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Separation Technologies for a Better Future™ is more than our tagline. It is our commitment and drive to constantly improve the value we create for our customers. For over 50 years Koch Separation Solutions has pioneered the advancement of spiral, tubular and hollow fiber filtration membranes and systems through innovation, research and development. Dairy, food and beverage, pharmaceutical and industrial companies rely on our technological expertise to improve the quality of the products they produce.

From our state of the art manufacturing and development facility in Wilmington, Massachusetts, USA we invest in technology with a focus on improving membrane formulations, element construction and process applications. The result is a wide range of Reverse Osmosis (RO), Nanofiltration (NF), Ultrafiltration (UF) and Microfiltration (MF) membrane products available to the market. In addition to more than 400 product offerings and 45 membrane chemistries, we offer global installation, customer service and support to keep our customers running at maximum efficiency. Let our experience work for you.
Koch Separation Solutions is part of the Koch Engineered Solutions. Founded in 1945 by Fred C. Koch, KCTG is a wholly-owned subsidiary of Koch Resources, LLC. KCTG exports technical equipment and engineering services — specialized in process and pollution control industries — to over 100 countries around the world.
Markets and Applications

Offering a wide range of membrane products and product configurations is a key to KSS’ position as a leading filtration solution provider to the process separations market. The KSS line of membrane products plays a vital role in the markets we serve - **Food, Beverage, Dairy, Life Sciences and General Industrial**. We offer state of the art, high-quality solutions that meet both performance and regulatory standards for each market and application.

KSS is uniquely qualified to serve these markets. Our scientists and engineers have gained knowledge and experience from decades-long relationships with the industry, helping clients improve their processes and operations. Our engineers are well-versed in application-specific separation and filtration challenges in the sanitary, as well as the industrial market segments.

From producing haze-free juice and wine while ensuring excellent color and aroma passage using our tubular and hollow fiber modules, through treating electrocoat paint with our “zero bypass” advanced spiral products, increasing protein yield in dairy operations using our high productivity dairy spirals, or using our extreme pH tolerant spirals to recover caustic, KSS offers the process separations market the complete, highest quality and most economical membrane solutions for every application.

### Dairy

<table>
<thead>
<tr>
<th>Whey</th>
<th>Milk</th>
<th>UF Permeate</th>
<th>Cheese Brine</th>
<th>Other Applications</th>
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<tr>
<td>Whey concentration</td>
<td>Milk protein concentrate</td>
<td>UF permeate concentration</td>
<td>Cheese brine clarification</td>
<td>RO water polishing for reuse</td>
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<td>Whey protein concentrate</td>
<td>Milk protein isolate</td>
<td>Calcium phosphate removal</td>
<td>Acid and caustic recovery from CIP streams</td>
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<td>Fat removal from WPC</td>
<td>Casein concentration</td>
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<td>Whey protein isolate</td>
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<td>Reduced mineral content whey</td>
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### Beverage

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<td>Juice clarification</td>
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<td>Alcohol adjustment</td>
<td>Juice concentration</td>
<td>Acid and caustic recovery from CIP streams</td>
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<td>Must filtration</td>
<td>Tank bottoms</td>
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<td>Alcohol adjustment</td>
<td>recovery</td>
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<td>Color reduction</td>
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<tr>
<td>Color concentration</td>
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### Wine Beer Juice Other Applications

<table>
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<th>Beer</th>
<th>Juice</th>
<th>Other Applications</th>
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</thead>
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<td>Wine clarification</td>
<td>Bright beer clarification</td>
<td>Juice clarification</td>
<td>High purity water</td>
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<td>Color reduction</td>
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<tr>
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<td>Food</td>
<td>Protein</td>
<td>Sugar/Starch</td>
<td>Nutraceuticals</td>
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<td>Colloidal silica concentration</td>
<td>Lignin recovery</td>
<td>Caustic recovery</td>
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<td>Mining acid drainage treatment</td>
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<td>Indigo dye recovery</td>
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<td>Mercerization</td>
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<td>Life Sciences</td>
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<td>Fermentation broth clarification</td>
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<td>Endotoxin removal from water and processes</td>
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<td>Protein and enzyme concentration and purification</td>
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<td>Water &amp; Wastewater</td>
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<td>Wastewater treatment for discharge or reuse</td>
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<td>Tertiary UF</td>
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<tr>
<td></td>
<td>RO polishing</td>
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</tr>
</tbody>
</table>
SPIRALS

Spiral wound elements are used in applications that have relatively low suspended solids; however, the solids tolerance of spiral wound products can be expanded using different thickness or geometry of feed spacer. Spiral wound elements offer the highest membrane area packing density and most economical solution of all configurations. Spiral wound element systems have a small footprint that can handle a wide range of feed volumes and materials. This membrane configuration can utilize the complete range of membrane pore size (RO, NF, UF and MF). The specific membrane selection is made based on the required separation properties.

HOLLOW FIBER

Hollow fiber cartridges are used in applications with a moderate level of suspended solids. The fiber lumen (inner diameter) can be adjusted to increase the suspended solids tolerance of the cartridge. While larger diameter fibers provide flexibility of processing high solids fluids, this also results in reduction of membrane area per cartridge and membrane packing density. The hollow fiber configuration has a unique structure, allowing operation under permeate back-pressure and back-flushing. As a result, flux and rejection during production and cleaning steps are more easily controlled. KSS offers a variety of UF and MF hollow fiber products to handle a wide range of process applications. The matrix of hollow fiber products offered by KSS demonstrates a wide range of pore and cartridge sizes, providing flexibility to handle small, as well as large feed volumes.

TUBULAR

Tubular modules are used in applications that require handling extreme levels of suspended solids. With the use of tubular modules, up to 90% concentration of suspended solids can be achieved. As a result of the high suspended solids tolerance, tubular modules have more moderate membrane areas; however, larger size modules have been developed to compensate for this and to accommodate large feed volumes. KSS offers tight UF and tight MF/loose UF membrane pore sizes. These products are offered in ½” and 1” membrane diameters to handle a wide range of process applications.
Spiral Wound Element Construction and Operation

A) Permeate Tube with Collection Holes
B) Feed Solution In
C) Permeate Out
D) Feed Flow Across Feed Channel Spacer
E) Permeate Carrier
F) Membrane
G) Feed Channel Spacer
H) Permeate Flow After Passage Through Membrane into Permeate Carrier
I) Outer Wrap/Shell
J) Retentate Flow
Koch Separation Solutions has been a leading supplier of spiral wound elements for more than 35 years. KSS (formerly ABCOR, Inc.) started manufacturing spiral wound UF and MF elements in 1980. In 1998, KSS acquired FLUID SYSTEMS Corporation to round out our spiral wound element portfolio to include RO and NF elements. In addition to different membrane types, KSS offers a number of different spiral configurations to best suit different applications: sanitary net-wrap, Dairy-Pro®, XL-1000, FRP, SelRO®, KPAK® PLUS, SPIRAPAK PLUS and SPIRAPRO.

With more than 12 different chemistries comprising more than 300 different unique spiral parts, KSS offers a wide range of spiral wound elements to meet your needs. Whether it is for caustic and acid recovery using SelRO elements, electrocoat paint recovery using KPAK PLUS modules, milk and whey processing using Dairy-Pro elements, or meeting pharmaceutical standards using SPIRAPRO elements, KSS has the product for you.
Sanitary Spiral Wound Elements

Sanitary net-wrap elements are used in a variety of applications that require complete cleaning and sanitization. These elements are designed to facilitate easy cleaning and conform with manufacturing practices and regulation in the sanitary field.

- **Dairy-Pro® sanitary spiral wound elements** are an enhancement of KSS’ standard sanitary net-wrap elements. While the Dairy-Pro elements continue to be designed to meet the sanitary and regulatory requirements of the dairy industry, they offer additional benefits to dairy customers, such as increased productivity, reduced energy usage, improved blister-resistance, expanded CIP capabilities and higher operating pressure capability.

- **XL-1000 sanitary spiral wound elements** were developed for difficult applications that operate at extreme solids concentrations, high viscosity, increased pressure drop or higher operating temperatures. KSS’ patented fused-fold technology offers the most durable and cleanest fold protection in the industry, using advanced construction techniques to enhance the element life.

- **HpHT sanitary spiral wound elements** are High pH and High Temperature tolerant. With capability of routine cleaning up to a pH of 12.5 and temperature up to 185°F (85°C). HpHT elements can be effectively cleaned without the use of chlorine. The expanded operating limits of these elements can also allow processing at higher temperature than non-HpHT sanitary elements.

- **SPIRAPRO sanitary spiral wound ultrafiltration elements** are used in pharmaceutical applications that require strict quality certificates along with change notification. The construction of the elements meets the same standards as the sanitary net-wrapped elements. All raw materials from the elements have passed USP Class VI extractables testing.

Industrial Spiral Wound Elements

Most industrial spiral wound elements use FRP (fiberglass reinforced plastic) outer-wrap. FRP elements are designed to operate where sanitary design is not required. FRP elements have integral ATDs (anti telescoping devices) with a brine seal that limits the amount of by-pass flow around the element to maximize crossflow through the element. For example, in the electrocoat market, KSS offers FRP drop-in replacement spirals.

- **SelRO® elements** were developed to handle extreme acid and caustic conditions and high temperature, up to 158°F (70°C). SelRO elements can tolerate 37% HCl, 5% HNO₃, 15% H₂SO₄, 20% H₃PO₄, 20% NaOH and 10% KOH. SelRO elements are available in both FRP and sanitary net-wrapped configurations.

- **KPAK® PLUS spiral wound ultrafiltration modules** were developed for the recovery and treatment of electrocoat paint. This spiral configuration includes an integral shell with victaulic style connections that simplifies system design and module change-out. KPAK PLUS modules use KSS’ charged UF membrane that has been the industry standard membrane for electrocoat paint recovery for almost 30 years, to provide customers with high productivity, stable flux and superior permeate quality.

- **SPIRAPAK PLUS spiral wound ultrafiltration modules** are used for both electrocoat paint recovery and oily water treatment. The module contains an integral shell with permeate and process connections for easy installation and removal from the system.
<table>
<thead>
<tr>
<th>Membrane Type</th>
<th>MWCO/Pore Size</th>
<th>Membrane Material</th>
<th>Product Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO</td>
<td>RO</td>
<td>TFC®</td>
<td>Dairy-Pro® RO</td>
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<tr>
<td>HRX</td>
<td>RO</td>
<td>TFC</td>
<td>RO</td>
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<tr>
<td>SR4</td>
<td>150 Dalton</td>
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<td>NF</td>
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<td>200 Dalton</td>
<td>Composite</td>
<td>pH stable NF</td>
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**Spiral Configuration**

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<tr>
<th>Feed Spacer Size Options</th>
<th>Permeate Tube Options</th>
<th>Outer wrap Options</th>
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<tbody>
<tr>
<td>G = 28 mil</td>
<td>Y = Polysulfone</td>
<td>V = Full Fit</td>
</tr>
<tr>
<td>L = 30 mil</td>
<td>S = Stainless steel</td>
<td>T = Tailed</td>
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<tr>
<td>N = 31 mil</td>
<td>N = Noryl</td>
<td>HN = Hard overwrap</td>
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<td>V = 46 mil</td>
<td>P = PVC</td>
<td>P = PVC</td>
</tr>
<tr>
<td>Z = 57 mil</td>
<td></td>
<td>F = Hard overwrap</td>
</tr>
<tr>
<td>H = 62 mil</td>
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<td></td>
</tr>
<tr>
<td>F = 80 mil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A = 80 mil (Ladder)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = 100 mil</td>
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<td></td>
</tr>
<tr>
<td>E = 135 mil</td>
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</table>

<table>
<thead>
<tr>
<th>Spiral Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter Options</td>
</tr>
<tr>
<td>25 = 2.5&quot;</td>
</tr>
<tr>
<td>38 = 3.8&quot;</td>
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<tr>
<td>40 = 4.0&quot;</td>
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<tr>
<td>43 = 4.3&quot;</td>
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<td>63 = 6.3&quot;</td>
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<tr>
<td>64 = 6.4&quot;</td>
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<tr>
<td>78 = 7.8&quot;</td>
</tr>
<tr>
<td>83 = 8.3&quot;</td>
</tr>
<tr>
<td>107 = 10.7&quot;</td>
</tr>
</tbody>
</table>

Note: Not all combinations available. Refer to product datasheets for details.
Hollow Fiber Cartridge Construction and Operation

A) Process Feed Flow
B) Retentate Flow
C) Permeate Flow
D) Inside-Out Hollow Fiber Membranes
E) Polysulfone or PVC Shell
When it was acquired by KSS in 1992, ROMICON® had already been making hollow fiber since 1975. KSS still uses the brand name ROMICON for our hollow fiber cartridges because of its long-history of high quality. KSS’ ROMIPRO hollow fiber cartridges are used in life sciences market applications that require strict quality certificates along with USP Class VI validation.

KSS’ hollow fiber product line includes nine different membrane chemistries, nine different cartridge sizes and seven different lumen sizes comprising more than 125 unique products. KSS’ hollow fiber modules can meet your needs whether it is for wine clarification using WINEFILTER cartridges, citrus juice debittering using ROMICON citrus cartridges or vinegar clarification using vinegar cartridges.
Hollow Fiber Products

Hollow Fiber Cartridges

Hollow fiber cartridges are used in a variety of applications that require complete cleaning and sanitization, ability to backflush the membrane to maintain productivity, and can be tested for product integrity. Hollow fiber cartridges are designed to facilitate easy operation and conform with manufacturing practices and regulation in the food, beverage, biotech and the pharmaceutical markets.

- **ROMICON® hollow fiber cartridges** are widely used in the industry for general separations. ROMICON cartridges were designed to provide wide range of separation properties to attain the different needs of the food, beverage and biotech markets.

- **ROMIPRO hollow fiber cartridges** were developed to meet requirements of the pharmaceutical industry. All ROMIPRO cartridge components have passed USP Class VI test guidelines and each cartridge ships with a Certificate of Quality.

- **Vinegar hollow fiber cartridges** provide excellent separation characteristics for vinegar filtration. Cartridges were designed to handle the acidic environment of vinegar process liquids. Cartridges are available with different fiber diameters and pore sizes, to ensure high filtration yield with low risk of fiber plugging, easy cleaning and conformity with food processing regulations and practices.

- **CITRUS hollow fiber cartridges** provide excellent separation characteristics for citrus juice filtration. Cartridges are available with wide channel fiber diameter to handle high solids concentration and achieve high filtration yield with low risk of fiber plugging, easy cleaning and conformity with food processing regulations and practices.

- **WINEFILTER hollow fiber cartridges** offer advanced crossflow filtration, helping wineries produce high quality wines. KSS WINEFILTER cartridges are well known for the production of clarified and stabilized product, full of aromas and rich in color. The microfiltration WINEFILTER membrane was optimized to maintain the unique character of each type of wine, producing clear and stable red, white and rosé wines without using additives.

- **BEERFILTER hollow fiber cartridges** utilize an advanced microfiltration hollow fiber membrane optimized to remove only undesirable suspended solids without affecting bitterness, aroma, color, taste or foam stability of the final product while providing a shelf-stable product. KSS BEERFILTER cartridges produce consistent, high quality bright beer from start to end of the filtration run.
## Membrane Characteristics

<table>
<thead>
<tr>
<th>Membrane Type</th>
<th>Pore Size</th>
<th>Membrane Material</th>
<th>Product Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM5</td>
<td>5,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>PM10</td>
<td>10,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>PM30</td>
<td>30,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>PM50</td>
<td>50,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>PM100</td>
<td>100,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>PM500</td>
<td>500,000 Dalton</td>
<td>Polysulfone</td>
<td>General use UF</td>
</tr>
<tr>
<td>ROMIPRO PM5</td>
<td>5,000 Dalton</td>
<td>Polysulfone</td>
<td>Pharma/Bio filtration UF</td>
</tr>
<tr>
<td>ROMIPRO PM10</td>
<td>10,000 Dalton</td>
<td>Polysulfone</td>
<td>Pharma/Bio filtration UF</td>
</tr>
<tr>
<td>ROMIPRO PM30</td>
<td>30,000 Dalton</td>
<td>Polysulfone</td>
<td>Pharma/Bio filtration UF</td>
</tr>
<tr>
<td>ROMIPRO PM100</td>
<td>100,000 Dalton</td>
<td>Polysulfone</td>
<td>Pharma/Bio filtration UF</td>
</tr>
<tr>
<td>ROMIPRO PM500</td>
<td>500,000 Dalton</td>
<td>Polysulfone</td>
<td>Pharma/Bio filtration UF</td>
</tr>
<tr>
<td>CITRUS PM10</td>
<td>10,000 Dalton</td>
<td>Polysulfone</td>
<td>Citrus filtration UF</td>
</tr>
<tr>
<td>CITRUS PM50</td>
<td>50,000 Dalton</td>
<td>Polysulfone</td>
<td>Citrus filtration UF</td>
</tr>
<tr>
<td>CITRUS PM500</td>
<td>500,000 Dalton</td>
<td>Polysulfone</td>
<td>Citrus filtration UF</td>
</tr>
<tr>
<td>VINEGAR PM50</td>
<td>50,000 Dalton</td>
<td>Polysulfone</td>
<td>Vinegar filtration UF</td>
</tr>
<tr>
<td>VINEGAR PM500</td>
<td>500,000 Dalton</td>
<td>Polysulfone</td>
<td>Vinegar filtration UF</td>
</tr>
<tr>
<td>WINEFILTER</td>
<td>0.2 micron</td>
<td>Polysulfone</td>
<td>Wine filtration MF</td>
</tr>
<tr>
<td>BEERFILTER</td>
<td>0.6 micron</td>
<td>Polysulfone</td>
<td>Beer filtration MF</td>
</tr>
<tr>
<td>XM50</td>
<td>50,000 Dalton</td>
<td>Polyacrylonitrile</td>
<td>Oil/water separation UF</td>
</tr>
</tbody>
</table>

### Fiber Diameter

<table>
<thead>
<tr>
<th>Fiber ID</th>
<th>Diameter Options</th>
<th>Length Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mil</td>
<td>10 = 1.0&quot;</td>
<td>18 = 18&quot;</td>
</tr>
<tr>
<td>43 mil</td>
<td>30 = 3.0&quot;</td>
<td>25 = 25&quot;</td>
</tr>
<tr>
<td>45 mil</td>
<td>50 = 5.6&quot;</td>
<td>41 = 41&quot;</td>
</tr>
<tr>
<td>52 mil</td>
<td>60 = 6.0&quot;</td>
<td>43 = 43&quot;</td>
</tr>
<tr>
<td>60 mil</td>
<td>60 = 60&quot;</td>
<td></td>
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<tr>
<td>75 mil</td>
<td>62 = 62&quot;</td>
<td></td>
</tr>
<tr>
<td>106 mil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Not all combinations available. Refer to product datasheets for details.
Tubular Modules
Construction and Operation

A) Process Feed Flow
B) Retentate Flow
C) Permeate Flow
D) Tubular Membranes
E) Polysulfone, PVC or CPVC Shell
KSS (formerly ABCOR, Inc.) has been a supplier of tubular products since we started manufacturing them in the early 1970’s. KSS offers tubular products with either ¼” or 1” diameter to handle applications with different levels of suspended solids. These tubes go into several different types of modules: SUPER-COR®, SUPER-G®, ULTRA-COR, FEG PLUS and INDU-COR. Different configuration and size modules allow KSS to select the most suitable product for each specific application to meet our customer’s needs.

With five different membrane chemistries comprising more than 30 unique products, KSS offers a wide range of polymeric tubular modules. KSS’ tubular modules can meet your needs whether it is for juice clarification using SUPER-COR modules, wine lees and juice must recovery using SUPER-G modules, electrocoat paint recovery using ULTRA-COR modules or colloidal silica concentration using FEG PLUS modules.
Food Grade Tubular Modules

Food grade tubular modules are used when fluids with high suspended solids need to be filtered. KSS tubular membranes are made of sturdy polymeric materials, serving in a variety of applications in the food and beverage markets. All modules are designed to facilitate easy operation and effective cleaning, and conformity with manufacturing practices and regulation for the food and beverage markets. Food grade tubular modules are widely used in the beverage industry, filtering a variety of juices, such as apple, cranberry, Açai, pomegranate, citrus, raspberry, cherry, and grape, as well as wine lees and beer tank bottoms.

- **SUPER-COR® tubular modules** utilize ½” tubules in a multi-tubular module design. SUPER-COR modules are available in small and large diameter and length, to best fit every client, from small boutique juice manufacturers to large juice production facilities. SUPER-COR modules are available with different pore size membranes, for light or dark juice filtration, ensuring that only turbidity is removed, while color, flavor and aroma of the juice are maintained.

- **SUPER-G® tubular modules** utilize wide channel 1” tubules in a multi-tubular module design to allow producers to squeeze the last drop of juice or wine and increase production yield. SUPER-G modules are available in small and large module diameters as well as with different pore size membranes, for light or dark juice filtration, ensuring that only turbidity is removed, while color, flavor and aroma of the filtered juice are maintained.

Industrial Tubular Modules

Industrial tubular modules are used when fluids with high suspended solids or high viscosity need to be filtered in the chemical industry, where they are used for purification and concentration of slurries and other high value products. KSS tubular membranes are made of sturdy polymeric materials for consistent and easy operation. KSS industrial tubular modules exhibit high packing density design and long membrane life, minimizing energy consumption and reducing footprint. Coupled with long membrane life, these products provide an overall low life cycle cost in the most demanding applications.

- **ABCOR® ULTRA-COR tubular modules** consist of a bundle of seven ½” diameter ultrafiltration membranes packed in a one-inch PVC shell. This product can handle elevated concentrations of suspended solids without sacrificing membrane area. The ULTRA-COR product is ideal for applications such as metal hydroxide concentration, electrocoat paint and other industrial streams.

- **ABCOR® FEG PLUS tubular modules** exhibit wide pH and temperature range, allowing them to easily manage high-suspended solids without plugging. These 1” diameter membrane tubes offer a robust design, with excellent mechanical and chemical resistance properties. Available in neutral or negatively-charged PVDF chemistries, they demonstrate high flux and easy cleaning in applications such as colloidal silica and kaolin clay concentration, latex concentration, ink and pigment processing and metal finishing separations.
### Module Configuration

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Module Diameter</th>
<th>Module Length</th>
<th>Tube Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPER-COR®</td>
<td>3.0”</td>
<td>10’</td>
<td>½”</td>
</tr>
<tr>
<td>SUPER-COR XL</td>
<td>3.0”</td>
<td>12’</td>
<td>½”</td>
</tr>
<tr>
<td>SUPER-COR XL PLUS</td>
<td>4.3”</td>
<td>12’</td>
<td>½”</td>
</tr>
<tr>
<td>SUPER-G®</td>
<td>3.0”</td>
<td>10’</td>
<td>1”</td>
</tr>
<tr>
<td>SUPER-G PLUS</td>
<td>4.3”</td>
<td>10’</td>
<td>1”</td>
</tr>
<tr>
<td>ULTRA-COR</td>
<td>1.0”</td>
<td>10’</td>
<td>½”</td>
</tr>
<tr>
<td>FEG PLUS</td>
<td>1.0”</td>
<td>10’</td>
<td>1”</td>
</tr>
<tr>
<td>INDU-COR</td>
<td>4.3”</td>
<td>10’</td>
<td>½”</td>
</tr>
</tbody>
</table>

Note: Not all combinations available. Refer to product datasheets for details.

### Membrane Characteristics

<table>
<thead>
<tr>
<th>Membrane Type</th>
<th>Pore Size</th>
<th>Membrane Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFM-180</td>
<td>100,000 Dalton</td>
<td>PVDF</td>
</tr>
<tr>
<td>HFM-513</td>
<td>500,000 Dalton</td>
<td>PVDF</td>
</tr>
<tr>
<td>HFM-500</td>
<td>100,000 Dalton</td>
<td>PVDF</td>
</tr>
<tr>
<td>HFM-251</td>
<td>100,000 Dalton</td>
<td>PVDF</td>
</tr>
<tr>
<td>HFP-276</td>
<td>120,000 Dalton</td>
<td>PVDF</td>
</tr>
</tbody>
</table>

Note: Not all combinations available. Refer to product datasheets for details.
Quality Overview

KSS commitment to quality is not only reflected in the products and services we provide, but in our strategic decision to implement a Quality Management System (QMS) registered to ASQ/ANSI/ISO 9001. KSS has a long history with ISO 9001, first becoming registered in 1995 to this International Standard and maintaining registration right up through today. The KSS Total Quality Management approach provides the structure and foundation for improving the overall effectiveness and performance of the organization. Our quality management system further enhances our ability to meet the requirements, needs and expectations of our customers and stakeholders.

The KSS quality management system is well documented and controlled to ensure communication of intent and consistency of action. Our production processes incorporate Lean Manufacturing methodology to improve our operational efficiency and productivity. KSS is committed to “quality at the source” where strict quality controls aligned with industry standards are implemented at every step of the production process, from raw material to finished product. Statistical process controls are incorporated for vital tests to ensure control of our processes and conformity of product. KSS has trained and empowered all of our employees to take responsibility for their safety and the quality and on-time delivery of our products and services.

Regulatory Information

- **U.S. CFR Title 21**: Title 21 of the U.S. Code of Federal Regulations (CFR) contains regulations issued by the U.S. Food and Drug Administration (FDA). KSS products used for processing foods and beverages comply with Title 21 as indicated in KSS datasheets. More specifically they comply with Parts 170-199 of Title 21 Subchapter B Food for Human Consumption, which list permitted food additives and associated restrictions. FDA compliance of KSS products is supported by supplier component evaluations, testing, and third-party legal opinions. Abbreviated versions of the legal opinions are available to KSS customers on request.

- **EC Reg. Nos. 1935/2004 and 10/2011**: These regulations were issued by the European Union (EU) and pertain to materials and articles intended to come into contact with food. KSS products used for processing foods and beverages comply with 1935/2004 and 10/2011 as indicated in KSS datasheets and supported by supplier component evaluations, testing, and third-party legal opinions. EU Declarations of Compliance and abbreviated versions of the legal opinions are available to KSS customers on request.

- **Halal**: Halal means “permitted” for food according to Islamic laws. KSS products used for processing foods have been Halal-certified by a third-party organization as indicated in KSS datasheets. Halal product certifications are available to KSS customers on request.

- **3-A Sanitary Standards**: Developed by 3-A Sanitary Standards, Inc. in collaboration with the U.S. Department of Agriculture (USDA) and other organizations, these standards provide criteria for material selection, design, and fabrication of dairy processing equipment. The USDA Agricultural Marketing Service (AMS) uses them in conjunction with their voluntary inspection and grading service to determine whether equipment is suitable for use in a dairy. KSS products used for dairy processing are typically designed to be compliant with applicable 3-A Sanitary Standards, including Standard 45-03 Crossflow Membrane Modules.

- **USP**: The U.S. Pharmacopeia (USP) is a compilation of drug manufacturing standards developed by the U.S. Pharmacopoeia Convention. KSS ROMIPRO and SPIRAPRO product components have been tested and certified by a third-party lab to meet the USP Class VI Biological Test for Plastics and Elution Test.

- **Electrocoat Materials of Construction Exclusion**: KSS designs its Electrocoat Paint Ultrafiltration systems per KSS equipment specification “ELECTROCOAT SYSTEM MATERIALS OF CONSTRUCTION EXCLUSION” to help ensure that all purchased components are free of silicone and certain metals that could cause paint coating defects.
About Koch Industries

Based in Wichita, Kansas, Koch Industries, Inc. is one of the largest private companies in America, with estimated annual revenues as high as $110 billion, according to Forbes. It owns a diverse group of companies involved in refining, chemicals, and biofuels; forest and consumer products; fertilizers; polymers and fibers; process and pollution control systems; electronics, software and data analytics; minerals; glass; automotive components; ranching; commodity trading; and investments.

Since 2003, Koch companies have invested nearly $105 billion in growth and improvements. With a presence in 60 countries, Koch companies employ more than 130,000 people worldwide, with about 67,000 of those in the United States. From January 2009 to present, Koch companies have earned more than 1,300 awards for safety, environmental excellence, community stewardship, innovation, and customer service.

Koch Engineered Solutions Group

- EFT Analytics
- Genesis Robotics and Motion Technologies
- John Zink Hamworthy Combustion
- Koch-Glitsch
- Koch Knight
- Koch Heat Transfer
- Koch Project Solutions
- Koch Separation Solutions
- Koch Specialty Plant Services
- Optimized Process Designs
- Sentient Energy