Q-SEP®

HOLLOW FIBER ULTRAFILTRATION

QUA® is a manufacturer of advanced membrane technologies for water, wastewater and water reuse applications. **F**or over a decade, extensive research and development activities have resulted in a range of cutting-edge membrane products such as hollow fiber ultrafiltration modules (**Q-SEP®**) fractional electrodeionization stacks (**FEDI®**), flat sheet membrane bioreactor modules (**E**nvi**Q®**), and ceramic membranes (Cera**Q**™).

The **Q-SEP®** ultrafiltration fibers and modules are manufactured in a state-of-the-art, environmentally- controlled manufacturing facility with continuous online monitoring to maintain consistent quality.

About Ultrafiltration

Ultrafiltration (UF) is a membrane process used to remove suspended solids, colloidal matter, high molecular-weight substances, bacteria and viruses from various feed water sources. UF membranes can achieve a low and consistent silt density index (SDI) and are often used as pre-treatment for reverse osmosis using surface water, seawater and biologically treated wastewater as feed source. **Q-SEP®** UF membranes incorporate high-strength hollow fibers that deliver superior performance without the risk of fiber breaks. **Q-SEP®** UF membranes are made from a modified polyethersulfone (PES) or polyvinylidene flouride (**P**V**DF**) material with excellent low fouling characteristics. These hollow fiber membranes operate under a pressurized inside-out flow configuration for superior performance.

Q-SEP® hollow fiber UF membranes offer reliable removal of turbidity, microorganisms and viruses. Turbidity can be reduced to less than 0.05 NTU. Typically, a 6-log removal for bacteria, giardia and cryptosporidium, while a 4-log removal for viruses, can be achieved.

Q-SEP® modules contain an advanced **UF** fiber, prepared by an innovative patented cloud point precipitation method. This method ensures a very uniform pore size distribution and high pore density in the membrane.

As a result, the product water quality from **Q- SEP**® modules is significantly better than the quality from conventional UF modules at a very low operating pressure.

The fibers in **Q-SEP**® module are held firmly in place which reduces the stress on the fibers even at high flow velocities. Uniform fiber packing limits the pressure drop variation within the module and prevents localized high fouling conditions. The unique end cap sealing design allows for high pressure operation and ease of assembly.

Q-SEP® inside-out modules contain an advanced UF fiber made from a modified polyethersulfone (**PES**) material. The fiber is prepared by a patented cloud point precipitation method. This method ensures a very uniform pore size distribution and high pore density in the membrane. As a result, the product water quality from the **Q-SEP**® modules is significantly better than the quality from conventional UF modules at a very low operating pressure. The membranes are available with 0.8 mm ID fibers, suitable for feed water turbidity up to **30 NTU**.

Q-SEP® outside-in hollow fiber ultrafiltration modules contain polyvinylidene fluoride (**PVDF**) membranes manufactured by **Q**UA's innovative modified thermally induced phase separation (TI**PS**) method. The membrane has high mechanical strength, high chemical and chlorine tolerance, and ability to handle high feed turbidity with wide range of application. The membranes are available with 1.25 mm (0.05 inch) **OD** capillary to treat feed water with high turbidity up to 100 **NTU**.

The Q-SEP® UF Features

- Superior module design
- Consistent pore sizes
- Uniform membrane fibers
- High porosity along the entire length of fiber
- Quality checks to ensure integrity of individual fibers prior to module assembly

Advantages of the Q-SEP® UF over Conventional Media Filtration

- Improved filtrate quality
- SDI typically less than 3
- Removal of virus and bacteria
- Removal of microbiological matter
- Removal of colloidal matter
- No need to add coagulant chemicals for most applications
- Improvement of downstream RO performance
- Consistently treated water quality irrespective of changes in feed water quality

Applications of the Q-SEP® UF technology

- Pretreatment to reverse osmosis (brackish and seawater applications)
- Purification of surface and well water for potable applications
- Filtration of industrial water
- Wastewater recycle and reuse

Module Specifications

Module Details

Parameter	Description / Information
Configuration	Self encapsulated hollow fiber UF membrane (Inside-Out or Outside-In)
Operating Mode	Dead-end or Cross-flow
Module Mounting	Vertical
Membrane Pore Size and Material	0.02 micron (Inside-Out), PES 0.04 micron (Outside-In), PVDF

Q-SEP® Modules - Inside-Out - 0.8 mm bore size

Product Data		Q-SEP® 2008*	Q-SEP® 4508*	Q-SEP® 6008*
Membrane area	m2 / ft2	20 / 215	45 / 484	60 / 645
Filtrate flow rate (minimum)	m3 / h / gpm	1.00 / 4.4	2.25 / 9.9	3.0 / 13.2
Filtrate flow rate (maximum)	m3 / h / gpm	3.00 / 13.2	6.75 / 29.7	9.00 / 39.6
Fiber inside diameter	mm/inch	0.8 / 0.03	0.8 / 0.03	0.8 / 0.03
Fiber outside diameter	mm/inch	1.2 / 0.05	1.2 / 0.05	1.2 / 0.05
Module Dimensions				
Diámeter (A)	mm/inch	225 / 8.85	225 / 8.85	225 / 8.85
Length - with end cap (B)	mm/inch	1015 / 39.95	1780.7 / 70.1	2230.1 / 87.8
Length - feed connection (C)	mm/inch	900 / 35.4	1666 / 65.69	2116 / 83.31
Distance - width (D)	mm/inch	345 / 13.58	345 / 13.58	345 / 13.58
Distance - Feed to center (E)	mm/inch	140 / 5.51	140 / 5.51	140 / 5.51
Module weight	kg / lbs	25 / 55.1	44 / 97.0	50 / 110.2

Q-SEP® Modules - Outside-In - 1.2 mm bore size

Product Data		Q-SEP® 6012	Q-SEP® 8012
Membrane area	m2 / ft2	60 / 645	80 / 861
Filtrate flow rate (minimum)	m3 / h / gpm	2.5 / 10.6	3.2 / 14.1
Filtrate flow rate (maximum)	m3 / h / gpm	7.2 / 9.6	9.6 / 42.2
Fiber outside diameter	mm/inch	1.25 / 0.05	1.25 / 0.05
Fiber inside diameter	mm/inch	0.75 / 0.03	0.75 / 0.03
Module Dimensions			
Diámeter (A)	mm/inch	225 / 8.85	225 / 8.85
Length - with end cap (B)	mm/inch	1780 / 70.1	2230 / 87.8
Length - feed connection (C)	mm/inch	1666 / 65.59	2116 / 83.3
Distance - width (D)	mm/inch	345 / 13.58	345 / 13.58
Distance - Feed to center (E)	mm/inch	140 / 5.51	140 / 5.51
Module weight	kg / lbs	45 / 99.2	50 / 110.2
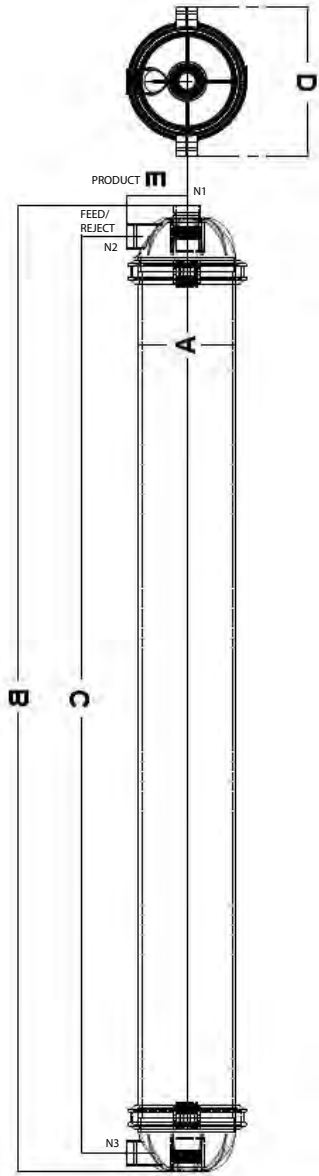
Technical Information

Operational Instructions	Inside-Out	Outside-In
Filtrate flux range	50 to 150 l/m²h (30 to 90 gfd)	40 to 120 l/m²h (24 to 71 gfd)
Maximum feed pressure	4.8 bar (70 psig)	4.8 bar (70 psig)
Recommended Operating Pressure	Up to 3.0 bar (44 psig)	Up to 3.0 bar (44 psig)
Trans-membrane pressure	0.14 to 1.4 bar max (2 to 20 psig max)	0.3 to 2.0 bar (5 to 30 psig)
pH range	2 to 12	2 to 10
Operating pH range	5 to 10	5 to 9
Maximum instantaneous chlorine tolerance	100 to 200 ppm	
Operating temperature range	5 - 45°C (41 - 113°F)	5 - 45°C (41 - 113°F)
Maximum feed turbidity	Up to 30 NTU	Up to 100 NTU*
Backwash flux range	150 to 300 l/m²h (90 to 180 gfd)	
Backwash feed pressure	0.7 to 2.1 bar (10 to 30 psig)	
Backwash frequency & duration	Every 15 - 45 min for 30 - 60 sec	
Operating air scour flow		8 - 10 Nm³/hr (4.7 to 5.9 scfm)
Maximum air flow		12 Nm³/hr (7.1 scfm)
Air inlet pressure max		2.0 bar (30 psig)

Chemical Cleaning		
Estimated frequency	Chemically Enhanced Backwash (CEB) Every 1 - 10 days (condition dependent)	Maintenance Chemical Cleaning Every 1 - 2 days (condition dependent)
Duration	10 to 20 minutes	20 to 30 minutes
CEB chemicals	NaOCl (100 - 200 ppm), NaOH (pH: 11-12), HCl / H_2SO_4 (pH: 2-3), Citric Acid	NaOCl (200 ppm as Cl_2, pH: 9-9.5), H_2SO_4 (0.2%, pH: 2), Citric acid (2%)

Module Characteristics		
Membrane material	Modified PES	Hydrophilic PVDF
Housing material	UPVC	UPVC
End cap material	GRP	GRP
Nozzles size	2"Victaulic	2"Victaulic

*Can handle up to 300 NTU on an intermittent basis

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