



MEMSTAR



Submerged UF

Product Line Overview and Technical Specifications

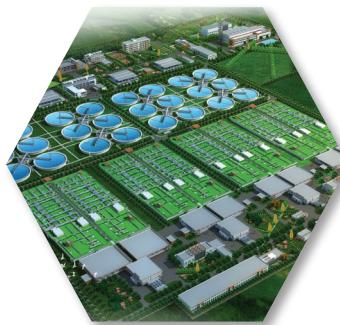
Memstar's submerged UF technology is ideally suited for water and wastewater clarification, especially membrane bioreactor applications.

Memstar has pioneered the development of a proprietary thermally induced phase separation (TIPS) PVDF hollow fiber membrane and innovative Energy Saving Air Scouring (ESAS) technology to minimize capital and life cycle costs for municipal and industrial applications. Memstar submerged technologies are currently used at over 400 sites worldwide to treat more than 10,000,000 m³/day (2.6 billion gallons/day) of wastewater.

Key Advantages:

1 Minimal Footprint

- High fiber packing density
- Double decker skid design



2 Lower Operating Costs

- Long membrane life due to high mechanical strength and superior chemical resistance
- Lower energy consumption due to patented ESAS and double decker skid design
- Permanently hydrophilic with high permeability
- Stable high flux with reduced fouling



3 Ability to Treat the Most Challenging Waters

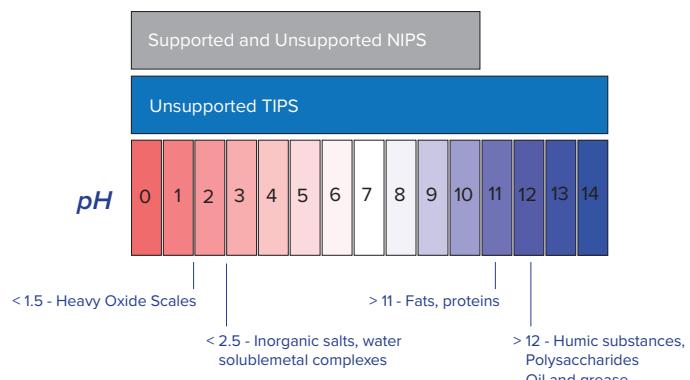
- High mechanical strength to minimize fiber breakage
- Extreme pH and oxidant (including ozone) tolerance to restore performance due to unexpected fouling
- Symmetric TIPS PVDF technology eliminates the risk of delamination and minimizes the impact of abrasion

Fiber Technology

Memstar's MBR products outperform the competition due to our superior TIPS PVDF hollow fiber technology which is at the core of every product. Our proprietary manufacturing process yields a fiber with a dense crystalline structure that is permanently hydrophilic. These properties enable its use on a wide range of applications and provide unparalleled flexibility on cleaning methods to recover performance.

Our single layer unsupported TIPS PVDF membrane is:

- Easy to clean - tolerates chemical cleaning across full pH range
- Permanently hydrophilic
- Compact and high strength, eliminating the need for reinforcement

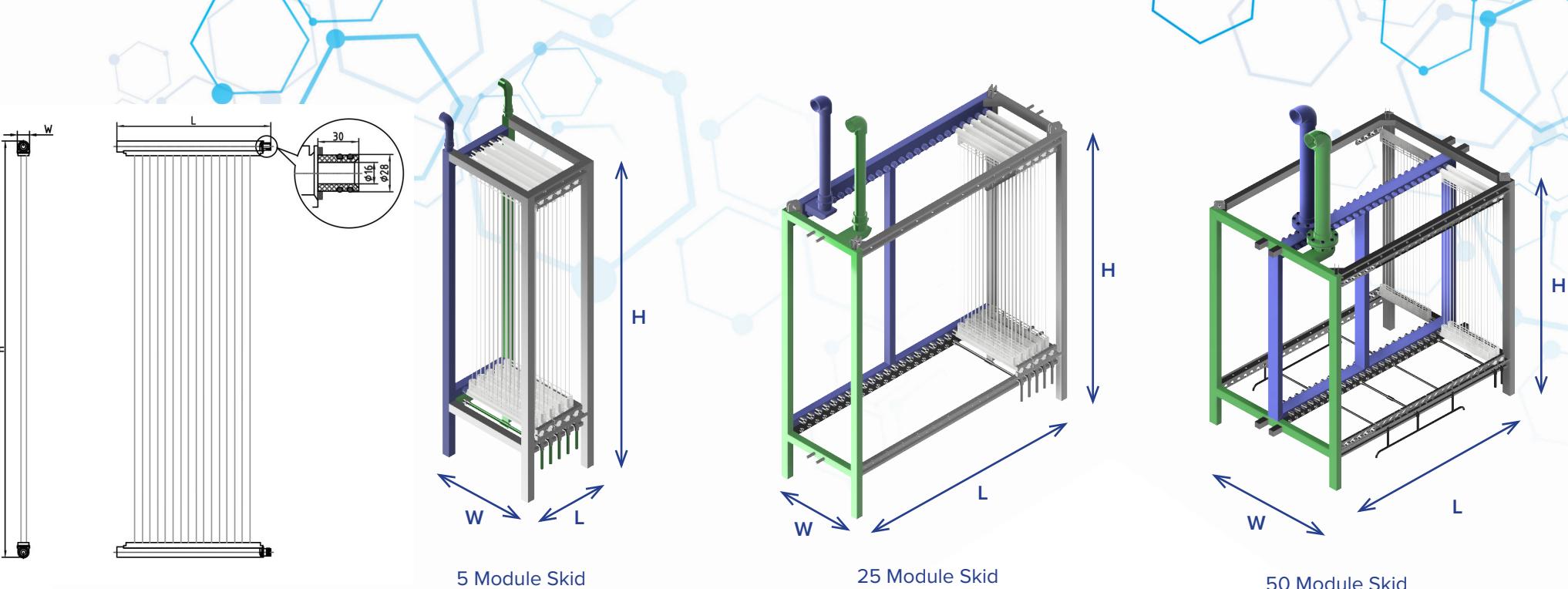


pH Required for Effective Removal of Common Foulnants

Module Specifications

Module Type	SMM-1015T	SMM-1522T	SMM-2030T
Membrane Material	PVDF (TIPS)		
Pore Size (um)	0.04		
Filtration Mode	Outside-in		
Housing Material	ABS		
Potting Material	Epoxy/Polyurethane		
Filtration Surface Area (m ²)[ft ²]	15 [161]	22 [237]	30 [323]
Wet Weight (kg) [lbs]	6 [13]	9 [20]	13 [29]
L* (mm) [inches]	571 [22.5]	571 [22.5]	571 [22.5]
W* (mm) [inches]	45 [1.8]	45 [1.8]	45 [1.8]
H* (mm) [inches]	1,040 [40.9]	1,540 [60.6]	2,040 [80.3]
Filtrate Pipe Port Pipe Port	DN20 ABS OD28	DN20 ABS OD28	DN20 ABS OD28

* Approximate dimensions. Check with Memstar for the most up-to-date and accurate values.



	5 Module Skids			25 Module Skids		50 Module Skids		92 Module Skids	
Module Name	SMM-1015	SMM-1522	SMM-2030	SMM-1522	SMM-2030	SMM-1522	SMM-2030	SMM-1522	SMM-2030
Skid Surface Area (m ²) [ft ²]	75 [807]	110 [1,184]	150 [1,614]	550 [5,918]	750 [8,070]	1,100 [11,836]	1,500 [16,140]	2,024 [21,778]	2,760 [29,698]
Flowrate municipal applications* m ³ /day [gpm]	41 [8]	59 [11]	81 [15]	297 [54]	405 [74]	594 [109]	810 [149]	1,093 [200]	1,490 [273]
Flowrate industrial applications* m ³ /day [gpm]	29 [5]	43 [8]	58 [11]	213 [39]	291 [53]	427 [78]	582 [107]	789 [145]	1,076 [197]
L**** (mm) [inches]	555 [22]	555 [22]	555 [22]	2,195 [86]	2,195 [86]	2,195 [86]	2,195 [86]	2,175 [85]	2,175 [85]
W**** (mm) [inches]	640 [25]	640 [25]	640 [25]	690 [27]	690 [27]	1,280 [50]	1,280 [50]	1,280 [50]	1,280 [50]
H**, **** (mm) [inches]	1,530 [60]	2,030 [80]	2,530 [99]	2,030 [80]	2,530 [99]	2,030 [80]	2,530 [99]	3,730 [147]	4,730 [186]
Filtrate Connection* (DN-mm) [inches]	DN40 [1-1/2"]	DN40 [1-1/2"]	DN50 [2"]	DN65 [2-1/2"]	DN80 [3"]	DN100 [4"]	DN100 [4"]	DN125 [5"]	DN125 [5"]
Air Connection* (DN-mm) [inches]	DN40 [1-1/2"]	DN40 [1-1/2"]	DN40 [1-1/2"]	DN65 [2-1/2"]	DN65 [2-1/2"]	DN100 [4"]	DN100 [4"]	DN100 [4"]	DN100 [4"]
Max. Shipping Weight*** kg [lbs]	150 [331]	180 [397]	210 [463]	460 [1,014]	580 [1,279]	830 [1,830]	950 [2,095]	1,600 [3,527]	2,100 [4,630]
Lifting Weight**** kg [lb]	200 [441]	240 [529]	280 [617]	1,100 [2,425]	1,240 [2,734]	1,940 [4,277]	2,240 [4,938]	3,580 [7,893]	4,000 [8,818]
Skid Frame Material	SS304 or SS316L								

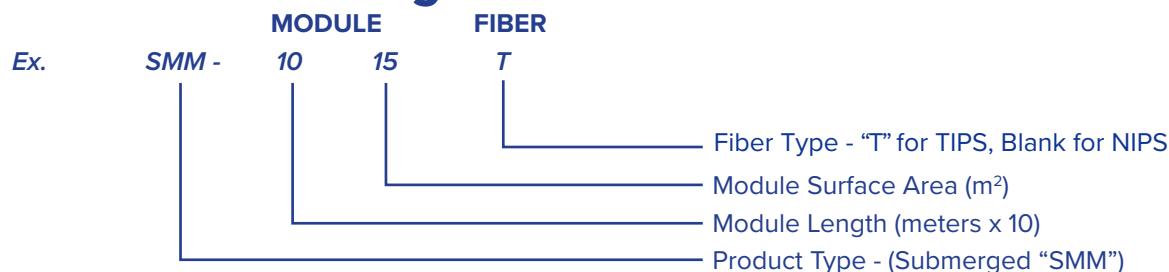
* Typical values provided may change base on project specific requirements **Skid only not inclusive of any lifting apparatus

***Crated with maximum number of modules

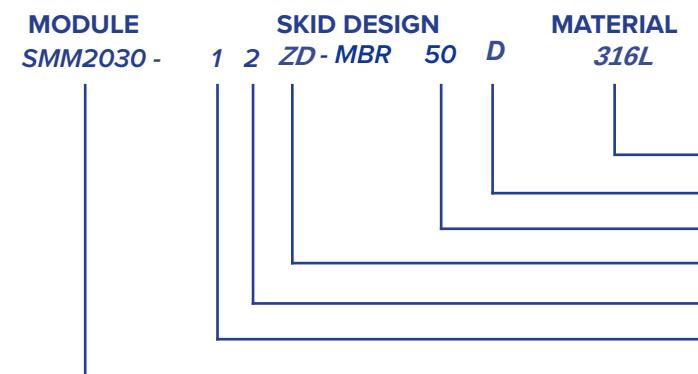
**** Varies with number of modules and solids accumulation

*****Approximate dimensions based on "D" Module Spacing. Check with Memstar for the most up-to-date and accurate values.

Module Numbering Guide



Skid Numbering Guide



Skid Material - SS304 or SS316L

Module Spacing A, B, C or D

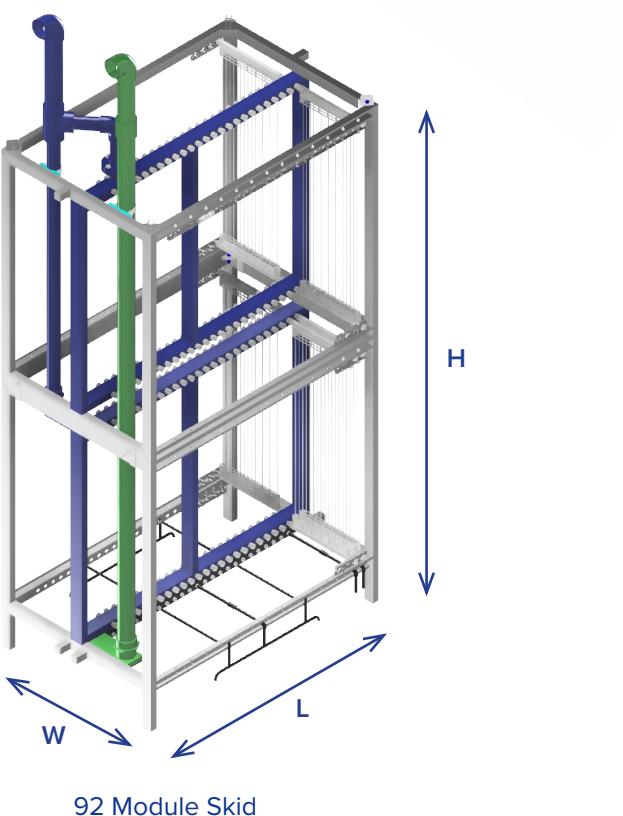
Number of modules that can be installed on skid

Aeration Design - ZD = Integrated Air/Water pipes, FD = Independent Air/Water pipes

Number of Rows - 1 or 2

Number of Vertical Layers - 1 or 2

Module Type - "SMM2030" = SMM-2030



MODULE OPERATING PARAMETERS	ALLOWABLE RANGE
Operating temperature (°C) [°F]	5 – 40 [41-104]
Typical flux (LMH) [gfd] ¹	8 – 30 [5-18]
Instantaneous chlorine tolerance (ppm)	10,000
Maximum lifetime chlorine tolerance (ppm-hrs)	3,000,000
Maximum transmembrane pressure (bar) [psi]	0.5 [7]
Maximum backwash pressure (bar) [psi]	0.5 [7]
Oil content in feed water (ppm)	< 2
pH range	Operating: 1 – 12; Cleaning: 1 – 14
Air scour rate (m ³ /hr/module) [cfm/module]	2 - 3 [1.3 - 1.9]
Membrane tank MLSS ² (mg/L)	6,000 - 12,000 Recommended: 6,000 - 8,000
Particle size in feed water ³ (mm)	≤ 2



1- Flux selection depends on feed type and water quality. Please consult Memstar for flux selection.

2 - Please consult Memstar for higher values.

3 - The primary concern is sharp objects entering the treatment system such as branches, plastic pieces, sand, etc.

Applications and Experience

Municipal MBR – Memstar submerged UF technology is used in the world's largest MBR plants, including the 750 MLD (198 MGD) Chengdu MBR project and the 600 MLD (158 MGD) Huafang MBR project, due to lower life cycle costs.

Industrial MBR – Unlike other PVDF products, Memstar TIPS PVDF enables the treatment of extremely challenging industrial wastewaters such as refinery, petrochemical, textile, and food and beverage.

Direct and Indirect Potable Re-Use – Memstar symmetric fiber technology allows integrity testing without risk of delamination, allowing the confirmation of removal efficiency for bacteria and virus.

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