher flow and longer life
- Wet-pack option for quick installation
- 100% thermally welded virgin polypropylene construction
- 100% integrity tested in cleanroom environment
- Polyflow-Membrane-Select is a higher surface area, all-polypropylene filter cartridge ideal for use in certain electronics applications such as the manufacturing of high-purity solvents and most G or I-line photoresists. Every cartridge is fabricated in a clean room environment, preflushed with 18 megohm-cm ultrapure DI water, and 100% integrity tested.

**Polyflow®-G**
- Depth matrix for economical prefiltration
- High flow rate and long service life reduce processing time
- Wide variety of configurations and ratings
- Broad chemical compatibility allows use in most applications
- Thermally bonded virgin polypropylene construction minimizes extractables
- These nominal-rated depth filter cartridges are thermally bonded from 100% virgin polypropylene. Polyflow-G’s high dirt-loading, random-fiber polypropylene depth media provides consistent particle retention and protection of upstream filters.

Hydrophilic PES Membrane Filter Cartridges

**Clariflow®-E**
- High-retention hydrophilic PES membrane
- Good flow rate
- DI water and dilute acids and bases
- Rating down to 0.02 microns
- 100% integrity tested in cleanroom environment
- Fulflo® Poly-Mate™ Plus

**Clariflow®-E Select**
- High-retention hydrophilic PES membrane
- Unique SELECT pleating technology for high flow rate and increased life
- DI water and dilute acids and bases
- Rating down to 0.02 microns
- 100% integrity tested in cleanroom environment
- Clariflow-E-SELECT filter cartridges are optimized for high-flow microelectronics. DI water and dilute aqueous-based chemical microelectronics applications. The SELECT pleated, mirrored-antireflective polypropylene (Polyether sulfonamide) membrane enables quick and convenient startup without the need for pre-wetting.

**Clariflow®-WE**
- Economical filtration
- High-retention hydrophilic PES membrane
- DI water and dilute acids and bases
- Rating down to 0.04 microns
- 100% integrity tested in cleanroom environment
- Clariflow-WE filter cartridges are an economical option for filtering DI water filtration and other dilute aqueous solutions. The filter features a hydrophilic PES membrane and all polypropylene support structure for cost efficient and convenient filtration.