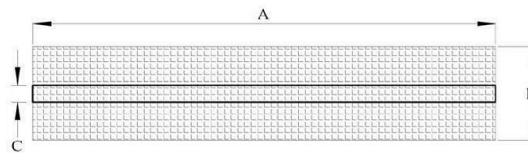


FG-SpiraCore™ S-UF-5K and S-UF-10K Membrane Series

| | |
|------------------------------|---|
| Membrane material: | PES (polyether sulphone) |
| MWCO options: | 5 kDa or 10 kDa |
| Water permeability: | 24-53 LMH/bar (1.0-2.2 GFD/psi) |
| Typical applications: | Protein and Enzymes |
| Outer wrap: | Net |
| Compliance: | 3A Standard, FDA21CFR 177.2550 and EU Directive 10/2011 |



Membrane Element Specifications



| Size | Nominal dimensions [in (mm)] | | | Feed spacer [mil] | Membrane area [ft ² (m ²)] |
|------|---------------------------------|-----------|--------------|----------------------|--|
| | A | B | C | | |
| 3838 | 38 (965) | 3.8 (97) | 0.830 (21) | 31 | 75 (7.0) |
| | | | | 46 | 60 (5.6) |
| 6338 | 38 (965) | 6.3 (160) | 1.139 (28.9) | 31 | 205 (19.0) |
| | | | | 46 | 165 (15.3) |
| | | | | 65 | 125 (11.6) |
| | | | | 80 | 118 (11.0) |
| 8038 | 38 (965) | 7.9 (200) | 1.139 (28.9) | 31 | 310 (32.5) |
| | | | | 46 | 260 (24.2) |
| | | | | 65 | 210 (19.5) |
| | | | | 80 | 183 (17.0) |
| 8338 | 38 (965) | 8.3 (211) | 1.139 (28.9) | 31 | 410 (38.1) |
| | | | | 46 | 319 (29.6) |
| | | | | 65 | 243 (22.6) |
| | | | | 80 | 213 (19.8) |

Note: ATDs (Anti-Telescoping Devices) are required for each membrane element. Do not hesitate to contact us if you need ATDs.

Recommended Operating Conditions

| Typical operating pressure [psi (bar)] | Maximum operating pressure [psi (bar)] | Maximum temperature [°C (°F)] | pH range [-] | Chlorine tolerance [ppm x days] | Maximum pressure drop [psi (bar)] |
|---|---|---|-------------------------------------|------------------------------------|--------------------------------------|
| 80-135 (5.5-9.3) | 200 (13.8) | Operation: 50 (122) standard version / 85 (185) high temperature version Cleaning: 85 (185) | Operation: 2-10 Cleaning: 2-11.5 | 5,000 | 15 (1.0) |

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Ordering Information

| Type | Size | MWCO | Maximum pressure | Feed spacer | Special execution code |
|------|------|---------------|--------------------------|--------------|---------------------------------|
| U | 3838 | -005 = 5 kDa | 020 = 200 psi (13.8 bar) | -31 = 31 mil | (nothing) = standard version |
| | 6338 | -010 = 10 kDa | | -46 = 46 mil | -S04 = high temperature version |
| | 8038 | | | -65 = 65 mil | |
| | 8338 | | | -80 = 80 mil | |

Important Information

- FG-SpiraCore™ membrane elements are to be stored in a dry environment with an ambient temperature of 20-35°C (68-95°F), and protected by direct sunlight, strong wind and dirt;
- Once membrane elements are wetted, keep them always wet in order to prevent any decline in production capacity;
- The maximum allowable dynamic and static backpressure on the permeate side should be zero. Meaning that permeate side pressure should never exceed feed/concentrate side pressure, while in operation or while plant is stopped;
- PCI Membranes reserve the rights to limit warranty in full if the operating parameters applied to the membrane elements are not strictly followed;
- See the PCI FG-SpiraCore™ Membrane Element Warranty document for more details about applied warranties.

Installation Information

- Before installing new FG-SpiraCore™ membrane elements, the inlet/outlet piping as well as the pressure vessels are to be flushed in order to ensure that any contaminant is removed;
- New membrane elements are to be cleaned prior to the first use. For more details, refer to the Cleaning Guidelines below;
- Use a rigid, stainless-steel end ATD (Anti-Telescoping Device) at a housing outlet/inlet;
- The inner diameter of the membrane housing should be ca. 0.08" (2 mm) larger than the outer diameter of the membrane elements to be installed.

Operating Guidelines

PCI Membranes recommend the following start-up procedure from standstill to operating condition:

- The unpressurized plant should be refilled with warm water (20-45°C, 68-113°F);
- The feed pressure should be gradually increased over a 30-60 seconds time scale;
- Before initiating crossflow at high permeation, the set feed pressure should be maintained for 5-10 minutes;
- Gradually increase the crossflow velocity over a period of 15-20 seconds, until the set operating point is achieved;
- Any temperature variation should be gradually implemented over a period of 3-5 minutes;
- Avoid any abrupt pressure or crossflow variation on the FG-SpiraCore™ membrane elements during start-up, operation, shutdown, cleaning or any other sequence in order to prevent any possible damage.

Cleaning Guidelines

PCI Membranes recommend cleaning and flushing the membrane with either deionized or Reverse Osmosis (RO) permeate water.

The following reference CIP guidelines are to be adapted based on the specific application, feed fluid and operating parameters:

- Flush the membranes with service water for 5 min at 1-3 bar (15-44 psi);
- Prepare a caustic solution at a pH of 11.0-11.5 and 45-50°C (113-122°F);

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- Circulate the caustic solution for 30 minutes at 1-3 bar (15-44 psi);
- Displace the caustic solution from the system;
- Flush with sufficient service water to remove all traces of the cleaning solution;
- Prepare a caustic solution at a pH of 10.5-11.0 and 45-50°C (113-122°F), and add 200 ppm of NaOC. Perhaps we should have this second cleaning step as optional, depending on the process application type. For which case, we could look at further clean with caustic plus sodium hypochlorite. This will also align with the CIP chemical recommendation in Table 2.;
- Circulate the caustic and hypochlorite solution for 30 minutes at 1-3 bar (15-44 psi);
- Displace the caustic solution from the system;
- Flush with sufficient service water to remove all traces of the cleaning solution;
- If required, prepare an acidic solution to get a pH of 2.0-2.2 at 45-50°C (113-122°F);
- Circulate the acidic solution for 30 minutes at 1-3 bar (15-44 psi);
- Displace the acidic solution from the system;
- Flush with sufficient service water to remove all traces of the cleaning solution.

Table 1. Service water specifications for flushing and cleaning solution make-up:

| Parameter | Value |
|-------------------------------|-------------|
| Electrical Conductivity (EC) | ≤ 50 µS/cm |
| Turbidity | ≤ 1 NTU |
| Total Suspended Solids (TSS) | ≤ 0.1 mg/L |
| Hardness | ≤ 30 mg/L |
| Iron | ≤ 0.05 mg/L |
| Manganese | ≤ 0.02 mg/L |
| Silica (as SiO ₂) | ≤ 5 mg/L |

Table 2. Membrane cleaning agents:

| Source of fouling | 0.1% wt. NaOH or KOH or 0.1% wt. Na ₄ EDTA at pH = 11.5 and 50°C (122°F) | 0.1% wt. NaOH or KOH or 0.025% wt. Na-SDS at pH = 11.5 and 50°C (122°F) | 0.2% wt. HCl or HNO ₃ at pH = 2.0 and 50°C (122°F) | 2.0% wt. citric acid at 50°C (122°F) |
|--------------------------------|---|---|---|--------------------------------------|
| Organic matter | Best as first step | Best as first step | Best as second step | Best as second step |
| Metals and inorganic compounds | | | Best | Can be used |
| Colloids | Can be used | Can be used | | |
| Microorganisms and silica | Can be used | Can be used | | |
| Inorganic matter | Can be used | Can be used | | |

Notes:

- Ensure that the caustic solution has reached the appropriate pH value prior to the addition of chlorine. Otherwise, this could lead to membrane damage with reduced operating life and release of chlorine gas;
- The duration of a CIP phase depends on the type of fouling on the membrane layer, and it could vary between 30 minutes to 2 hours or more;
- The use of any incompatible CIP chemical can affect FG-SpiraCore™ membrane elements and is out of PCI Membranes' responsibility.

Preservation Guidelines

- When stopping the membrane filtration unit for up to 48 hours, FG-SpiraCore™ membrane elements are to be flushed with RO permeate grade water for 5-10 min every 24 hours in order to prevent any biological growth on the membrane surface;

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- When stopping the membrane filtration unit for more than 48 hours, membrane elements are to be cleaned (for more details, refer to the Cleaning Guidelines below) and to be preserved with 1.5% wt. food-grade sodium bisulfite in order to prevent any biological growth on the membrane surface. Every 3 months, the pH is to be checked and, when it is lower than 3.0, the preservation solution needs to be replaced.

Installation Accessories

Pressure vessels:

| | Material | Diameter | Length | Maximum pressure | Feed/concentrate ports configuration | Connections type |
|----|---------------------|------------|-----------------|-----------------------------|--|-------------------|
| MH | S0 = SS AISI316L | -38 = 3.8" | 1E = elements | 025 = 250 psi (17.2 bar) | -O = 2 side ports, opposite side -S = 2 side ports, same side -E = 4 side ports (2 each side) -F = 2 front ports, opposite side | B = threaded FBSP |
| | | -63 = 6.3" | ... | | | N = threaded NPT |
| | | -80 = 8.0" | 6E = 6 elements | | | T = tri-clamp |
| | | -83 = 8.3" | | | | V = Victaulic |

ATD (Anti-Telescoping Devices):

| | Material | Diameter | Thickness | Permeate tube internal diameter | Seal type |
|----|------------------|------------|--------------------|----------------------------------|---------------|
| MA | S0 = SS AISI316L | -38 = 3.8" | E.g., 080 = 8.0 mm | -0830 = 0.830" -1139 = 1.139" | -L = lip seal |
| | | -63 = 6.3" | | | -O = O-ring |
| | | -80 = 8.0" | | | |
| | | -83 = 8.3" | | | |

End plugs:

| | Material | Permeate tube internal diameter | Seal type |
|----|------------------|---------------------------------|---------------|
| ME | S0 = SS AISI316L | -0830 = 0.830" | -L = lip seal |
| | P0 = PPS | -1139 = 1.139" | -O = O-ring |

O-rings:

| | Material | Diameter | Thickness | Shore A hardness |
|----|-------------|-----------------------|---------------------|------------------|
| MO | E = EPDM | E.g., -0170 = 17.0 mm | E.g., x020 = 2.0 mm | E.g., -070 = 70 |
| | N = NBR | | | |
| | V = Viton | | | |
| | S = Silicon | | | |
| | P = PTFE | | | |

Lip seals:

| | Material | Standard | Permeate tube internal diameter |
|----|-----------|--------------------------|---------------------------------|
| ML | E = EPDM | S = Sanitary (FDA) | -0830 = 0.830" |
| | V = Viton | I = Industrial (non-FDA) | -1139 = 1.139" |

Disclaimer: Filtration data presented is representative of performance observed in controlled laboratory testing. It is not given as a warranty, specification or statement of fitness for use. Specific performance can vary widely depending on contaminant type, fluid properties, flow rates and environmental conditions. It is recommended that users conduct thorough qualification testing to ensure the product functions as required.

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