

## Absolute, Economical Filtration

Clark-Reliance Filtration Group's PSEC Pleated Microfiberglass Cartridges offer an economical choice for absolute-rated efficiency, high flow rate capability and long service life. A wide variety of construction components, end fittings and seal options make this product line ideal for prefiltration and point of use filtration for many industrial applications.

PSEC Pleated Microfiberglass Cartridges are available in 0.45µm, 1µm, 2µm, 3µm, 5µm, 10µm, 20µm and 40µm absolute-rated pore sizes.

### Markets

- Chemical Processing
- Oil/Gas Production
- Food & Beverage
- Photographic
- Coatings
- Power Generation
- Pharmaceutical

### Applications

- Membrane Prefiltration
- Corn Syrup
- Critical Lubricating Oils
- Sterile Air
- Aromatic Hydrocarbons
- R.O. Prefiltration
- Oilfield Completion Fluids
- Wine Clarification
- Beer Stabilization



## Features and Benefits

- Absolute-rated media provide reliable pore size control.
- Thermal bonding eliminates particle bypass.
- Laminated media/support layer maximizes flow capacity and media utilization and minimizes media migration.
- Variety of construction/seal options increases compatibility choices.
- Several end fitting options provide competitive housing retrofit capability.
- All FDA listed components biosafe per USP Class V1-121°C Plastic Tests allows filtration of edible and potable liquids.
- Optional stainless steel O-ring adapter inserts provide added stability for *in situ* sterilization.
- High surface area yields high flow rate/low differential pressure capability.
- Non-fiber-releasing media with minimal extractables provides high purity filtrate.



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This document and other information from Clark-Reliance Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection for the products and systems and assuring that all performance, safety and warning requirements of the application are met.

### Technology

The high surface area and high void volume matrix provided by pleated microfiberglass media optimize flow rate and service life capability unattainable with any other microfiber technology. The hydrophilic nature of the microglass medium also enhances flow rate capability. The microfiber matrix lends itself well to optimizing the pore size geometry necessary to provide absolute-rated filtration performance. A polyester laminated support layer maintains pore size consistency of the microglass medium, improves flow through the pleat configuration and eliminates fiber migration. Acrylic binder in the microglass medium also contributes significantly to media migration control.

Microglass media is non-protein binding, i.e. it doesn't remove flavor enhancing proteins from beer, wine and similar beverages. PSEC Microfiberglass cartridges can be used as final filters to clarify red wines and other beverages which are not normally sterile filtered. In addition the medium has the unique ability to remove high molecular weight carbohydrates, such as  $\beta$ -glucans, from these same beverages.  $\beta$ -Glucans are gel forming materials which tend to plug microporous membranes used in the stabilization (sterile filtration) of beverages. When used as pre-filters, PSEC Microfiberglass cartridges will significantly increase the throughput of expensive membrane final filters.

### Construction

Four distinct support constructions are available to maximize chemical compatibility and application requirements. All available construction types are generally satisfactory for water and water-based solutions, organic solvents and inorganic chemicals in a pH range of 5-10. General application areas include plating chemicals, syrups, alcoholic beverages, polymers, lubricating oils, brines, emulsions, process air and magnetic media.

1. Polypropylene Heavy-Duty ("F" Code): this special construction features standard polypropylene end capping, but has a glass-filled polypropylene core and pure polypropylene extruded outer cage. This construction withstands temperatures up to 200°F @ 35  $\Delta$ P. In addition backwashing may be accomplished to enhance service life or to perform *in situ* sanitization or sterilization required by many beverage applications. Hot water may also be used to dissolve proteins and carbohydrates collected during beverage filtration.
2. Polyester ("P" Code): core, end caps and outer netting of polyester are required for the filtration of specific aggressive fluids not generally compatible with polypropylene components. These fluids include halogenated and aromatic organic solvents and mineral oil based lubricants. One primary application is the filtration of the benzene-based organic used in the peroxide manufacturing process. The maximum recommended temperature for this construction is 140°F @ 35  $\Delta$ P.
3. Stainless Steel ("G" Code): stainless steel components allow usage of the cartridge up to 275°F @ 35  $\Delta$ P. An outer netting of polyester is used with this style cartridge.

4. Stainless Steel Insert ("S" Code): a stainless steel insert can be installed into the I.D. of the 222 or 226 O-ring adapter to enhance the *in situ* sterilization capability of the PSEC Microfiberglass cartridge. The insert prevents distortion to the O-ring adapter due to the cyclic hot and cold temperatures associated with steam sterilization, autoclaving and similar processes.



Stainless Steel Inserts

Efficiency, flow capability and service life are similar for all available constructions.

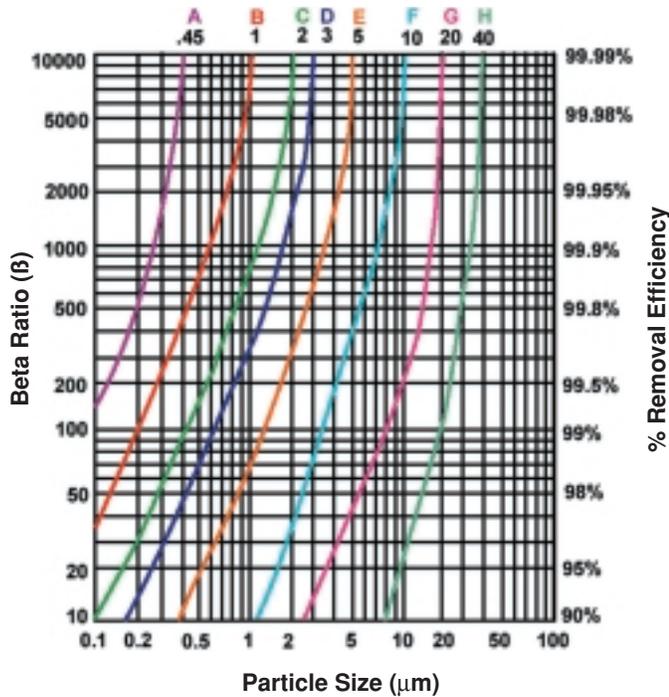
### Performance

PSEC Microfiberglass product line offers absolute-rated efficiency performance as determined by the ASTM F795-88 Filter Test Method. Published absolute particle removal ratings were established at 99.98% ( $\beta_x=5000$ ) efficiency at 2.5 gpm design flow rate.

Pleat configuration was optimized to maximize dirt holding capacity and flow rate capability. The clean pressure drop for all ratings is less than 1.1 psi at maximum recommended flow rate of 10.0 gpm.

Due to the variability of processes, testing is recommended to optimize the final filter element selection.

**Performance Profile  
PSEC Particle Removal Efficiency Over Life**



A = PSEC004      D = PSEC030      G = PSEC200  
 B = PSEC010      E = PSEC050      H = PSEC400  
 C = PSEC020      F = PSEC100

**Flow Rate Capability:  
PSEC Microfiberglass  
Length Factors**

Length (in)	Length Factor
9	1.0
10	1.0
19	2.0
20	2.0
29	3.0
30	3.0
39	4.0
40	4.0

**PSEC Microfiberglass  
Flow Factors  
(psid/gpm @ 1 cks)**

Rating (μm)	Flow Factor
0.45	.108
1	.102
2	.095
3	.090
5	.072
10	.060
20	.042
40	.018

**Liquid Particle Retention Ratings (μm) @ Removal Efficiency of:**

Cartridge	β=5000 Absolute	β=1000 99.9%	β=100 99%	β=20 95%	β=10 90%
PSEC004	0.45	0.3	<0.1	<0.1	<0.1
PSEC010	1.0	0.6	0.2	<0.1	<0.1
PSEC020	2.0	1.2	0.4	0.2	0.1
PSEC030	3.0	1.8	0.6	0.3	0.2
PSEC050	5	3	1.3	0.5	0.4
PSEC100	10	7	3.5	1.6	1.2
PSEC200	20	16	8	4	2.5
PSEC400	40	32	20	11	8

Beta Ratio (β) =  $\frac{\text{Upstream Particle Count @ Specified Particle Size and Larger}}{\text{Downstream Particle Count @ Specified Particle Size and Larger}}$

Percent Removal Efficiency =  $\left( \frac{\beta-1}{\beta} \right) \times 100$

Performance determined per ASTM F-795-88. Single-Pass Test using AC test dust in water at a flow rate of 2.5 gpm per 10 in cartridge (9.5 lpm per 254 mm).

**Flow Rate and Pressure Drop Formulas:**

Flow Rate (gpm) =  $\frac{\text{Clean } \Delta P \times \text{Length Factor}}{\text{Viscosity} \times \text{Flow Factor}}$

Clean ΔP =  $\frac{\text{Flow Rate} \times \text{Viscosity} \times \text{Flow Factor}}{\text{Length Factor}}$

**Notes:**

1. **Clean ΔP** is **PSI** differential at start.
2. **Viscosity** is centistokes. Use Conversion Tables for other units.
3. **Flow Factor** is ΔP/GPM at 1 cks for 10 in (or single).
4. **Length Factors** convert flow or ΔP from 10 in (single length) to required cartridge length.

## Quality-Pure Pleated Series

### Specifications

#### Absolute Filtration Ratings:

- 99.98% ( $B_x=5000$ ) removal efficiency at 0.45 $\mu$ m, 1 $\mu$ m, 2 $\mu$ m, 3 $\mu$ m, 5 $\mu$ m, 10 $\mu$ m, 20 $\mu$ m and 40 $\mu$ m pore sizes

#### Effective Filtration Area:

- 5 ft<sup>2</sup>/10 in (0.46 m<sup>2</sup>/254mm) minimum

#### Materials of Construction:

- Filter Media:** Borosilicate microfiberglass with acrylic binder
- Support/Drainage Layers:** Spunbonded polyester; laminated on the downstream side
- Polypropylene Support ("F" Code):** Glass-filled polypropylene core; polypropylene end caps and outer extruded cage; sonic welded side seal; hot melt polypro bonded end caps
- Polyester Support ("P" Code):** Polyester core, end caps and outer netting; sonic welded side seal; FDA grade hot melt polyester-adhered end caps
- Stainless Steel ("G" Code):** 304 SS core and end caps; polyester outer netting; sonic welded side seal; FDA grade white urethane bonded end caps

- O-Ring Adapter Insert:** 316 stainless steel
- Seal Materials:**
  - Polyethylene foam: standard gasket for DOE polypropylene supported cartridge
  - Viton: standard gasket for DOE polyester or stainless steel supported cartridges
  - See nomenclature for other gasket and O-ring options

#### Recommended Operating Conditions:

- Changeout Differential Pressure:** 35 psi (2.4 bar)
- Maximum Flow Rate:** 10 gpm per 10 in length (38 lpm/254 mm)
- Design Flow Rate:** 2.5 gpm per 10 in length (9.5 lpm/254 mm)
- Maximum Temperature:**
  - Glass-Filled Polypropylene: 200°F @ 35 $\Delta$ P (93°C/2.4 bar)
  - Polyester: 140°F @ 35 $\Delta$ P (60°C/2.4 bar)
  - Stainless Steel: 275°F @ 35 $\Delta$ P (135°C/2.4 bar)
- Maximum Differential Pressure:**
  - Glass-Filled Polypropylene: 90 psi @ 75°F (6.2 bar/24°C)
  - Polyester: 70 psi @ 75°F (4.8 bar/24°C)
  - Stainless Steel: 75 psi @ 275°F (5.1 bar/135°C)

#### Cartridge Dimensions:

- Lengths:** Various. See Ordering Information and catalog sheet A-700.
- Outside Diameter:** 2.5 in (63.5 mm)
- Inside Diameter:**
  - DOE - 1-1/16 in (27 mm);
  - SOE - 1 in (25.4 mm)

#### Biological Safety/Product Purity:

- Meets USP XXI Class VI requirements for plastics
- All components FDA listed per CFR, Title 21
- Non-fiber releasing per FDA Part 210.3B (5) and (6)
- Non-photo sensitive

#### Sterilization/Sanitization:

- Hot water ("F" construction): 180°F (82°C) for 30 minutes at maximum 15 psid (1 bar).
- In-Line Steam/Autoclave ("F" construction with stainless steel sleeve): 60 minutes at 255°F (140°C) at 2 psid (0.14 bar) maximum pressure.

## Ordering Information

PSEC Cartridge Code	100 Absolute Particle Removal Rating	N Seal Material	STC End Cap Options	R Special Options
Pleated	004 = 0.45 $\mu$ m	A = Polyethylene	AR = 020 O-Ring/Recessed	B = Bubble Point Test
Micro	010 = 1.0 $\mu$ m	Foam (DOE	DO = Double-Open-End (DOE)	R = Rinse with DI water (5 mins.)
Glass	020 = 2.0 $\mu$ m	Gasket Only	DX = DOE With Core Extender	Z6 = Individual poly bag only
	030 = 3.0 $\mu$ m	for "F" support	LL = 120 O-Ring (Both Rings)**	Z15 = Individual poly bag
	050 = 5.0 $\mu$ m	construction)	LR = 120 O-Ring/Recessed**	15/ctn. (20", 30", 40")
	100 = 10.0 $\mu$ m	E = EPDM	OB = Std. Open End/Polypro	Z30 = Individual poly bag
	200 = 20.0 $\mu$ m	N = Buna-N	Spring Closed End	30/ctn. (10")
	400 = 40.0 $\mu$ m	S = Silicone	PR = 213 O-Ring/Recessed**	
		T = PFA	SC = 226 O-Ring/Closed	
		Encapsulated	SF = 226 O-Ring/Fin	
		Viton	SSC = S.S. Inserted 226	
		(222,226	O-Ring/Closed	
		O- Ring Only)	SSF = S.S. Inserted 226 O-Ring/Fin	
		V = Viton	STC = S.S. Inserted 222	
			O-Ring/Closed	
			STF = S.S. Inserted 222 O-Ring/Fin	
			TC = 222 O-Ring/Closed	
			TF = 222 O-Ring/Fin	
			TX = 222 O-Ring/Flex Fin	
			XB = Ext. Core Open End/	
			Polypro Spring Closed End	

\* "G" Code cartridges are available in SOE style with polyester O-Ring adapters.  
 \*\* Available only in 9-5/8" (-9) and 19-5/8" (-19) lengths.

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