



Pall Activated Carbon Filters Incorporating Seitz® AKS Filter Media

Description

Streamlining Your Process with Pall Carbon Filters

Powdered Activated Carbon (PAC) is widely used in the pharmaceutical industry for decolorization and removal of other trace impurities. The use of bulk PAC has significant drawbacks relating to the handling of bulk carbon powder, cleaning of process equipment, and time (costs) associated with carbon removal from the process. Seitz® AKS immobilized carbon filter media alleviates these concerns by incorporating activated carbon within a matrix of cellulosic fibers. This immobilized carbon media is then coupled with a downstream filter paper that eliminates any possible carbon particle shedding downstream of the filter. Additionally, the adsorption efficiency of Seitz AKS immobilized carbon filter media is greater than an equivalent amount of bulk PAC, further reducing overall process time and increasing product yield.

[Now available in Stax Disposable Capsule Format!](#)

Pharmaceutical processes involving the addition of Bulk Activated Carbon, generally involve 4 operations:

- 1. Handling of bulk carbon and dosing into a mixing vessel**
This can result in the distribution of carbon dust into the working environment, with potentially detrimental effects on both occupational hygiene and good manufacturing practice.
- 2. Mixing of bulk carbon with product solution**
This involves agitation for sufficient time to allow the majority of the impurity molecules to come into contact with the PAC, diffuse into the internal structure of the carbon particles, and be adsorbed onto the internal surface of the carbon. This operation typically lasts at least 30 minutes.
- 3. Removal of PAC from the process after adsorption**
Bulk carbon is usually removed by a cake filtration process, whereby the suspension is recirculated over a filter sheet or cloth supported by a porous plate. Particles build up on the surface of the filter forming a "cake", which also contributes to the filtration process. Additional "polishing" filtration steps with cartridge filters are typically required to remove carbon fines and provide a clear fluid for the subsequent step.
- 4. Cleaning of carbon from process equipment**
Carbon powder can become widely distributed through process equipment and can be very difficult to completely remove. This is particularly problematic for pilot plants and multipurpose plants where cleaning of process equipment between batches is a critical issue to avoid cross-contamination.

Figure 1: A typical decolorization process involving addition of bulk activated carbon (cleaning steps not shown)

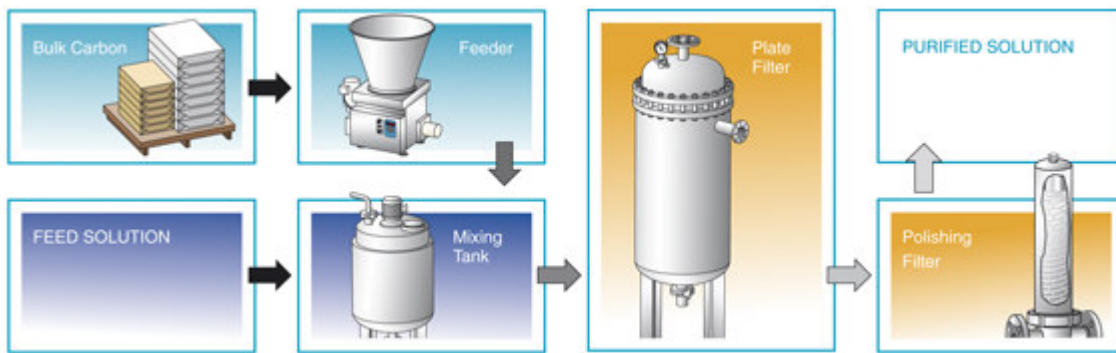
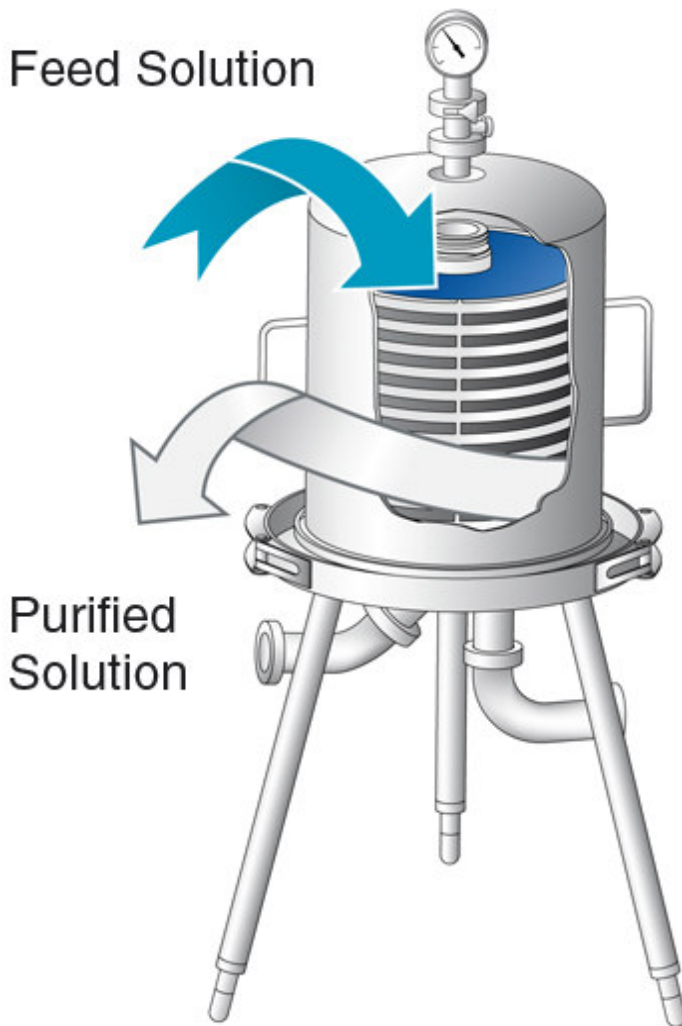


Figure 2: A typical decolorization process using a Seitz AKS immobilized activated carbon filter media assembly



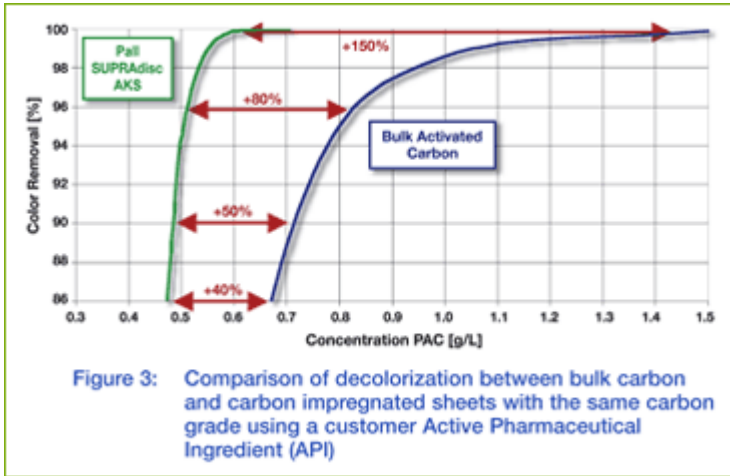
Seitz AKS Filter Media - The Better Choice

Pall Seitz AKS immobilized carbon filter media provides a streamlined process only requiring a single step. The feed stream is simply passed once through the module at an appropriate flow rate to achieve the desired adsorption. This saves time, resources, and expense. It is nearly 100% free of carbon dust so operators and the workspace are much better protected. No additional mixing, filtration, or cleaning steps are needed.

Improved Adsorption

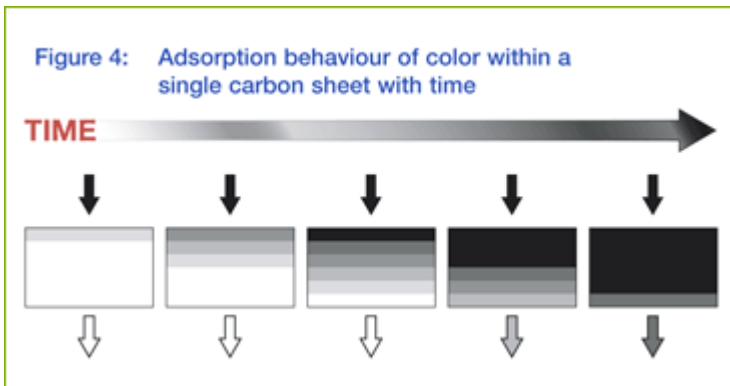
In addition to streamlining the process, Pall Seitz AKS immobilized carbon filters are actually more efficient at removing colors and other impurities from a solution compared to a batch process with the equivalent PAC

grade (Figure 3).



There are two reasons for the improved efficiency of sheet-based adsorption compared to bulk mixing adsorption processes.

1. At an optimized flow rate, the probability of contact between the impurities and carbon particles is greater in carbon-impregnated sheets. This is due to process fluids more efficiently contacting carbon particles immobilized into a sheet matrix.
2. Due to the depth (thickness) of the sheet, it is possible to consider the structure as being made up of a series of layers containing PAC. The initial layers make first contact with the fluid and as time and increasing fluid volume is passed through this layer they are the first to become saturated with impurity. Subsequent layers, however, still have adsorbing sites and a capacity to adsorb impurity, which increases through the depth of the media (figure 4). In essence, having a depth of PAC and passing the fluid at an optimal flow rate through that depth enables the potential of the carbon to adsorb impurity to be fully utilized.



Ensuring Highly Efficient Contaminant Removal



Pall offers a complete range of UpScaleSM program products available with all 9 different AKS media grades suitable for the development laboratory through the pilot plant to full production. Media test discs are available as 47 mm, 60 mm and 90 mm diameter discs (other sizes upon request). Also available are highly convenient, fully disposable Supracap 60 capsules (26 cm²) for grade section and process development.

For pilot plant or small production, Supra AKS cartridges may be used. Supra AKS depth filter cartridges are available in 10 in., 20 in. and 30 in. size with all AKS grades. Supra AKS cartridges follow the same design principle as Supracap 100 capsule internal elements and consist of activated carbon depth filter sheets supported by inside and outside separators. The entire element is held together by 4 support jackets as well as an inner support anchor. Supra AKS cartridges feature a code 7 adapter for ease of use in standard stainless steel cartridge housings.

For For full scale production SupradiscTM AKS modules (12 in. or 16 in.), Supracap 200 depth filter capsules and [Stax disposable capsules](#) are available.

Supracap 200 filters are fully encapsulated Supradisc modules, designed for applications with hazardous materials. The encapsulation of the module significantly reduces operator exposure and simplifies handling during change-out. Furthermore, the encapsulated modules provide a dramatic reduction in the proportion of normally wetted surfaces in the housing, resulting in faster hardware clean-up and easier cleaning validation compared to standard lenticular formats. For detailed information regarding [Supracap 200 capsules](#) please refer to the relevant web page or contact Pall.

The [Stax disposable capsule format with Seitz AKS media](#) provides a ready-to-use, easy to handle system. Scalable in size and performance to meet lab, pilot and process needs, the Stax AKS capsules are ideal for use in applications from 50 – 20,000+ L.

For selection and optimization studies, we recommend performing adsorption evaluation studies at a recommended range of flow rates either at your facility or in our Scientific and Laboratory Services (SLS) laboratories using the appropriate UpScale program product with Seitz AKS media. Pall specialists can provide valuable expertise, providing hands-on assistance if required and placing our extensive technical resources at your disposal.

Specifications

- [Supradisc AKS Filters](#)
- [Supracap 200 AKS Filters](#)
- [Supracap 60 AKS Filters](#)
- [Supra AKS Filters](#)

Supracap 200 Capsule and Supradisc I Module Configuration Codes* for Different AKS Media Grades and Module Diameters

Media Grade	Media Code	Configuration Codes for 12 in. Module	Amount of PAC Present per 12 in. Module (kg)	Media Area per 12 in. Module	Configuration Codes for 16 in. Modules	Amount of PAC Present per 16 in. Module (kg)	Media Area per 16 in. Module
AKS1	XAK1	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS2	XAK2	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS3	XAK3	214	1.3	1.6 m ²	416	3.00	3.7 m ²
AKS4	XAK4	215	0.7	1.7 m ²	419	1.85	4.35 m ²
AKS5	XAK5	214	1.05	1.6 m ²	416	2.40	3.7 m ²
AKS6	XAK6	214	1.35	1.6 m ²	416	3.00	3.7 m ²
AKS7	XAK7	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS8	XAK8	214	1.3	1.6 m ²	416	3.00	3.7 m ²
AKS9	XAK9	214	1.3	1.6 m ²	416	3.00	3.7 m ²

* Modules with other areas available on request

Supra AKS Cartridge Filter Information for Different AKS Media

Media Grade	Media Code	Amount of PAC Present per 10 in. Cartridge in g	Media Area per 10 in. Cartridge in cm ²
AKS1	XAK1	72.5	700
AKS2	XAK2	72.5	700
AKS3	XAK3	60	750
AKS5	XAK5	52.5	800
AKS6	XAK6	60	750
AKS7	XAK7	72.5	700
AKS8	XAK8	60	750
AKS9	XAK9	60	750

Typical Ash and Endotoxin Levels for Different AKS Grades

Media Grade	Typical Ash Content(%)	Typical Endotoxin Level(EU/mL)*
AKS1	<3	<0.12
AKS2	<4	<0.12
AKS3	<3	<0.12
AKS4	13	n.d.
AKS5	<1	<0.06
AKS6	<3	<0.06
AKS7	<3	<0.12
AKS8	<2	<0.12
AKS9	<2	<0.12

All listed Pall Supradisc AKS meet the specifications for the biological test listed in the current version of the USP Class VI 121 °C and met the limits for determination of total extractables described in current 21CFR 177.2600

** Levels for unrinsed media*

Supradisc I Modules with AKS Media

Materials of Construction

Media	Cellulose base and PAC
Plastic Components	Polypropylene (standard version) Polyamide (high temperature version)
O-rings	Platinum-cured silicone elastomer or FEP-encapsulated silicone or EPDM elastomer
Endcap Gaskets	Platinum-cured silicone elastomer or EPDM elastomer or PTFE

Operating Parameters*

Maximum Operating Temperature	80 °C in polypropylene design 160 °C in polyamide design
Maximum Differential Pressure	2.4 bar (35 psi) at 80 °C

Typical Operating Flux**

150 - 250 L/m³/h

Sterilization

Steam in Place *** 125 °C for 30 minutes at 0.3 bar (4.3 psi) differential maximum

Nominal Module Dimensions

Total Length: Double O-ring Endcap Version	332 mm (13.1 in.)
Flat Gasket Endcap Version	272 mm (10.7 in.)
Total Diameter	284 mm (11.2 in.) ¹ 410 mm (16.1 in.) ²

Supracap 200 Capsules with AKS Media

Materials of Construction

Media	Cellulose base and PAC
Plastic Components	Polypropylene
O-rings	Platinum-cured silicone elastomer or FEP-encapsulated silicone or EPDM elastomer

Operating Parameters*

Maximum Operating Temperature	90 °C
Maximum Operating Pressure	6 bar gauge (87 psi gauge) at 60 °C 3 bar gauge (44 psi gauge) at 90 °C
Maximum Differential Pressure	2.4 bar (35 psi) at 80 °C

Typical Operating Flux **

150 - 250 L/m³/h

Sterilization

Steam in Place *** (3) 125 °C for 30 minutes at 0.3 bar (4.3 psi) differential maximum

Nominal Dimensions

Total Length	326 mm (12.8 in.)
Total Diameter	298 mm (11.7 in.)

Supracap 60 Capsules with AKS Media

Materials of Construction

Media	Cellulose base and PAC
Capsule	Polycarbonate
Vent	Polypropylene
Sealing Technology	Thermal bonding

Operating Parameters*

Maximum Operating Pressure and Temperature	3 bar gauge (44 psi gauge) at 40 °C
Maximum Differential Pressure	1.5 bar (22 psi)

Sterilization⁽⁴⁾

Autoclaving at 125 °C 1 cycle x 30 minutes

Typical Filtration Area

26 cm² (4.04 in²)

Supra AKS Filters

Materials of Construction

Media	Cellulose base and PAC
Plastic Components	Polypropylene
O-rings	Platinum-cured silicone elastomer or fluorocarbon elastomer

Operating Parameters*

Maximum Operating Pressure	80 °C
Maximum Differential Pressure	2.4 bar (35 psi) at 80 °C

Typical Operating Flux**

150 - 250 L/m²/h

Sterilization

Not sterilizable by autoclaving or steaming *in-situ*

Nominal Dimensions

	Total Length	Total Diameter
10 in. element	322 mm (12.7 in.)	70 mm (2.8 in.)
20 in. element	572 mm (22.5 in.)	70 mm (2.8 in.)
30 in. element	822 mm (32.4 in.)	70 mm (2.8 in.)

* with compatible fluids, which do not soften, swell or adversely affect the product or its material of construction

** Higher fluxes may be possible

*** Steam in place must only take place in the forward flow direction

(1) Filter area codes 212, 214, 215

(2) Filter area codes 415, 416, 419

(3) Only possible for modules with stainless steel insert in endcaps - code C300

(4) Supracap 60 capsules must not be sterilized in situ by passing steam under pressure

Applications

Since colors, impurities and processes can vary, Pall offers nine thoroughly researched and optimized PAC grades incorporated into Seitz AKS filter media. These grades are based upon different raw materials and different activation methods resulting in pore structures and adsorption characteristics appropriate for adsorbing different molecular impurities (Table 1). According to International Union of Pure and Applied Chemistry (IUPAC) definitions, three groups of pores are distinguished. Macropores (above 50 nm diameter), mesopores (2–50 nm diameter) and micropores (<2 nm diameter).

Table 1: Typical Applications and Efficiency Characteristics of Pall AKS Module Grades

AKS Grade	Typical Application	Efficiency Characteristic	Typical Molecular Weights of Target Contaminants
AKS 1	API decolorization	Ultra high efficiency	400 – 1500 daltons
AKS 2	API decolorization	Ultra high efficiency	400 – 1000 daltons
AKS 3	API decolorization	High efficiency	400 – 1000 daltons
AKS 4	General purpose	Lowest efficiency in AKS range	400 – 1500 daltons
AKS 5	Plasma fractionation	High efficiency	200 – 400 daltons
AKS 6	Plasma fractionation	High efficiency	400 – 1500 daltons
AKS 7	API decolorization	Ultra high efficiency	400 – 1500 daltons
AKS 8	API decolorization	High efficiency	400 – 1000 daltons
AKS 9	API decolorization	High efficiency	400 – 1000 daltons

Macro- and mesopores can generally be regarded as the highways into the carbon particle, and are crucial for adsorption kinetics. Macro pores are used for the transport, and absorption occurs in the meso- and micropores.

Small molecules, such as methylene blue, which has a molecular weight of 319.86 daltons, are mainly captured in micropores.



For larger impurity molecules, other pore structures in the carbon must be available to ensure optimal adsorption. Carbon, which can capture larger molecules, tends to adsorb smaller impurities as well, whereas dedicated carbons for small molecules do not remove larger contaminants.

Table 1 provides an overview of how different AKS grades may suit an application based on their general characteristics. However, due to the various factors that may affect the adsorption process, Pall recommends scaled-down testing of several Seitz AKS filter media using Pall UpScaleSM program test kits as the most reliable way of selecting a suitable grade.

[Now available in Stax Disposable Capsule Format!](#)

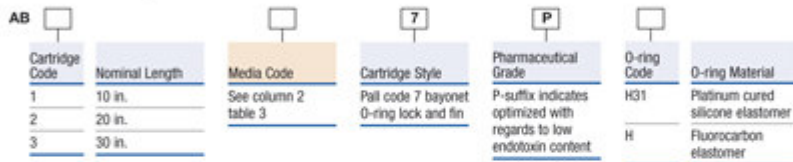
Ordering Information

Supracap 60 Capsules with Seitz AKS Media- Pall Part Number:



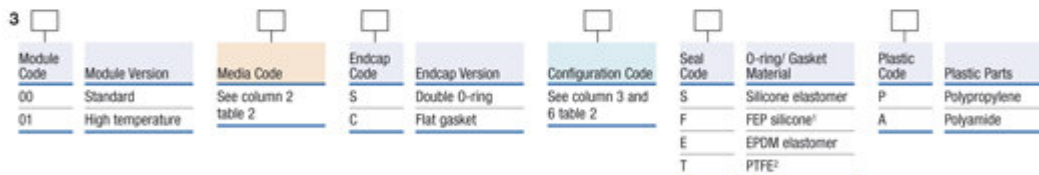
Example part number: SC060XAK3
Supracap 60 capsule with AKS 3 media

Supra AKS Cartridges with Seitz AKS Media - Pall Part Number:



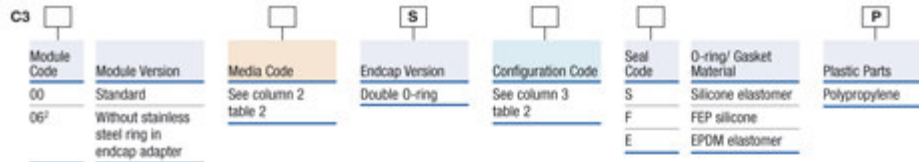
Example part number: AB1XAK17PH31
Supra AKS 10 in. filter with AKS 1 media and platinum cured silicone elastomer double O-rings

Supradisc Filter Modules with Seitz AKS Media - Pall Part Number:



Example part number: 300XAK1C415EP
Standard Supradisc module with AKS1 media, 16 in. diameter flat gasket endcap with EPDM gasket seals, plastic parts all-polypropylene
¹Only available for double O-ring endcap adapter ²Only available for flat gasket endcap

Supracap 200 Capsules with Seitz AKS Media - Pall Part Number:¹



Example part number: C306XAK5S214FP
Supracap 200 capsule without stainless steel insert in endcaps, containing AKS 5 media and supplied with FEP encapsulated silicone O-rings.

¹Only available in 12 in. diameter modules with double O-ring adapter ²Not steamable

Table 2: Supracap 200 and Supradisc I module configuration codes¹ for different AKS media grades and module diameters

Media Grade	Media Code	Configuration Codes for 12 in. Modules	Amount of PAC Present per 12 in. Module (kg)	Media Area per 12 in. Module	Configuration Codes for 16 in. Modules	Amount of PAC Present per 16 in. Module (kg)	Media Area per 16 in. Module
AKS1	XAK1	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS2	XAK2	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS3	XAK3	214	1.3	1.6 m ²	416	3.00	3.7 m ²
AKS4	XAK4	215	0.7	1.7 m ²	419	1.85	4.35 m ²
AKS5	XAK5	214	1.05	1.6 m ²	416	2.40	3.7 m ²
AKS6	XAK6	214	1.35	1.6 m ²	416	3.00	3.7 m ²
AKS7	XAK7	212	1.4	1.35 m ²	415	3.65	3.5 m ²
AKS8	XAK8	214	1.3	1.6 m ²	416	3.00	3.7 m ²
AKS9	XAK9	214	1.3	1.6 m ²	416	3.00	3.7 m ²

¹ Modules with other areas available on request

Table 3: Supra AKS cartridge filter information for different AKS media

Media Grade	Media Code	Amount of PAC Present per 10 in. Cartridge in g	Media Area per 10 in. Cartridge in cm ²
AKS 1	XAK1	72.5	700
AKS 2	XAK2	72.5	700
AKS 3	XAK3	60	750
AKS 5	XAK5	52.5	800
AKS 6	XAK6	60	750
AKS 7	XAK7	72.5	700
AKS 8	XAK8	60	750
AKS 9	XAK9	60	750

Now available in Stax Disposable Capsule Format!

Contact Information

© Copyright Pall Corporation

Visit us on the Web at www.pall.com

This information is accurate as of the revision date indicated.