



SEITZSCHENK® — THE TECHNOLOGY

LEADER IN DEPTH FILTERS



*SUPRAdisc® modules and VELAdisc™ housings offer an enclosed form of the depth filter media to simplify filter changeout and minimize system downtime.*



*NIRO™ Plate & Frame Filter Presses*

## *Table of Contents*

<i>3</i>	<i>The Global Leader in Depth Filters for More Than 100 Years</i>
<i>4</i>	<i>The Mechanisms of Depth Filtration</i>
<i>5</i>	<i>Depth Filter Development</i>
<i>6</i>	<i>Retention Characteristics</i>
<i>7</i>	<i>Filter Selection</i>
<i>8</i>	<i>Performance Characteristics</i>
<i>9</i>	<i>K® Series</i>
<i>10</i>	<i>HS™ Series</i>
<i>12</i>	<i>T™ and P™ Series</i>
<i>14</i>	<i>SUPRAdur®</i>
<i>15</i>	<i>IR Series</i>
<i>16</i>	<i>PVPP Series</i>
<i>17</i>	<i>AKS™ Series</i>
<i>18</i>	<i>PERMAdur® and D400</i>
<i>20</i>	<i>Technical Data</i>
<i>22</i>	<i>Selection Guidance</i>

*More than 100 years ago, in 1887, SeitzSchenk developed first effective microfilter. Since then, we have continued to lead the way with new advancements in depth filter technology.*

*Worldwide, SeitzSchenk is synonymous with technological innovation and high quality, dependable depth filtration products.*

A NEW DEFINITION FOR STATE-OF-THE-ART:

At SeitzSchenk, the development of depth filters has always involved on-going cooperation with our customers.

**The SeitzSchenk Advantage**

You have always been able to depend on our depth filters for:

- Efficiency
- Easy Handling
- Cost Effectiveness
- High Reliability
- Consistent Quality

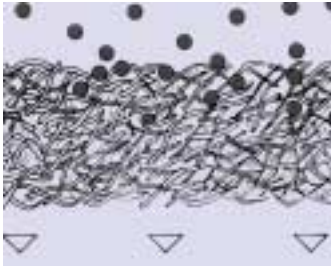
Through extensive field tests in a wide range of applications, SeitzSchenk has established the optimal balance between special cellulose grades and specific inorganic filter aids. This balance, along with the addition of polymers to provide a positive ZETA potential and other proprietary manufacturing parameters, all combine to create a new generation of depth filters. SeitzSchenk depth filters have evolved over the years to provide higher flow rates, greater dirt-holding capacity, negligible filter media migration, minimal edge leakage and longer on-stream life than competitive products.

Globally, SeitzSchenk continues to prove why it is the leader in depth filter technology.



*All SeitzSchenk depth filters are available in both SUPRADisc and sheet form*

**SEITZSCHENK DEPTH FILTER  
MICROSCOPIC ENTRAPMENT  
STRUCTURE OF A DEPTH FILTER**

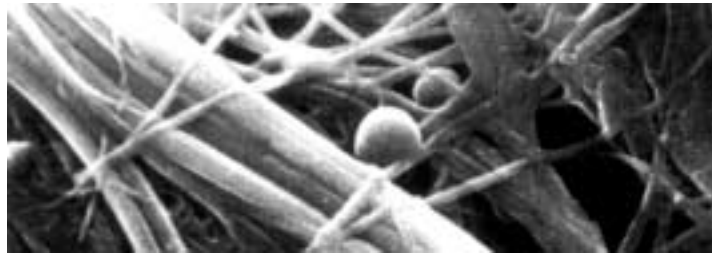


The microscopic pore structure of a SeitzSchenk depth filter is an extremely fine, three-dimensional sieve. It contains numerous, branched micro-channels to mechanically capture contaminant. SeitzSchenk depth filters contain 70 to 85 percent void volume, a significant amount of space to trap contaminants. The void volume of a SeitzSchenk depth filter can be as high as 4 liters per square meter of filter area. The design of SeitzSchenk depth filters translates to economic value for our customers, providing extremely high contaminant holding capacity, high flow rates and long on-stream life.

In addition to mechanical removal of contaminants, most grades of SeitzSchenk depth filters use electrokinetic attraction to enhance

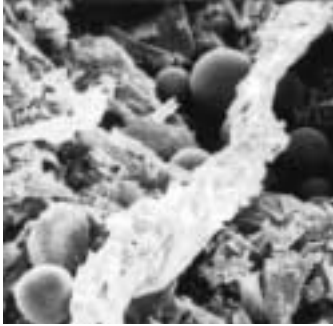
retention. Synthetic polymers are added to many formulations to create a positive ZETA potential within the filter media. Through the use of dual capture mechanisms, sieving and adsorption, SeitzSchenk depth filters provide a filtration matrix that is highly efficient at removing both particles and specific impurities from the process stream.

To optimize adsorption, a liquid should pass through the innumerable channels at a specific flow rate, maximizing contact time with the filter media. Particles, microorganisms, colloids, virus and endotoxins are trapped on their long passage through the fine maze. The synergy between the three dimensional filter and its ZETA potential provides enhanced removal of the impurities and particles.



*Test particles with a diameter of 1.05 and 1.45 μm trapped in the three-dimensional screen of a depth filter. (magnification 9500x)*

FACTORS THAT INFLUENCE MECHANICAL RETENTION		FACTORS THAT INFLUENCE ADSORPTIVE RETENTION	
FLUID	FILTER	FLUID	FILTER
Type of contaminant	Contaminant holding capacity	Fluid chemistry	Pore structure and size distribution
Contaminant size and concentration	Pore structure and size distribution	Contaminant charge	Number of charged sites
Viscosity	Raw material quality	Contaminant concentration	Nature of the charge carriers
Fluid chemistry	Media thickness	Fluid pH	Charge intensity
	Composition	Filtration flow rate	Polarity of the charge carriers
		Process temperature	



*Matrix of a tight cellulose fiber aggregation mixed with fine diatomaceous earth*

**THE EARLY YEARS OF DEPTH FILTER TECHNOLOGY:**

**Advantages**

- Adequate impurity and particle retention
- Adequate organism reduction

**Disadvantages**

- Low internal surface area because of the relatively large fiber dimension
- High edge leakage
- Premature blocking in liquids with high dirt loads



*Matrix of an agglomeration with the addition of synthetic polymers to form a high ZETA potential*

**THE MIDDLE YEARS:**

**Advantages**

- Positive ZETA potential achieved by the addition of synthetic polymers
- Increased adsorption and screening capabilities

**Disadvantages**

- Low internal surface area
- Potential breakthrough of impurities, particles and microorganisms if flow rate fluctuates during use
- Excessive binding of color and active ingredients to filter media
- High edge leakage



*Matrix of an agglomeration of specially upgraded cellulose fibers*

**STATE-OF-THE-ART DEPTH FILTER TECHNOLOGY TODAY:**

**Advantages**

- Large internal surface area achieved by SeitzSchenk specific upgrade to the cellulose fibers used in our formulations
- Formation of a consistent ZETA potential achieved by selective addition of synthetic polymers
- Best possible combination of all material and process parameters

MAXIMUM RETENTION EFFICIENCY:

SeitzSchenk depth filters have:

- High retention capacity due to extremely fine fibers
- Positive ZETA potential in polar liquids

With the exception of some special grades, SeitzSchenk depth filters are positively charged. This positive charge retains negatively-charged particles from the filtered product and enhances the depth filter's contaminant removal efficiency from a wide range of process fluids.

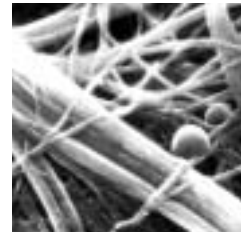
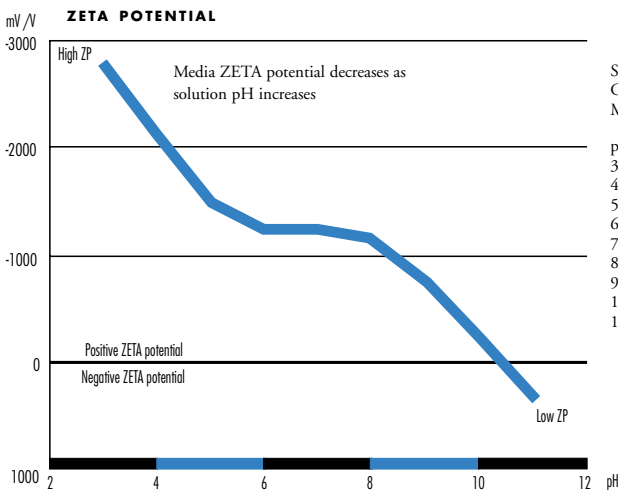
The depth filter charge is finely adjusted to prevent retention of color components and effective substances. With product line choices from nine filter sheet series, the SeitzSchenk depth filter product line meets the full range of process filtration requirements.

CHARACTERISTIC RETENTION RATES:

Depth filters retain solids predominantly within the depth of the matrix rather than on the surface. Compared with typical surface filtration, depth filters are characterized by much higher dirt-holding capacities and significantly longer than on-stream life. For these reasons, depth filters are indispensable in a variety of applications for beverage, food, pharmaceutical and biotech manufacturers.

Many factors influence the retention characteristics and filtration life of depth filters. Such factors include the:

- Shape and Concentration of the Contaminants
- Chemical Nature of the Contaminants
- Fluid pH
- Fluid Salt Concentration
- Content of Surface-Active Substances
- Temperature and Viscosity
- Flow Velocity
- Differential Pressure
- Continuous or Batch Process
- Prefiltration Stages



Microscopic view of the cellulose fiber filter matrix. The distinct effect of depth comes from numerous finely divided maze-like channels and cavities.



Microscopic morphology of perlite inorganic filter aid — a key ingredient in many formulations

APPLICATIONS FOR DEPTH FILTERS:

- Prefiltration of Liquid Processes
- Clarification of Sugar Syrups
- Clarification of Food Products
- Final Filtration of Liquids
- Sterile Filtration of Beverages
- Pyrogen Reduction
- Filtration of Aggressive Fluids
- Color and Taste Correction of Beverages and Syrups
- Filtration of Pharmaceutical and Biotechnology Products

Filtration requirements are determined by a combination of factors specific to each process. To achieve the best possible filtration results and maximum reliability, test runs under operational conditions are recommended.

SeitzSchenk consultants can help you obtain maximum filtration. Our applications group can evaluate your process, your filtration goals and your processing conditions. We can use this information to design and conduct filtration studies either in our laboratory or on-site. This method allows us to make the best filtration recommendation to meet your requirements.

Our fully qualified application specialists are readily available to assist you on-site to determine the best possible solution for your filtration task.

For whatever assistance you need, our consultants are near at hand. Just contact your local SeitzSchenk representative or call the number listed on the back cover.

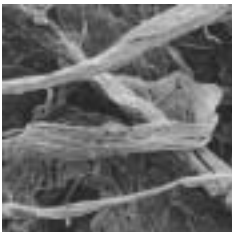
A SELECTION OF FILTERS FOR MANY NEEDS:

Filtration technology involves many facets that cannot be addressed with one single type of filter. In addition to the chemical and physical conditions affecting filtration, the filter media must be selected to meet the individual application's requirements.

SeitzSchenk offers a range of depth filters to accommodate the entire spectrum of applications.



*Microscopic morphology of diatomaceous earth*



*Microscopic morphology of polyolefin fibers*

DEPTH FILTERS	
COMMON APPLICATION	DEPTH FILTER SERIES
Standard Range Filters	K
High Flow Food and Beverage Filters	HS
Pharmaceutical and Biotech Filters	BIO®; P
General Industrial-Use Filters	T**
Filters with Very High Wet Strength	SUPRAdur**
Filters for Filtration of Spirits	IR
Filters for Chill Haze Stabilization	PVPP**
Filters Containing Activated Carbon	AKS 4, AKS 5
Reusable Supporting Filters	PERMAdur**, D400**

*\*Please refer to our BIO Depth Filter Brochure for more information.*

*\*\*Please refer to our Beer, Soft Drinks and Sweeteners Brochures for more information.*

CHEMICAL COMPATIBILITY:

SeitzSchenk depth filters show high chemical compatibility with most aqueous and organic fluids. For detailed compatibility information, please call our Application Engineering Group at 800-881-4917.

QUALITY ASSURANCE FOR ION RELEASE LEVELS:

As a standard quality assurance procedure, we use atomic absorption spectroscopy (following elutriation with 0.05 N H<sub>2</sub>SO<sub>4</sub>) to analyze every production batch of SeitzSchenk depth filters for release of relevant soluble ions.

Ion release into the filtered product is considerably lower after rinsing.

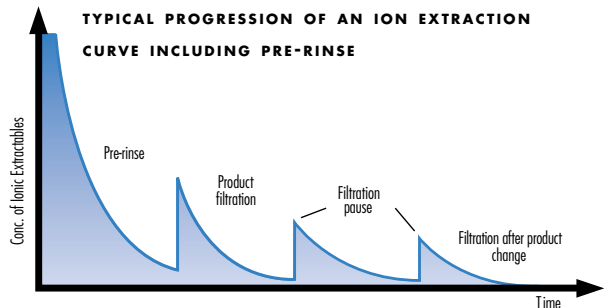
Absolute quantities are a function of the rinsing procedure, the product to be filtered and the filtration parameters, such as temperature and flow rate.

ION RELEASE FROM SEITZ-EK*						
After	Ni (ppm)	Cr (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Al (ppb)
1 Lm <sup>2</sup>	nm	nm	nm	83	16.6	17
5 Lm <sup>2</sup>	nm	nm	nm	23	4.6	12
10 Lm <sup>2</sup>	nm	nm	nm	8.8	1.8	13
20 Lm <sup>2</sup>	nm	nm	nm	2.81	0.52	14
50 Lm <sup>2</sup>	nm	nm	nm	0.72	0.12	<10
75 Lm <sup>2</sup>	nm	nm	nm	0.51	0.07	<10
100 Lm <sup>2</sup>	nm	nm	nm	0.41	0.04	<10
200 Lm <sup>2</sup>	nm	nm	nm	0.25	nm	<10

\*Pre-rinse with H<sub>2</sub>O (circulation for 20 min. at 500 L/m<sup>2</sup>/hr)  
 Medium: physiological saline solution,  
 nm = below detection limit (≤0.02 ppm)

COMPATIBILITY OF SEITZ FILTERS WITH ALKALIS AND ACIDS AT 20° AND 80° C				
Conc. %	20°C 8 hours	20°C 24 hours	80°C 8 hours	80°C 16 hours
NaOH	1	Compatible	Compatible	Compatible
	2	Compatible	Compatible	Compatible
	10	Compatible	Compatible	Compatible
	20	Compatible	Compatible	Compatible
	30	Compatible	Compatible	Compatible
HCl	1	Compatible	Compatible	Compatible
	3	Compatible	Compatible	Compatible
	5	Compatible	Compatible	Compatible
	10	Compatible	Compatible	Compatible
	20	Compatible	Compatible	Compatible
HNO <sub>3</sub>	1	Compatible	Compatible	Compatible
	5	Compatible	Compatible	Compatible
	10	Compatible	Compatible	Compatible
	20	Compatible	Compatible	Compatible
	30	Compatible	Compatible	Compatible
H <sub>2</sub> SO <sub>4</sub>	5	Compatible	Compatible	Compatible
	10	Compatible	Compatible	Compatible
	20	Compatible	Compatible	Compatible
	30	Compatible	Compatible	Compatible
	50	Compatible	Compatible	Compatible

= compatible  
 = partially compatible  
 = non-compatible



STANDARD DEPTH FILTERS FOR COARSE,  
FINE AND BIOREDUCTION FILTRATION:

SeitzSchenk depth filters contain a pronounced positive ZETA potential that forms in aqueous solutions. A depth filter's filtration performance is determined by a well-defined matrix of components. These include cellulose fibers, upgraded and finely fiberized by our unique process along with fine diatomaceous earth and perlite filter aids. Thirteen different porosities, from coarse to fine, are available.

**Depth Filter — Applications:**

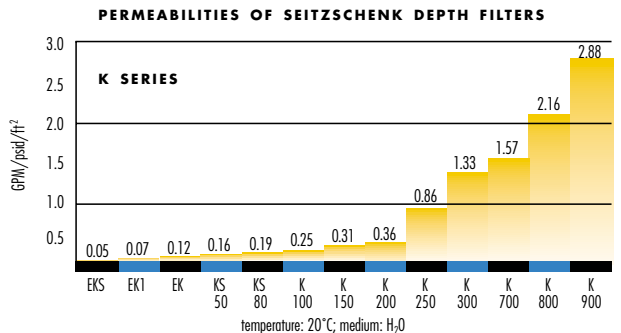
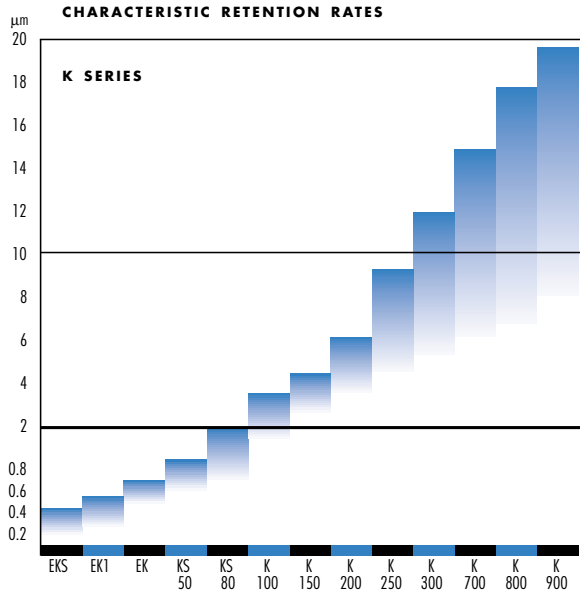
- EKS® and EK1™ — Filtration for Bioreduction of Microorganisms
- EK®, KS® 50, and KS 80 — Filtration for Removal of Yeast and Fine Particles
- K100 through 900 — Filtration of Larger Particles

Successful bioreduction filtration with depth filters begins with knowledge about the microbiological nature of the fluid. The filtration process needs to be designed and sized so that required organism removal criteria are met successfully.

When using SeitzSchenk depth filters in bioreducing applications, the differential pressure of the filter should not exceed 22 psi (1.5 bar), and flows should not exceed 12 gph/ft² (525 lph/m²). For handling difficult products, such as protein-containing products, lower operating parameters may be needed. For additional bacterial challenge results, please refer to the Technical Data section on page 21 of this brochure.

**TYPICAL ORGANISM CHALLENGE LIMITS (LRV)**

EKS	8.5	<i>B.diminuta</i>
EK1	7.5	<i>B.diminuta</i>
EK	7.0	<i>S.marcescens</i>
KS 50	6.5	<i>S.marcescens</i>
KS 80	6.0	<i>S.marcescens</i>
HS 400	7.0	<i>S.marcescens</i>
HS 600	7.0	<i>S.marcescens</i>
HS 800	6.5	<i>S.marcescens</i>
HS 1000	6.0	<i>S.marcescens</i>
SUPRA EK1P	7.5	<i>S.marcescens</i>
SUPRA 80P	5.0	<i>S.marcescens</i>
EKS P	8.5	<i>B.diminuta</i>
KS 50 P	6.5	<i>S.marcescens</i>



\*For LPM/psid/m², please see permeabilities information on chart, page 20.

FOOD AND BEVERAGE APPLICATIONS:

HS Series filter sheets are specially formulated for the filtration of foodstuffs and beverages. Our design distributes a high filter aid concentration throughout the entire depth of the filter sheet. This filter sheet series was developed for processing natural products which can exhibit widely variable filterability from batch to batch. HS Series sheets provide food and beverage manufactures with filtration flexibility.

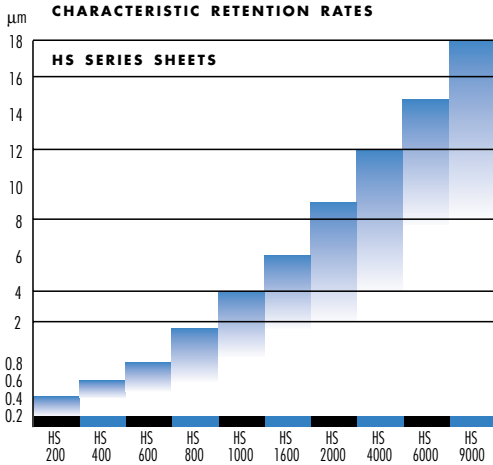
HS Series depth filters are the culmination of over 100 years experience in the filtration of beverages and foodstuffs. This sheet series offers high filter outputs at low filtration resistance pressures, giving SeitzSchenk customers dependable filtration performance in an economical way.



RECOMMENDATIONS FOR THE USE OF HS SERIES DEPTH FILTERS IN BIOREDUCTION FILTRATION							
DEPTH FILTER GRADE	RETENTION OF YEAST—LOW CHALLENGE	RETENTION OF YEAST AND BACTERIA—LOW CHALLENGE	RETENTION OF YEAST—MODERATE CHALLENGE—AS WELL AS BACTERIA—LOW CHALLENGE	RETENTION OF YEAST AND BACTERIA—MODERATE CHALLENGE	RETENTION OF YEAST AND BACTERIA—HIGH CHALLENGE	RETENTION OF YEAST AND BACTERIA—VERY HIGH CHALLENGE	RETENTION OF YEAST AND BACTERIA—EXTREME CHALLENGE
HS4000	●	—					
HS2000	●	●	—				
HS1600	○	●	●	—			
HS1000	○	○	●	●	—		
HS800	○	○	○	●	●	—	
HS600	○	○	○	○	●	●	—
HS400	○	○	○	○	○	●	●

- highly suitable
- suitable – however too tight and thus reduced life
- partially suitable – possibly too open

\* Please note:  
 Low challenge: up to approx. 250 yeast per 100 ml  
 up to approx. 50 bacteria per 100 ml  
 High challenge: from approx. 500 yeast per 100 ml  
 from approx. 300 bacteria per 100 ml



DEPTH FILTER RECOMMENDATIONS FOR THE FILTRATION OF WINE	
WINE APPLICATION	DEPTH FILTER
Prefiltration after racking	K 700
Fine filtration	K 200
Polishing filtration prior to EK	K 100
Sterilizing filtration	
normal conditions risk of bacterial spoilage extreme risk of bacteria spoilage	EK
risk of bacteria spoilage	KS 50
Membrane prefiltration	
easy to filter	KS 80
difficult to filter	KS 50
extremely difficult to filter	EK
extremely difficult to filter	KS 50
SPARKLING WINE APPLICATION	DEPTH FILTER
Cuvée – prefiltration	K 200
Cuvée – fine filtration	
– Charmat process	KS 80
– Bottle fermentation	EK
KS 50	
Finished product – prefiltration	K 200
Finished product – final filtration	KS 50
Asti spumante	EK
	KS 50

HS SERIES DEPTH FILTERS FOR BEER FILTRATION			
Differential pressure for all depth filter grades listed: up to 1.5 bar			
Flow velocities max. approx. 1.5 hL/m <sup>2</sup> /hr			
Depth filter grade	Service life in filtration hours*	Improvement of the polish in EBC units approx.*	Microbiological filtration effect
HS4000	up to approx. 150	0.02 – 0.05	Removal of yeast – low challenge
HS2000	up to approx. 110	0.03 – 0.06	Removal of yeast and bacteria – low challenge
HS1600	up to approx. 80	0.04 – 0.10	Removal of yeast – moderate challenge as well as bacteria – low challenge
HS1000	up to approx. 70	0.06 – 0.14	Removal of yeast and bacteria – moderate challenge
HS800	up to approx. 50	0.08 – 0.16	Removal of yeast and bacteria – high challenge
HS600	up to approx. 40	0.10 – 0.18	Removal of yeast and bacteria – very high challenge
HS400	up to approx. 30	0.10 – 0.20	Removal of yeast and bacteria – (i.e. polishing filtration)

\* The data quoted here are based on figures customary for production conditions in German breweries.

Please contact our Application Engineers for assistance under your operating conditions.

T SERIES: FOR GENERAL INDUSTRIAL PURPOSES

T Series depth filters are designed for general filtration applications.

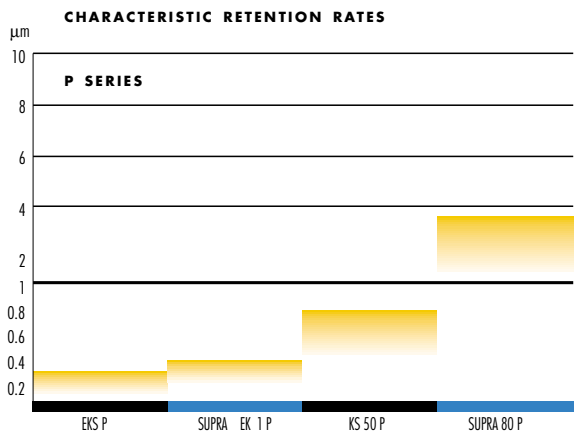
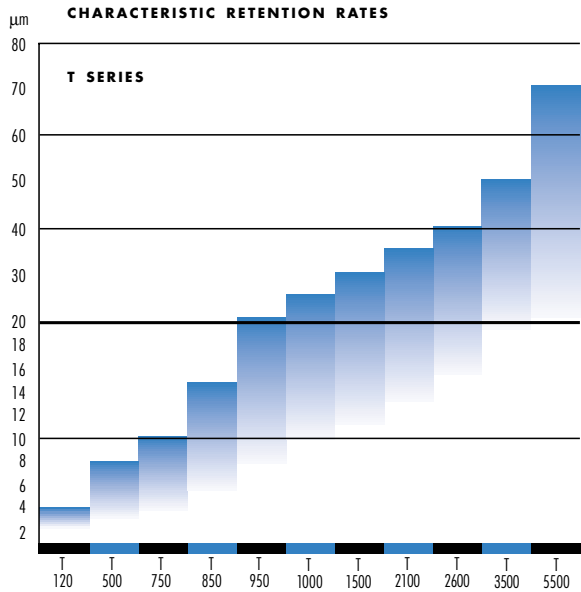
T 120 through T 950 are specifically designed for clarifying filtration. Because of their positive ZETA potential, these depth filters contain a high adsorption capacity.

T 1000 through T 5500 are for coarse filtration. These have no ZETA potential. This range of the T series is characterized by its open structure. Each grade in the T Series combines high throughput with long service life, benefits of this series' high dirt-holding capacities. These filters have proven highly successful in filtering viscous media, in retaining gel particles and in removing coarsely dispersed components. These sheets are also appropriate when low filter resistance is specified. In addition, T Series sheets are suitable as supporting material for precoat filter aid filtration in plate and frame filter presses.

P SERIES: FOR PHARMACEUTICAL APPLICATIONS

P Series depth filters are designed for use in the pharmaceutical and biotech industries.

Specific manufacturing procedures and control methods guarantee a filter material low in endotoxins. Low endotoxin content is confirmed through batch analysis using the Limulus Amoebocyte Lysate Assay procedure (LAL). Certificates documenting these results are available upon request.



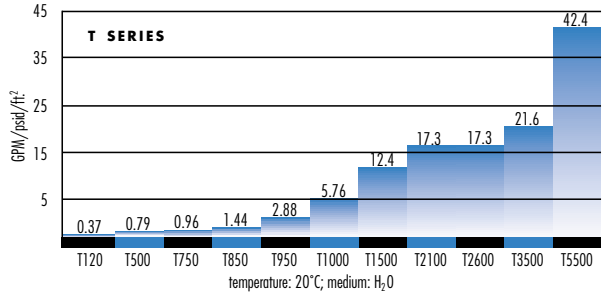
P Series physical data corresponds with the respective grades of the standard depth filter series. The EKS P media grade is the preferred choice when the goal is maximum organism reduction. KS 50 P media is an excellent prefilter for pharmaceuticals.

Two SUPRA grades, SUPRA EK1P and SUPRA 80P, contain low pyrogen levels, and are characterized by a pronounced adsorption capacity. These sheets can even reduce endotoxins in some pharmaceutical solutions. Endotoxin adsorption, however, changes with electrolytes and protein concentrations.

All P Series media grades are low in endotoxins.

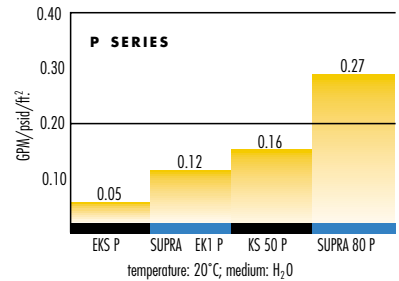


PERMEABILITIES OF SEITZSCHENK DEPTH FILTERS



\*For LPM/psid/m², please see permeabilities information on chart, page 20.

PERMEABILITIES OF SEITZSCHENK DEPTH FILTERS



\*For LPM/psid/m², please see permeabilities information on chart, page 20.

DEPTH FILTER	ENDOTOXIN CONTENT (EU/mL)		LOGARITHMIC ENDOTOXIN REDUCTION	ENDOTOXIN CHALLENGE (EU/cm²)	TOTAL ENDOTOXIN RETENTION (EU/cm²)
	UNFILTRATE	FILTRATE			
SUPRA EK1 P 60	0.06	3	282	282	
	600	<0.06	>4	3.11 x 10 <sup>3</sup>	3.11 x 10 <sup>3</sup>
	6000	<0.06	>5	3.14 x 10 <sup>4</sup>	3.14 x 10 <sup>4</sup>
	6 x 10 <sup>4</sup>	<0.06	>6	3.14 x 10 <sup>5</sup>	3.14 x 10 <sup>5</sup>
	6 x 10 <sup>5</sup>	6 x 10 <sup>5</sup>	0	3.14 x 10 <sup>6</sup>	0

Lipopolysaccharide: *E. coli* 055:B5

Filtration flow rate: 460 L/m²/hr

Endotoxin reduction:  $\frac{\text{EU/ml unfiltrate}}{\text{EU/ml filtrate}}$

Endotoxin retention:  $\frac{(\text{EU/ml unfiltrate} - \text{EU/ml filtrate}) \times \text{ml volume filtered}}{\text{cm}^2 \text{ filter area}}$

Sensitivity of reagent: 0.05 EU/ml

Medium: pure water

FOR RESISTANCE TO AGGRESSIVE CONDITIONS:

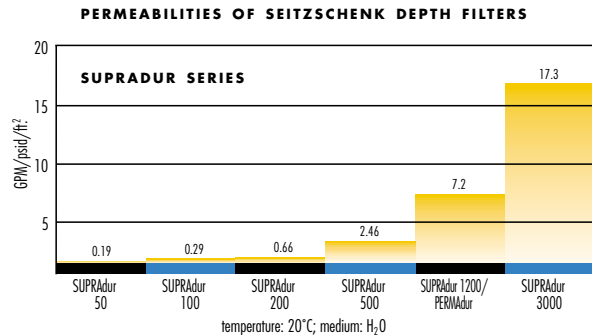
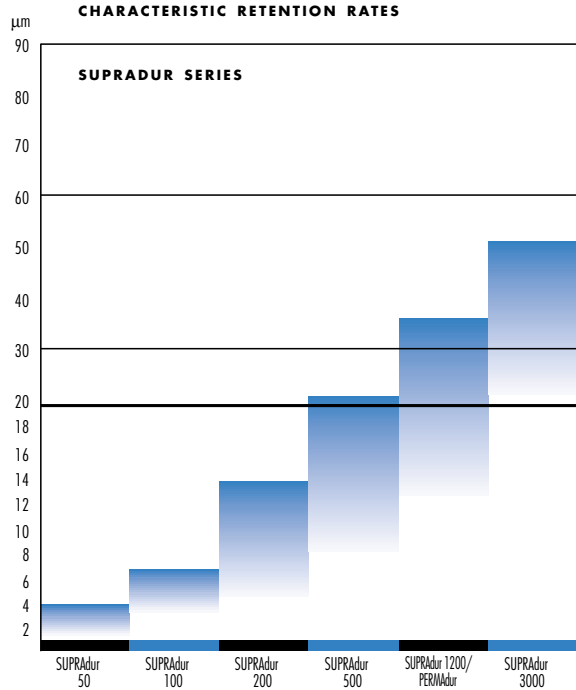
SUPRADur® Series depth filters have additional synthetic fibers for increased resistance against aggressive media such as metal tetrachlorides, acids and caustic solutions.

Besides cellulose, SUPRADur Series depth filters contain specially treated polyolefin microfibers for additional wet strength. The SUPRADur 50 grade also contains perlite. Special versions of the series (HR grades) are available without cellulose.

Other benefits of SUPRADur Series depth filters include:

- Minimal edge leakage
- Minimal ion release
- Minimal loss of active ingredients

APPLICATION POSSIBILITIES				
SUPRADur	50	100	200	500
Retention of activated carbon		■	■	■
Retention of bleaching earth			■	■
Gelatin			■	■
Yeast removal	■	■		
Catalysts	■	■		
Clear lacquers			■	■
Solvents	■	■	■	
Polishing filtration of edible oil			■	■
Ointment bases			■	■
Viscous liquids (liqueurs)			■	■
Sugar solutions			■	■



temperature: 20°C; medium: H<sub>2</sub>O  
 \*For LPM/psid/m<sup>2</sup>, please see permeabilities information on chart, page 20.

FOR SPIRITS FILTRATION:

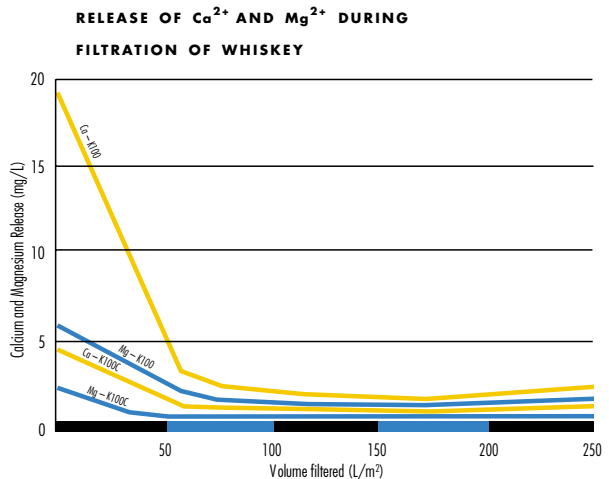
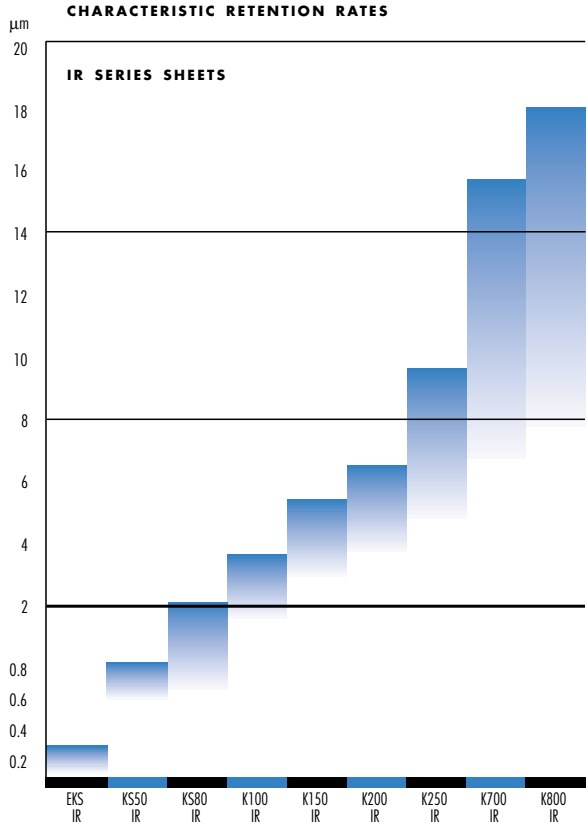
Of critical importance to distilled spirits manufacturers are the concentrations of ionic extractables released from depth filters into their distillates. The concentrations of calcium, magnesium, iron and aluminum are of particular concern, since these ions can cause precipitates in alcohol, the final product.

While calcium precipitates are known to cause instability problems in poorly buffered spirits such as vodka and gin, magnesium is especially undesirable in tannin-bearing products such as whiskey and brandy.

Standard filter sheets contain small quantities of extractable ions from the raw material. IR Series filter sheets undergo a proprietary treatment to remove alkali metals, a process that results in extremely low levels of extractable ions from IR Series sheets. IR Series filter sheets are available in the full range of micron ratings designed to fit the range of applications within spirits manufacturing.



Spirits Distillation Kettles





FOR CHEMICAL AND PHYSICAL CHILL HAZE  
STABILIZATION OF BEVERAGES

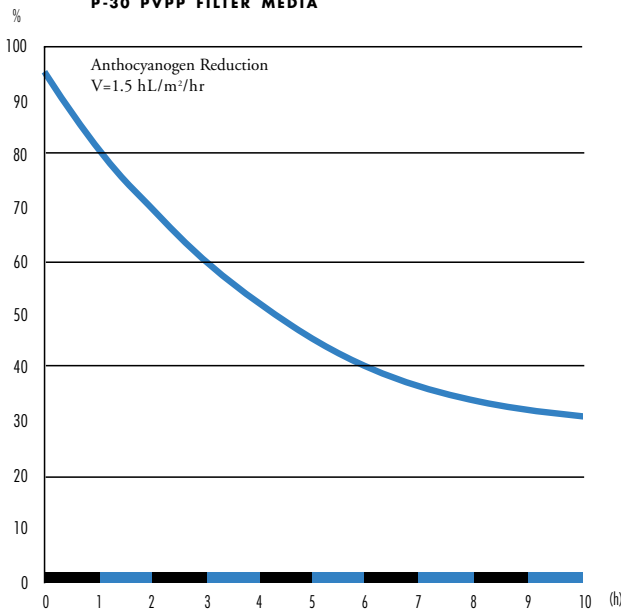
P-30 PVPP filter sheets are made from highly purified cellulose with PVPP interspersed throughout the media. This filter sheet series provides an easy to use form of this valuable filter aid without the problems and expense of PVPP dosing. Concern over filter cake stability and reliability have been overcome with the development of the SeitzSchenk PVPP filter sheet media, offering beverage manufacturers an easy-to-use form of this valuable filter aid.

PVPP chemically binds with phenolics and potential haze-forming components in the beverage being treated. The most efficient PVPP stabilization process first uses tight prefiltration aimed at preventing premature PVPP blinding from exposure to a high particulate load. The recommended flow velocity for PVPP Series filter sheets will vary with the type of beverage being filtered. In general, this velocity should range from 1.5 to 3.5 hL/m<sup>2</sup>/hr.

The beverage volume which can be stabilized during each filtration cycle averages 20 hL/m<sup>2</sup>. This volume, however, can range from 6 hL/m<sup>2</sup> to 20 hL/m<sup>2</sup> depending on the degree of stabilization required.

P-30 PVPP Series depth filters can easily be regenerated using a dilute caustic and hot water rinse. These filters have excellent regenerability, a feature that gives a very long service life and makes using these filter sheets highly economical for our customers.

ADSORPTION CAPABILITY OF  
P-30 PVPP FILTER MEDIA



Percent Reduction  
of Anthocyanogens

Initial concentration.....	95
after two hours.....	75-80
after four hours.....	60-65
after six hours.....	45-50
after eight hours.....	35-40
after ten hours.....	30-35

FOR HIGH ADSORPTION WITH ACTIVATED CARBON

SeitzSchenk AKS 4 and AKS 5 depth filters are designed for dechlorination, off-color correction, off-flavor correction and organics removal from beverages and food products. For the pharmaceutical market, AKS 5 depth filters are designed for color removal, reduction of endotoxin levels, lipid removal and reduction of PKA.

These filters have an extremely high adsorptive capacity because they contain 40 to 50 percent activated carbon in the filter sheet matrix. AKS 4 depth filters include diatomaceous to enhance filtration.

The activated carbon is integrated within the filter matrix without the use of binding agents. This maintains adsorptive capacity.

An optional carbon-tight protective paper can be applied to the outlet side of the AKS depth filters to prevent activated carbon migration into the filtrate.

SeitzSchenk recommends a filtration flow rate between 200 and 500 L/m<sup>2</sup>/hr for its AKS Series Filter Sheets.

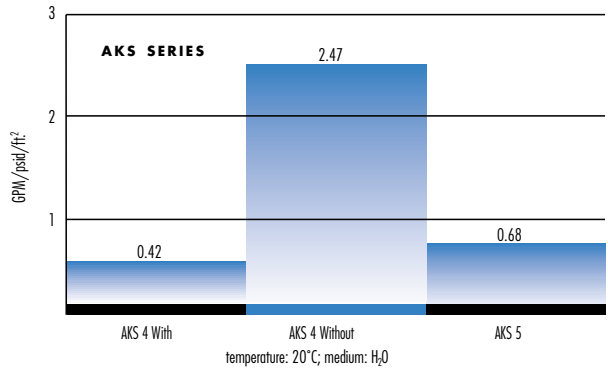
The adsorption capacity achieved with SeitzSchenk AKS depth filters is very high:

- AKS 4 >26 g/m<sup>2</sup> methylene blue
- AKS 5 >220 g/m<sup>2</sup> methylene blue



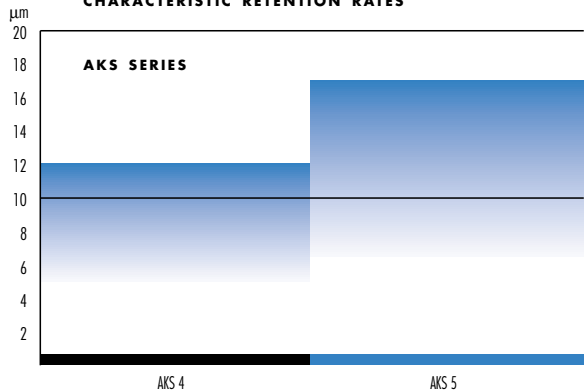
Activated carbon depth filter module

PERMEABILITIES OF SEITZSCHENK DEPTH FILTERS

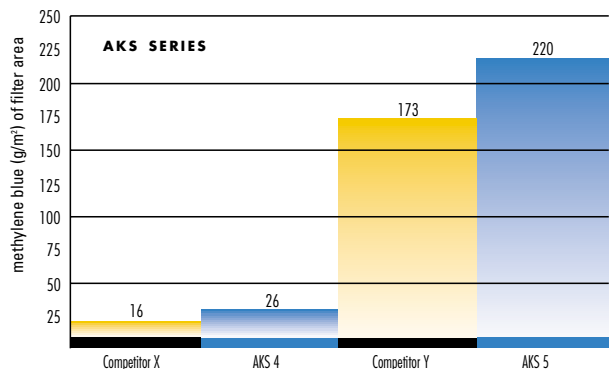


\*For LPM/psid/m<sup>2</sup>, please see permeabilities information on chart, page 20.

CHARACTERISTIC RETENTION RATES



COMPARISON OF ADSORPTIVE CAPACITY



SUPPORTING FILTERS FOR DOSED FILTER AID:

PERMAdur is a stable, reusable filter for precoat filtration in plate and frame presses. After filtration, the plate and frame is opened, and the filter cake removed, leaving the PERMAdur filter sheet ready for the next run. SeitzSchenk offers PERMAdur media in foldover or square sheet configurations.

PERMAdur sheets have a high proportion of polyolefin microfibers, making these filters particularly suited for rough operating conditions. PERMAdur sheets were developed for high wet strength, distortion resistance and durability in repeat use conditions.



*SeitzSchenk NIRO*

PERMADUR OFFERS SEVERAL FEATURES:

- Prolonged service life — up to 50 percent longer than standard sheets
- Long-term shape stability, with no swelling or growth into the eyelets of the filter equipment
- Uniform precoating, with no island formation
- Easy detachment of the filter cake

PERMAdur sheets are rugged. They maintain their durability after heat treatment, and are highly successful as depth filters for aggressive media.

PERMAdur sheets are also very efficient for filtration of viscous products with high turbid matter and gel particles, such as sugar syrups and edible oils.

APPLICATION EXAMPLES:

- Precoat Filtration with Filter Aids
- Clarifying Filtration of Sugar Syrups
- Clarifying Filtration of Edible Oils

PERMADUR DATA:

- Maximum continuous operating temperature: 90°C (195°F)
- Maximum temperature: 105°C (221°F)
- Thickness: approximately 3.5 mm
- Recommended maximum filtering velocity for liquids with a low viscosity: 2200 L/m<sup>2</sup>/hr (54 gal/ft<sup>2</sup>/hr)

PERMAdur is a patented product only available from SeitzSchenk.

D400 supporting sheets are special filter sheets with excellent wet strength, obtained through additional polymers. Both PERMAdur and D400 are made from high purity cellulose and are effective filter aid supporting sheets.





*SeitzSchenk depth filters, like all other SeitzSchenk products, are manufactured under a quality management system that is certified to meet ISO 9001 requirements.*

SAFETY APPROVALS:

The U.S. Food and Drug Administration (FDA) has registered SeitzSchenk depth filters (under the Drug Master File No. 8199) as safe to use in the pharmaceutical industry, the food industry and the beverage industry. AKS 5 depth filters pass all USP requirements for purity for use in the pharmaceutical industry. The filter material shows very low extractables content (aluminum, endotoxin) and very low deviation of pH value.

DMF registration ensures that SeitzSchenk Depth Filters and the SeitzSchenk Quality Assurance System are in conformity with FDA standards.

Test procedures for biological safety are based on current USP guidelines for plastic materials in contact with parenterals.

As an example of compliance with these procedures, the independent North American Science Associates Inc. tested EK and SUPRA-EK1 P depth filters. These filters passed the tests for:

- Acute systemic toxicity
- Intracutaneous toxicity (extraction 1 hr at 121°C)
- Safety, according to page 1182 f.

SeitzSchenk depth filters meet all the requirements of plastics class V and the requirements of filter sheets manufactured with resins according to FDA guidelines.

Our manufacturing process is also subject to constant analysis by ISEGA-Forschungs- und Untersuchungs-Gesellschaft mbH, Aschaffenburg.



TECHNICAL DATA

FILTER NAME	PH	WEIGHT BY AREA <sup>1)</sup> (g/m <sup>2</sup> )	THICKNESS <sup>1)</sup> (mm)	ASH CONTENT (%)	PERMEABILITY		BACTERIAL RETENTION LRV	CATIONS, SOLUBLE IN 0.05 N H <sub>2</sub> SO <sub>4</sub> SOLUTION <sup>2)</sup> (mg/m <sup>2</sup> ) (NOT APPLICABLE FOR LOW-ION EXECUTIONS)			
					(GPM/PSID/FT <sup>2</sup> )	(LPM/PSID/M <sup>2</sup> )		Ca <sup>2+</sup>	Mg <sup>2+</sup>	Fe <sup>2+/3+</sup>	Al <sup>3+</sup>
EKS	6.5	1400	3.7	58	0.05	2.0	8.5*	2200	<500	<75	<600
EK1	6.5	1400	3.7	51	0.07	2.8	7.5*	<1800	<500	<75	<500
EK	6.5	1350	3.7	46	0.12	4.7	7.0**	<1500	<400	<75	<400
KS 50	6.5	1350	3.7	46	0.16	6.4	6.0**	<1500	<400	<75	<400
KS 80	6.5	1350	3.7	46	0.19	7.8	6.0**	<1500	<400	<75	<400
K 100	6.5	1350	3.7	46	0.25	10.1	—	<1500	<400	<75	<400
K 150	6.5	1350	3.9	46	0.31	12.8	—	<1500	<300	<75	<400
K 200	6.5	1350	3.9	46	0.36	14.7	—	<1500	<300	<75	<400
K 250	6.5	1300	4.0	46	0.86	35.2	—	<1200	<250	<100	<300
K 300	6.5	1300	4.2	46	1.33	54.1	—	<1000	<250	<150	<300
K 700	6.5	1300	4.1	46	1.57	63.8	—	<1000	<250	<150	<300
K 800	6.5	1300	4.1	46	2.16	87.9	—	<1000	<250	<75	<300
K 900	6.5	1300	4.3	46	2.88	117.2	—	<1000	<250	<150	<300
T 120	6.5	900	2.8	43	0.37	15.0	—	<750	<200	<75	<250
T 500	6.5	850	2.7	38	0.79	32.1	—	<750	<200	<75	<200
T 750	6.5	850	2.7	40	0.96	39.0	—	<750	<200	<75	<200
T 850	6.5	850	2.7	40	1.44	58.6	—	<750	<200	<75	<200
T 950	6.5	850	2.8	40	2.88	117.2	—	<750	<200	<75	<200
T 1000	6.5	950	3.6	33	5.76	234.0	—	<800	<150	<75	<150
T 1500	6.5	850	3.7	33	12.4	502.3	—	<500	<150	<75	<150
T 2100	6.5	700	3.3	15	17.3	703.3	—	<500	<150	<75	<150
T 2600	6.5	700	2.9	<1	17.3	703.3	—	<500	<150	<30	<50
T 3500	6.5	850	4.6	15	21.6	879.1	—	<500	<150	<50	<150
T 5500	6.5	750	4.5	<1	42.4	1724.0	—	<500	<150	<30	<50
S100 <sup>3)</sup>	6.5	1500	4.0	61	0.05	2.0	8.5**	<2200	—	<10	<100
S200	6.5	1400	3.8	52	0.10	4.1	7.5**	<2500	—	<25	<125
HS400	6.5	1360	3.8	49	0.14	5.5	7.0**	<2150	—	<25	<110
HS600	6.5	1320	3.7	49	0.19	7.6	6.5**	<2100	—	<25	<105
HS800	6.5	1280	3.7	49	0.25	10.3	6.0**	<2050	—	<25	<100
HS1000	6.5	1260	3.7	48	0.34	13.8	—	<1800	—	<25	<95
HS1600	6.5	1240	3.7	48	0.47	19.0	—	<1800	—	<25	<95
HS2000	6.5	1220	3.8	48	0.68	27.6	—	<1600	—	<25	<110
HS4000	6.5	1200	3.9	46	0.93	37.9	—	<1500	—	<20	<90
HS6000	6.5	1180	4.2	46	1.44	58.6	—	<1050	—	<25	<65
HS9000	6.5	1080	4.2	46	2.62	106.9	—	<800	—	<15	<35
P 30 PVPP <sup>4)</sup>	—	1350	4.0	14	0.45	20.0	—	<750	<200	<50	<200
D400 <sup>5)</sup>	5.0	900	3.5	1	7.2	293.1	—	<1000	<200	<50	<100
PERMA <sup>6)</sup>	7.0	900	3.5	1	7.2	293.1	—	<1000	<200	<50	<100
EKS IR <sup>3)</sup>	5.0	1400	3.7	58	0.05	2.0	8.5**	<900	—	<15	<70
KS 50 IR	5.0	1350	3.7	46	0.16	6.4	6.5**	<350	—	<10	<50
KS 80 IR	5.0	1350	3.7	46	0.19	7.8	6.0**	<350	—	<10	<50
K 100 IR	5.0	1400	4.3	51	—	—	—	<250	—	<15	<50
K 150 IR	5.0	1350	3.9	46	—	—	—	<250	—	<15	<50
K 200 IR	5.0	1350	3.9	46	0.36	14.7	—	<250	—	<15	<35
K 250 IR	5.0	1300	4.0	46	0.86	35.2	—	<200	—	<15	<35
K 700 IR	5.0	1300	4.1	46	1.57	63.8	—	<200	—	<15	<30
K 800 IR	5.0	1300	4.1	46	2.16	87.9	—	<200	—	<15	<30
SUPRA <sup>7)</sup>	6.5	1300	3.6	25	0.19	7.8	—	<800	<200	<50	<200
Adur 50	6.5	1250	3.6	<1	0.29	11.7	—	<700	<200	<50	<50
Adur 100	6.5	1200	3.8	<1	0.66	26.9	—	<700	<200	<50	<50
Adur 200	6.5	950	3.6	<1	2.46	100	—	<700	<200	<50	<50
Adur 500	6.5	900	3.5	<1	7.2	293.1	—	<200	<100	<30	<100
Adur 1200	6.5	900	3.5	<1	17.3	703.3	—	<700	<200	<50	<50
Adur 3000	6.5	900	3.5	<1	17.3	703.3	—	<700	<200	<50	<50
SUPRA EK1 P	6.0	1300	3.5	48	0.12	4.7	7.5*	<1200	<300	<75	<400
SUPRA 80 P	6.0	1300	3.7	48	0.27	11.0	5.0**	<1200	<300	<75	<400
EKS P	6.0	1400	3.7	58	0.05	2.0	8.5*	<1800	<400	<75	<600
KS 50 P	6.0	1350	3.7	46	0.16	6.4	6.5**	<1200	<300	<75	<400
AKS 4	6.5	1050	3.8	13	0.42	17.2	—	<2000	<250	<150	<250
with protective paper	6.5	1050	3.8	13	2.47	100.3	—	<2000	<250	<150	<250
without protective paper	6.5	1400	4.5	1	0.68	27.6	—	<1500	<150	<30	<50
AKS 5	6.5	1400	4.5	1	0.68	27.6	—	<1500	<150	<30	<50

For all types of depth filters in the table, the following apply:

- pH-value (according to DAB 9):  
methylene red .....yellow  
phenolphthalein .....colorless
- Determination of the heavy metals according to recommendation XXXVI/1: .....<50 mg kg
- Dry content: .....approx. 98%

(Determined directly after the drying process. As a function of the humidity in the environment, subsequent pick-up of moisture may occur).

Notes relative to the table:

- \* *B. diminuta*
- \*\* *S. marcescens*
- <sup>1)</sup> The figures quoted should be regarded as a guideline.
- <sup>2)</sup> By means of the method quoted (elutriation with 0.05 N H<sub>2</sub>SO<sub>4</sub>), all soluble and for practical purposes relevant ions are extracted.
- <sup>3)</sup> S/HS Series depth filters are specially formulated for the filtration of foodstuffs and beverages.
- <sup>4)</sup> P 30 PVPP depth filters are used for chill haze stabilization of beer and wine.
- <sup>5)</sup> IR Series media release very low levels of calcium and magnesium and are designed for the filtration of spirits.
- <sup>6)</sup> PERMADur and D400 are special grades with a very high wet strength for use as supporting sheets for dosed filter aid.

<b>BACTERIAL REDUCTION ACHIEVED USING SEITZSCHENK DEPTH FILTERS</b>					
Depth Filters	Filtration Medium: 0.5% Peptone Solution		Filtration Medium: Physiological Saline Solution		Test Organism
	Challenge Level CFU*/cm <sup>2</sup>	Titer reduction**	Challenge Level CFU*/cm <sup>2</sup>	Titer reduction**	
EKS	5.2 x 10 <sup>9</sup>	8.9 x 10 <sup>7</sup>	2.1 x 10 <sup>10</sup>	1.7 x 10 <sup>9</sup>	<i>Brevundimonas diminuta</i>
EK1	5.2 x 10 <sup>9</sup>	2.0 x 10 <sup>7</sup>	4.7 x 10 <sup>9</sup>	5.0 x 10 <sup>8</sup>	ATCC 19146
EK	7.9 x 10 <sup>8</sup>	2.5 x 10 <sup>7</sup>	2.6 x 10 <sup>9</sup>	6.4 x 10 <sup>8</sup>	<i>Serratia marcescens</i>
KS 50	2.1 x 10 <sup>8</sup>	4.2 x 10 <sup>6</sup>	2.6 x 10 <sup>9</sup>	1.1 x 10 <sup>7</sup>	ATCC 14756
KS 80	2.1 x 10 <sup>8</sup>	1.7 x 10 <sup>5</sup>	6.1 x 10 <sup>8</sup>	1.6 x 10 <sup>6</sup>	

\* CFU = Colony forming units

\*\* Titer reduction =  $\frac{\text{No. of organisms unfiltrate}}{\text{No. of organisms filtrate}}$

Test Flow Rate:  
500 L/m<sup>2</sup>/hr

**A GUIDELINE TO SELECTING THE  
APPROPRIATE DEPTH FILTER**

<b>APPLICATION EXAMPLES</b>		
<b>PRODUCT</b>	<b>FILTRATION APPLICATION</b>	<b>SEITZSCHENK DEPTH FILTERS</b>
Aftershave	Removal of terpenes	K 300 to K 150
Agar-agar	Undissolved components	K 150
Alkyd resin	Gel corpuscles, swelling substances	T 5500
Ammonia water	Turbid matter, iron hydroxide	K 900 and dosed DE
Bath extract (camomile)	Fine turbid matter in larger quantities	K 900 and dosed DE
Beer	Normal turbid matter	HS 9000 to HS 4000
	DE	D 400 or PERMAdur
	PVPP Stabilization	P 30
Utility water	Normal turbidity	T 1500
Caprolactam melt	Removal of manganese dioxide	K 900 to K 700
Collagen solution	Final filtration prior to filling	K 900
Sodium hypochlorite	Impurities	SUPRAdur 100
Disinfectants (alkaline)	Fine turbid matter, colloids	EKS
Eau de Cologne/Eau de Toilette	Removal of terpenes after the cooling process	KS 80 to KS 50
Electro-immersion lacquer	General polishing	T 5500 to T 2600
Enzyme solution (containing cellulase)	Polishing filtration	HR 9000 to HR 1000
Epoxy resin	Swelling components	K 900
Vinegar	Filtration after precoat filter	K 250 to K 150
Liquid fertilizer	General polishing	K 900
Tissue culture solution	Sterilization	EKS
Face lotion	Removal of terpenes	EKS
Glycerine, 30%	Retention of activated carbon (Carboraffin)	K 900 to K 300
Gum arabic	Removal of non-soluble components	T 2600
Resin melts	Overpolymerized resp. overcondensated components, swelling and gel corpuscles	T 5500 to T 850
Cough syrup	Insoluble extract components	K 300 to K 250
Invert sugar solution	Retention of activated carbon	K 100
Coconut butter	Pressing residues, slimy substances	T 950
Camomile pressings	Filtration of the alcoholic decantate	K 700 to K 300
Cheese rennet	Colloidal impurities	K 300
	Organism reduction	EK1
Catalysts, e.g.: Raney Nickel	Residual catalysts	K 900 to KS 50
Clear lacquer	Colloidal impurities	K 900
Copper chloride solution with HCl	Residues from coatings	PERMAdur
Molasses	Foreign bodies	K 150
Olive oil	Fine particles from pressing residues and traces of H <sub>2</sub> O	K 800
Plant pesticides	Fine clarification to protect nozzles from blocking	T 1500
Plant extracts (alcoholic)	Prevention of subsequent clouding	K 250 to KS 80
Phosphoric acid	Clarification	SUPRAdur 100
Ointment bases	Prefiltration	K 300
Soup seasoning	Final filtration	T 5500
Wine	Normal turbid matter	K 900 to EKS
Tin tetrachloride	Removal of hydrolyzed components	SUPRAdur 500

Answering “yes” to the following questions will help you assure that your depth filters are working properly.

- Were the operating instructions followed?
- Were pretests carried out?
- Were the procedure, the system and the filter media specified?
- Was scale-up correct?
- Was the filter unit cleaned and in proper working order?
- Was the compression device of the filter unit checked? During steam sterilization, please observe operating differences between filter plates made of plastic and those made of stainless steel.
- Was the depth filter intact and undamaged?
- Was the depth filter correctly installed? The filtrate has to pass through the depth filter from the rough, unmarked side to the smooth, stamped side. Incorrectly installed depth filters may yield up to 40 percent less throughput.
- Was the filter unit properly vented after rinsing?
- Was the product adequately pre-filtered?
- Have the processing conditions been altered?
- Have the properties of the raw materials used in the manufacture of the product changed?
- Was the recommended flow rate followed?
- Was the maximum differential pressure exceeded?
- Was the monitoring equipment operating correctly?
- Were the filtration results checked?
- Did the pump pressure exceed the maximum permissible pressure of the filter unit?
- Was the appropriate sized depth filter used?

**SEITZSCHENK:  
THE MARKET LEADER IN  
DEPTH FILTRATION**

THE RIGHT CHOICE: SEITZSCHENK DEPTH FILTERS:

Quality is incorporated into SeitzSchenk depth filters, whose manufacturing is certified to ISO 9001. Moreover, our state-of-the-art production department has equipment to meet the high and demanding quality standards of our customers.

At SeitzSchenk, we are constantly striving to develop new, improved filter materials and filter procedures so that our customers are guaranteed the best possible filtration performance.

Together with our customers, we work to solve any filtration problem. Using the latest methods, our application engineers analyze your filtration tasks and make appropriate recommendations.

Experts with a wealth of knowledge in the field of filtration are always at your disposal. Worldwide, one telephone call is all you need to arrange a visit from one of our professionals.

**North America**

2118 Greenspring Drive  
Timonium, Maryland 21093  
United States of America  
Telephone: 1 800 881-4917  
Facsimile: 1 410 252-6029

**Latin America - S. Africa**

1320 South Dixie Highway,  
Suite 871  
Coral Gables, Florida 33146  
United States of America  
Telephone: 1 305 662-2557  
Facsimile: 1 305 662-2489

**France**

ZAC de Chassagne BP12  
69360 Ternay  
France  
Telephone: 33 472 248080  
Facsimile: 33 472 248181

**United Kingdom**

Bromyard Road Industrial Estate  
Ledbury  
Herefordshire  
HR8 1LG  
England  
Telephone: 44 1531 635228  
Facsimile: 44 1531 634207

**Italy**

Piazza De Angeli, 3  
20146 Milano  
Italy  
Telephone: 39 02 4381271  
Facsimile: 39 02 438127370

**Germany**

Planiger Straße 137  
D-55543 Bad Kreuznach  
Germany  
Telephone: 49 671 7962952  
Facsimile: 49 671 7962955

**Japan - Korea**

Miyamasu O.N. Building 5<sup>th</sup> Floor  
1-15-8 Shibuya Shibuya-ku  
Tokyo  
150-0002 Japan  
Telephone: 81 3 5485 6121  
Facsimile: 81 3 5485 5669

**Far East**

1 Jalan Taman, #04-01  
St. Michael's Place  
Singapore 329022  
Telephone: 65 6296 6817  
Facsimile: 65 6296 5461

**Australia - Asia**

Locked Bag 50  
93-103 Ricketts Road  
Mt. Waverley 3149 Vic.  
Australia  
Telephone: 61 3 8542 9000  
Facsimile: 61 3 9543 6095



UL  
UL FILTRATION & SEPARATIONS  
GROUP INC.  
REGISTERED NO. 24241



ISO 9001  
UL FILTRATION & SEPARATIONS  
GROUP INC.  
REGISTERED NO. 2424229



BSI  
REGISTERED TRADE  
UL FILTRATION & SEPARATIONS  
GROUP INC.  
REGISTERED NO. 1962397



SEITZ FILTER-WERKE  
REGISTERED NO. 09 100 5162  
DINENISO 9001

SeitzSchenk, BIO, EKS, EK, KS, K, SUPRADur, PERMAdur, and SUPRADisc are registered trademarks of Pall Corporation.  
NIRO, EK1, HS, P, T, PVPP, AKS, and VELAdisc are trademarks of Pall Corporation.

© 2002 Pall Corporation • All Rights Reserved • Printed In USA • 5/02 • 1M  
Bulletin No. STZ-2200-B

**1-800-FILTERS**



Pall Corporation

**SeitzSchenk Division**

2118 Greenspring Drive  
Timonium, Maryland 21093

1.800.881.4917 phone  
410.252.6029 fax  
www.pall.com website  
seitz@pall.com e-mail

*Filtration. Separation. Solution.™*