

# Q-SEP<sup>®</sup>

**HOLLOW FIBER ULTRAFILTRATION**



## About QUA®

**QUA®** is a manufacturer of advanced membrane technologies for water, wastewater and water reuse applications. For 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 (**EnviQ®**), and ceramic membranes (**CeraQ™**).

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 fluoride (PVDF) 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 QUA's innovative modified thermally induced phase separation (TIPS) 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

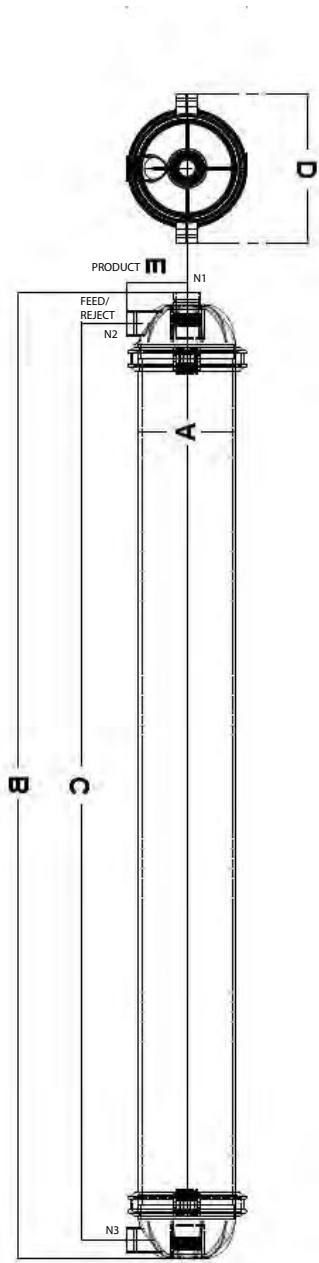
Parameter	Description / Information
Configuration	Self encapsulated hollow fiber UF membrane (Inside-Out or Outside-In)
Operating Mode	Dead-end or Cross-flow
Module Mounting	Vertical
Membrane Pore Size and Material	0.02 micron (Inside-Out), PES 0.04 micron (Outside-In), PVDF

## 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				
Diámetro (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			
Diámetro (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

Filtrate flux range  
Maximum feed pressure  
Recommended Operating Pressure  
Trans-membrane pressure  
pH range  
Operating pH range  
Maximum instantaneous chlorine tolerance  
Operating temperature range  
Maximum feed turbidity

## Inside-Out

50 to 150 l/m<sup>2</sup>h (30 to 90 gfd)  
4.8 bar (70 psig)  
Up to 3.0 bar (44 psig)  
0.14 to 1.4 bar max (2 to 20 psig max)  
2 to 12  
5 to 10  
100 to 200 ppm  
5 - 45°C (41 - 113°F)  
Up to 30 NTU

## Outside-In

40 to 120 l/m<sup>2</sup>h (24 to 71 gfd)  
4.8 bar (70 psig)  
Up to 3.0 bar (44 psig)  
0.3 to 2.0 bar (5 to 30 psig)  
2 to 10  
5 to 9  
  
5 - 45°C (41 - 113°F)  
Up to 100 NTU\*

Backwash flux range  
Backwash feed pressure  
Backwash frequency & duration  
Operating air scour flow  
Maximum air flow  
Air inlet pressure max

150 to 300 l/m<sup>2</sup>h (90 to 180 gfd)  
0.7 to 2.1 bar (10 to 30 psig)  
Every 15 - 45 min for 30 - 60 sec

8 - 10 Nm<sup>3</sup>/hr (4.7 to 5.9 scfm)  
12 Nm<sup>3</sup>/hr (7.1 scfm)  
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  
CEB chemicals

10 to 20 minutes  
NaOCl (100 - 200 ppm), NaOH (pH: 11-12), HCl / H<sub>2</sub>SO<sub>4</sub> (pH: 2-3), Citric Acid

20 to 30 minutes  
NaOCl (200 ppm as Cl<sub>2</sub>, pH: 9-9.5), H<sub>2</sub>SO<sub>4</sub> (0.2%, pH: 2), Citric acid (2%)

## Module Characteristics

Membrane material  
Housing material  
End cap material  
Nozzles size

Modified PES  
UPVC  
GRP  
2" Victaulic

Hydrophilic PVDF  
UPVC  
GRP  
2" Victaulic

\*Can handle up to 300 NTU on an intermittent basis



## QUA Q-CONNECT SERIES

**Qua Q-Connect** series is pre-engineered Q-SEP Ultrafiltration rack solution which provides reduced footprint, high flow rates and ease of installation. Q-Connect can be used for any industrial and municipal water and waste water treatment application requiring Ultrafiltration membranes. Q-SEP 10012 Q-Connect Series consists of Outside in Ultrafiltration membranes. This is available in two configurations, Q-Connect 6.0 with 6 nos. of Q-SEP 10012 modules and Q-Connect 4.0 with 4 Nos. of Q-SEP 10012 modules.. Each ultrafiltration module has a membrane area of 100 m<sup>2</sup>.



### Module Details

Parameters	Description/information
Configuration	Self-encapsulated hollow fiber ultrafiltration membrane module (outside-in)
Operating Mode	Dead-end or Cross flow
Module Mounting	Vertical

### Q-CONNECT - 10012 Rack Specifications

Product Data	UOM	Q-CONNECT 4.0	Q-CONNECT 6.0
Q-SEP®10012 modules	Nos.	4	6
Total Membrane area	m <sup>2</sup> /ft <sup>2</sup>	400 / 4306	600/ 6458
Filtrate flow rate minimum	m <sup>3</sup> /hr / gpm	16/ 70.5	24 / 105.6
Filtrate flow rate maximum	m <sup>3</sup> /hr / gpm	48/ 211.3	72 / 316.8
Air scouring – Air assisted cleaning	Nm <sup>3</sup> /hr / scfm	48 –56 / 30 –35	72 –84 / 45 –52
Air scouring – Chemical cleaning	Nm <sup>3</sup> /hr / scfm	16 –24 / 10 -15	24 –36 / 15 –22
Rack Length (A)	mm / inch	801 / 31.5	1202 / 47.3
Rack Width (B)	mm / inch	856 / 33.7	856 / 33.7
Rack Height – with product header (C)	mm / inch	2732/ 107.5	2732 / 107.5
Rack weight	Kg / lbs	-	-

### Q-CONNECT 10012 Module Ports Description

Ports Tag No	Ports Description	Size & Type
N1	Reject	6" Victaulic
N2	Product	6" Victaulic
N3	Feed	6" Victaulic
N4	Air	2" Victaulic



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