Emflon™ PFR

GAS FILTERS

Emflon™ PFR filter membrane provides high assurance of filter integrity and long life, even during continuous use in hot air up to 60°C, in vent applications up to 80°C, and during repeated steaming. This is combined with high flow rates and excellent de-wetting characteristics, resulting in very economical filtration through the use of fewer installations and reduced energy costs. Emflon PFR filter membrane has an absolute removal rating of 0.2 µm in liquids and 0.003 µm in gases, and has been validated by:

- *Brevundimonas (Pseudomonas) diminuta* liquid challenge at $10^7/cm^2$
- *Brevundimonas (Pseudomonas) diminuta* aerosol challenge
- PP7 bacteriophage aerosol challenge
- Airborne sodium chloride aerosol challenge at 100 L/min flow (0.003 µm rated in gases)

The features and benefits of Emflon PFR filter membrane include:

- **Comprehensive validation** – assure high removal efficiency and high safety margins.
- **High flow rates and low pressure drop** – allow use of small systems, reducing installation and running costs.
- **Robust construction** – ensure integrity and reliability.
- **Long steaming life and long service** – offer low-cost filtration.



Fig 1. Emflon PFR filter cartridges.

Quality

Emflon PFR pharmaceutical grade filters are designed for use in conformance with cGMP in Manufacturing, Processing, Packing or Holding of Drugs (21CFR210) and cGMP for finished Pharmaceuticals (21CFR211.72), including batch release certificate and full traceability.

Validation guide, extractables reports, and regulatory statements are available through our Regulatory Support website. All GMP grade filters are covered under our change control policy.

Emflon PFR AB style filter cartridges

Technical specifications

Typical air flow rates

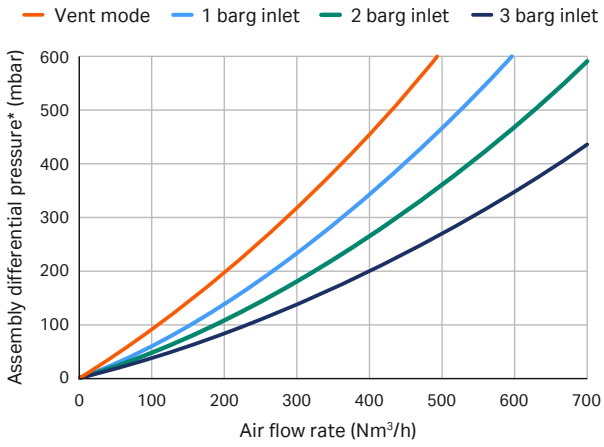


Fig 2. System air flow vs differential pressure (AB1 size filter cartridge).

* Filter AGT11 series housing at 20°C



Fig 3. Emflon PFR AB style filter cartridge.

Materials of construction

Membrane	Double layer hydrophobic PTFE*
Support and drainage layers	Oxidation-resistant polypropylene (PP)
Core, cage, and end caps	Oxidation-resistant PP
Adapters	Polymeric, encapsulated in oxygen-resistant PP

* Polytetrafluoroethylene.

Maximum differential pressure†

20°C	5.3 bard (77 psid)
80°C	4.1 bard (60 psid)

† In air/N_2 service or other compatible gases.

Service life in air

60°C pressurized air	Typically 12 months
80°C vent service	Typically 6 months

Effective filtration area (EFA)

EFA per 254 mm (10 in.) element	0.8 m^2 (8.6 ft^2)

Sterilization

Max. steaming conditions‡, §	Pressure and temperature	Cumulative steaming time‡, §
Forward	1.0 bard (14.5 psid) at 125°C	20 hours (one hour cycles)
	0.3 bard (4.38 psid) at 140°C	165 hours (one hour cycles)
Reverse	0.5 bard (7.3 psid) at 125°C	20 hours (one hour cycles)

‡ Lab tests to establish multi-cycle resistance. Filters should be qualified in actual use. Contact us for recommended procedures.

§ Excursion conditions only.

Ordering information

Cartridge style	Nominal length	O-ring material	Product code
Double 222 O-ring with bayonet lock and flat end	127 mm (5 in.)	Silicone	AB05PFR3PVH4
	254 mm (10 in.)	Ethylene propylene	AB1PFR3PVJ
		FEP-encapsulated fluorocarbon elastomer	AB1PFR3PVH1
		Fluorocarbon	AB1PFR3PVH
		Silicone	AB1PFR3PVH4
	508 mm (20 in.)	Silicone	AB2PFR3PVH4
	762 mm (30 in.)	Silicone	AB3PFR3PVH4
Double 222 O-ring with bayonet lock and fin end	254 mm (10 in.)	FEP-encapsulated fluorocarbon elastomer	AB1PFR8PVH1
		Silicone	AB1PFR8PVH4
	508 mm (20 in.)	Silicone	AB2PFR8PVH4
	762 mm (30 in.)	Ethylene propylene	AB3PFR8PVJ
		Silicone	AB3PFR8PVH4
Double 226 O-ring with bayonet lock and flat end	127 mm (5 in.)	Ethylene propylene	AB05PFR2PVJ
		FEP-encapsulated fluorocarbon elastomer	AB05PFR2PVH1
		Fluorocarbon	AB05PFR2PVH
		Silicone	AB05PFR2PVH4
	254 mm (10 in.)	Silicone	AB1PFR2PVH4
	762 mm (30 in.)	Silicone	AB3PFR2PVH4
Double 226 O-ring with bayonet lock and fin end	127 mm (5 in.)	Ethylene propylene	AB05PFR7PVJ
		FEP-encapsulated fluorocarbon elastomer	AB05PFR7PVH1
		Silicone	AB05PFR7PVH4
	254 mm (10 in.)	Ethylene propylene	AB1PFR7PVJ
		FEP-encapsulated fluorocarbon elastomer	AB1PFR7PVH1
		Fluorocarbon	AB1PFR7PVH
		Silicone	AB1PFR7PVH4
	508 mm (20 in.)	Ethylene propylene	AB2PFR7PVJ
		FEP-encapsulated fluorocarbon elastomer	AB2PFR7PVH1
		Fluorocarbon	AB2PFR7PVH
		Silicone	AB2PFR7PVH4
	762 mm (30 in.)	Ethylene propylene	AB3PFR7PVJ
		FEP-encapsulated fluorocarbon elastomer	AB3PFR7PVH1
		Silicone	AB3PFR7PVH4
	1016 mm (40 in.)	Silicone	AB4PFR7PVH4

Emflon PFR junior style filter cartridges

Technical specifications

Typical air flow rates

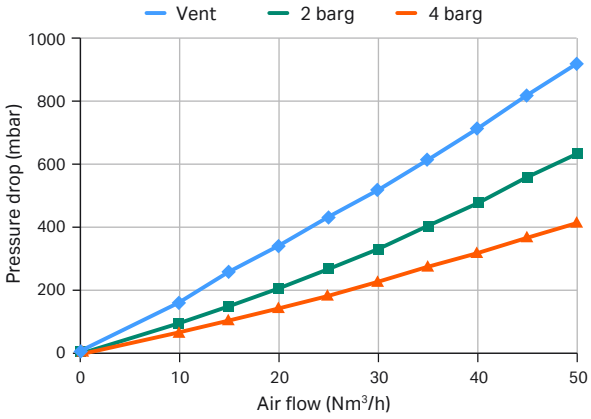


Fig 4. Typical airflow/pressure drop for SBF1PFR filters.

Typical air flow rates

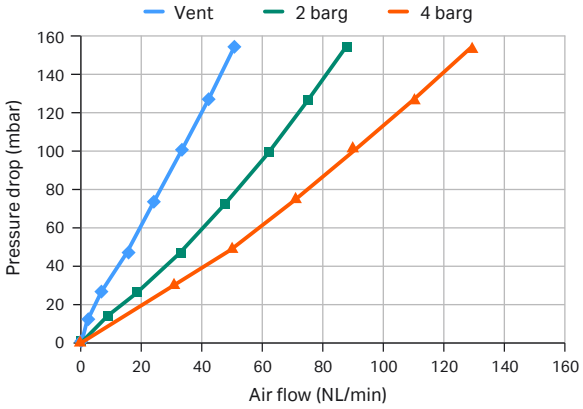


Fig 5. Typical airflow/pressure drop for SLK7002PFR.



Fig 6. Emflon PFR junior style filter cartridges.

Materials of construction

Membrane	Hydrophobic PTFE
Support and drainage layers	PP
End cap, core, and cage	PP
O-rings*	Silicone elastomer
Internal adapter support ring†	Stainless steel

* Excluding SLK styles.
† MCY2230/4463 styles only.

Maximum differential pressure

4.1 bar (60 psi) up to 80°C

Ordering information

Nominal filter area	Differential pressure at 50 Nm³/h air flow and 2 barg (29 psig) inlet pressure	O-ring material	Product code
0.04 m²	790 mbard (11.4 psid)	Ethylene propylene	SBF1PFRPJ
		Silicone	SBF1PFRPH4
0.05 m²	500 mbard (7.25 psid)	FEP-encapsulated fluorocarbon elastomer	MCY1110PFRPH1
		Silicone	MCY1110PFRPH4
0.14 m²	175 mbard (2.5 psid)	N/A	SLK7001PFRP
	200 mbard (2.9 psid)	Ethylene propylene	MCY2230PFRPJ
		Fluorocarbon	MCY2230PFRPH
		Silicone	MCY2230PFRPH4
0.17 m²	160 mbard (psid)	Silicone	MCY3330PFRPH4
0.23 m²	120 mbard (psid)	FEP-encapsulated fluorocarbon elastomer	MCY4440PFRPH1
		Fluorocarbon	MCY4440PFRPH
		Ethylene propylene	MCY4440PFRPJ
		Silicone	MCY4440PFRPH4
0.28 m²	80 mbard (0.28 psid)	N/A	SLK7002PFRP
	180 mbard (2.6 psid)	Ethylene propylene	MCY4463PFRPJ
		FEP-encapsulated fluorocarbon elastomer	MCY4463PFRPH1
		Fluorocarbon	MCY4463PFRPH

Kleenpak™ capsules with Emflon PFR membrane

Technical specifications

Typical air flow rates†

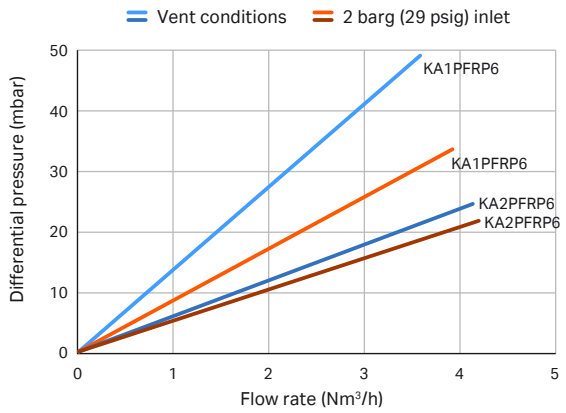


Fig 6. Flow rate (Nm³/h) vs differential pressure (mbar) in KA1 and KA2 capsules.

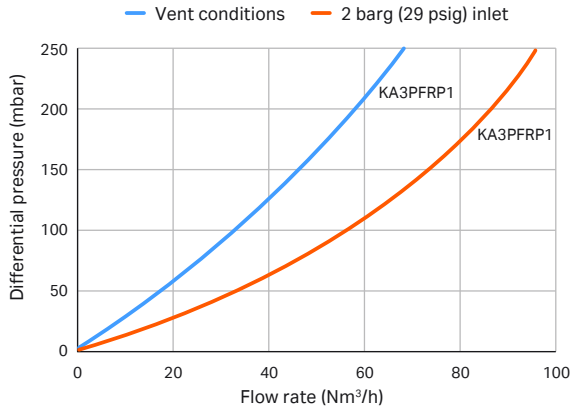


Fig 7. Flow rate (Nm³/h) vs differential pressure (mbar) in KA3 capsules.

† Typical initial clean differential pressure, air at 20°C. Values shown are for 38 mm (1½ in.) sanitary flange connections. Values with other connections are available upon request. Please contact us for gases other than air or nitrogen.

Materials of construction

Membrane	Double-layer hydrophobic PTFE
Support and drainage layers	PP
End cap	PP
Core and cage	PP
Outer shell	PP
Vent and drain	Ethylene propylene rubber
Valve O-rings	Ethylene propylene rubber



Fig 8. Kleenpak capsules with Emflon PFR membrane.

Maximum cumulative steam autoclave time

Up to 140°C for 50 hours

Warning: Kleenpak filters must not be *in situ* steam sterilized by passing steam through under pressure. The figures are maximum allowable values determined by testing under controlled laboratory conditions to the total number of hours indicated. Actual operating conditions may affect the filters' long-term response to sterilization. Filters should be qualified for each process application.

Nominal dimensions

	KA1	KA2	KA3
Maximum diameter (including valves)	94 mm (3.7 in.)	94 mm (3.7 in.)	109 mm (4.2 in.)
Length with 38 mm (1½ in.) sanitary connections	117 mm (4.6 in.)	158 mm (6.2 in.)	174 mm (6.8 in.)
Length with hose barb connection (14 mm [9⁄16 in.] single-barb)	158 mm (6.2 in.)	199 mm (7.8 in.)	210 mm (8.2 in.)

Nominal filter area

KA1	0.04 m² (0.45 ft²)
KA2	0.08 m² (0.95 ft²)
KA3	0.2 m² (2 ft²)

Operating conditions‡

Maximum operating temperature	40°C
Maximum operating pressure	3.5 barg (50 psig)
Maximum differential pressure	3.5 bard (50 psid)

‡ In compatible fluids which do not soften, swell, or adversely affect the filter or materials of construction.

Filter integrity test recommendation

KA2 and KA3	Water intrusion test

KA1, KA2, and KA3 are also testable with forward flow test after wetting with suitable alcohol/water mixtures. Please contact us for test method parameters.

Ordering information

Filter	Connection type	Product code
KA1	38 mm (1½ in.) sanitary flange	KA1PFRP1
	6–13 mm (¼–½ in.) stepped hose barb	KA1PFRP2
	14 mm (9⁄16 in.) hose barb	KA1PFRP6
KA2	38 mm (1½ in.) sanitary flange	KA2PFRP1
	6–13 mm (¼–½ in.) stepped hose barb	KA2PFRP2
	14 mm (9⁄16 in.) hose barb	KA2PFRP6
KA3	38 mm (1½ in.) sanitary flange	KA3PFRP1
	14 mm (9⁄16 in.) hose barb	KA3PFRP6

Mini Kleenpak capsules with Emflon PFR membrane

Technical specifications

Materials of construction

Components	Material
Membrane	Hydrophobic PTFE
Support and drainage layers	PP
Capsule	PP
Vent	PP
Sealing technology	Thermal bonding

Maximum diameter including valves

41 mm (1.6 in.)

Nominal EFA

280 cm^2 (0.3 ft^2)

Operating parameters*

Maximum operating pressure	4.1 bar (59 psi) at 38°C
Maximum operating temperature	80°C at 2.1 bar (30 psi)

* In compatible fluids which do not soften, swell, or adversely affect the filter or its materials of construction.

Sterilization†

Autoclave at 125°C	20 × 30 minute cycles
Autoclave at 142°C	10 × 30 minute cycles

Warning: This product must not be sterilized *in situ* by passing steam through under pressure.

† Maximum allowable figures determined by testing under controlled laboratory conditions to the length of time indicated. Actual operating conditions may affect the filter's long term response to sterilization. Filters should be qualified for each process application



Fig 9. Mini Kleenpak capsules with Emflon PFR membrane.

Typical air flow rates

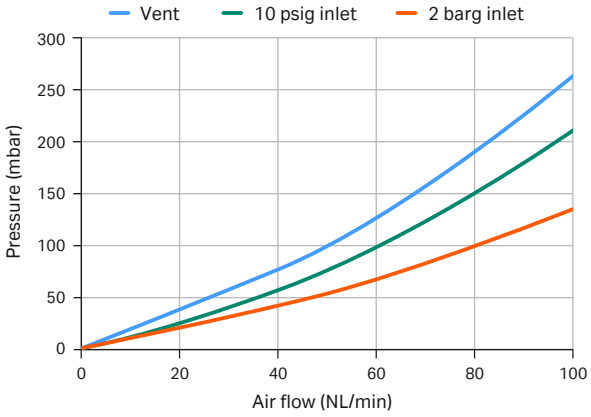


Fig 10. Mini Kleenpak PFR air flow dP.

Ordering information

Sterilization	Packaging	Connection	Nominal dimensions	Product code
Non-sterile	3/box	6–13 mm (¼–½ in.) hose barb connections	72.6 mm (2.9 in.)	KA02PFRP2
		¼ in. NPT connection	97.4 mm (3.8 in.)	KA02PFRP3
		½ in. sanitary clamp connection	104.6 mm (4.1 in.)	KA02PFRP8

Novasip™ capsules with Emflon PFR membrane

Technical specifications

Typical air flow rates*

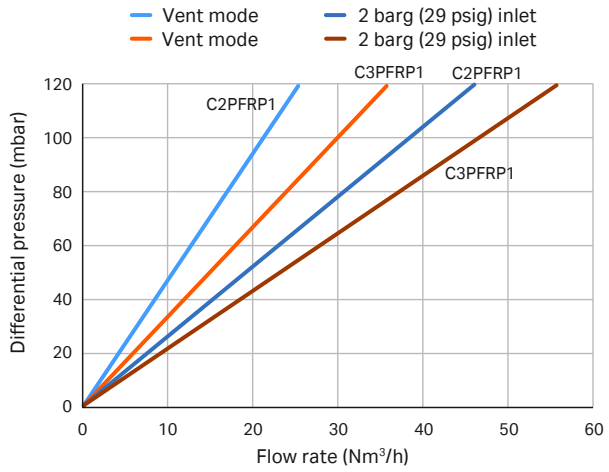


Fig 11. System air flow vs differential pressure.

* Typical initial clean differential pressure, air at 20°C.

Contact us for assistance.



Fig 12. Novasip capsules with Emflon PFR membrane.

Maximum accumulated steam life†,‡

125°C	100 cycles
135°C	50 cycles
142°C	5 cycles

† Validated using 30 minute cycles.
‡ Maximum values determined in laboratory tests. Actual steam life may vary with conditions of use.

Materials of construction

Membrane	Hydrophobic PTFE
Membrane support and drainage layer assembly	PP
Endcaps	PP
Core and cage	PP
Housing bowl	Polyetherimide
Housing head	Polyetherimide with TiO_2
O-rings	Silicone elastomer

Operating conditions§

Maximum operating pressure	6.5 barg (94 psig) at 40°C
Maximum differential pressure¶	5.2 barg (75 psig) at 40°C

§ With fully compatible fluids that do not soften, swell, or adversely affect the filter or its materials of construction.
¶ Maximum differential pressure during steam sterilization at up to 142°C is 300 mbar (4.3 psid).

Nominal dimensions

Maximum diameter (including valves)	123 mm (4.84 in.)
Length	157 mm (6.18 in.)

Ordering information

Connection	Nominal filter area	Vent, drain, and valves	Product code
25–38 mm (1–1½ in.) sanitary flange fittings	0.17 m²	**Vent:** Quick, Stäubli compatible connect and disconnect coupling, with valve **Drain:** Hose barb for 4–6 mm (⅛–¼ in.) i.d. tube, with valve	C2PFRP1
		Vent and drain: Quick, Stäubli compatible connect and disconnect coupling, with valve	C2PFRP1A
		Vent and drain: 13 mm (½ in.) sanitary flange, no valve	C2PFRP1B
	0.23 m²	**Vent:** Quick, Stäubli compatible connect and disconnect coupling, with valve **Drain:** Hose barb for 4–6 mm (⅛–¼ in.) i.d. tube, with valve	C3PFRP1
		Vent and drain: Quick, Stäubli compatible connect and disconnect coupling, with valve	C3PFRP1A
		Vent and drain: 13 mm (½ in.) sanitary flange, no valve	C3PFRP1B

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CY39372-15Sep26-DF

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