

Microfiltration

the perfect pre-treatment



MF20: Microfiltration unit with booster pump



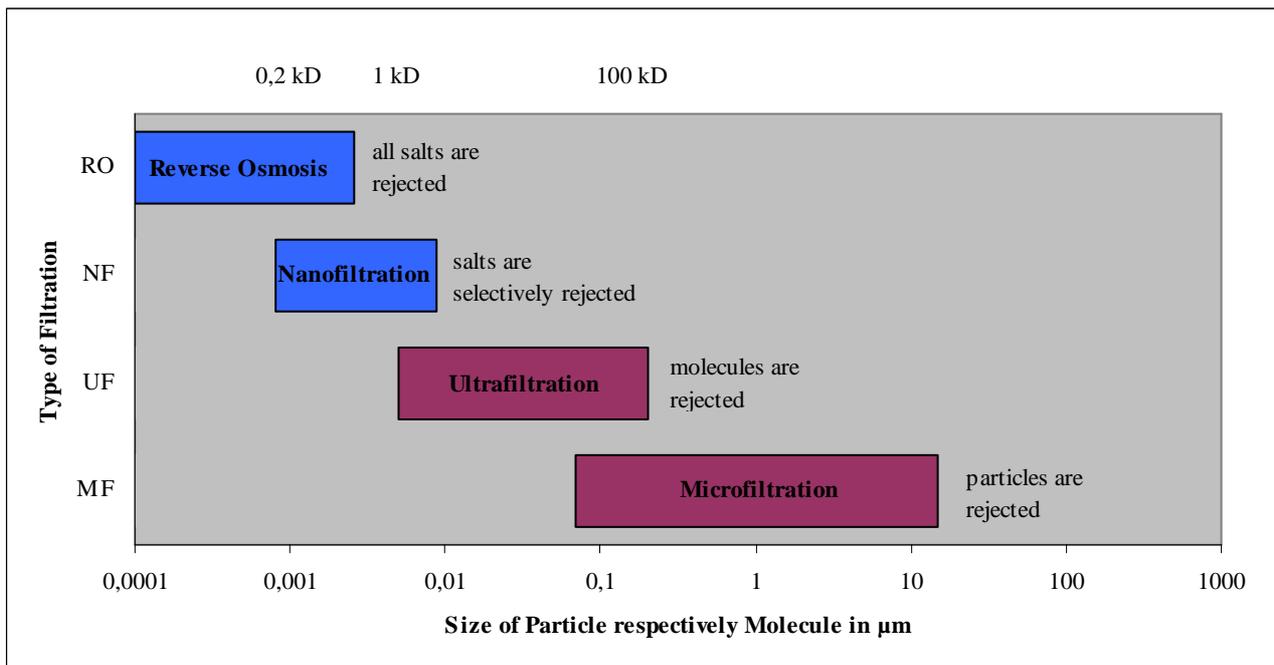
MF90: Microfiltration unit without booster pump

Overview:
Microfiltration –
Ultrafiltration –
Nanofiltration –
Reverse Osmosis

The distinction between the different types of the membrane is not clear. Sharp boundaries are not existing. Therefore the terms becomes indistinct.

The most simple classification is done by the rejected substances. With microfiltration exclusively particles are rejected - diffusion processes do not play a role. With the finest microfiltration membrane some of the

largest molecules are rejected - the range of ultrafiltration begins. The most common parameter for characterising an ultrafiltration membrane is the "molecular weight cut off" MWCO. The unit is Dalton (D) respectively kilo-Dalton (kD). If a membrane has a MWCO of 100 kD, 90% (in some extent 95%) it will reject 90% of the particles with a molecular weight of 100 g/mol. Larger particles are rejected better, smaller particles worse.

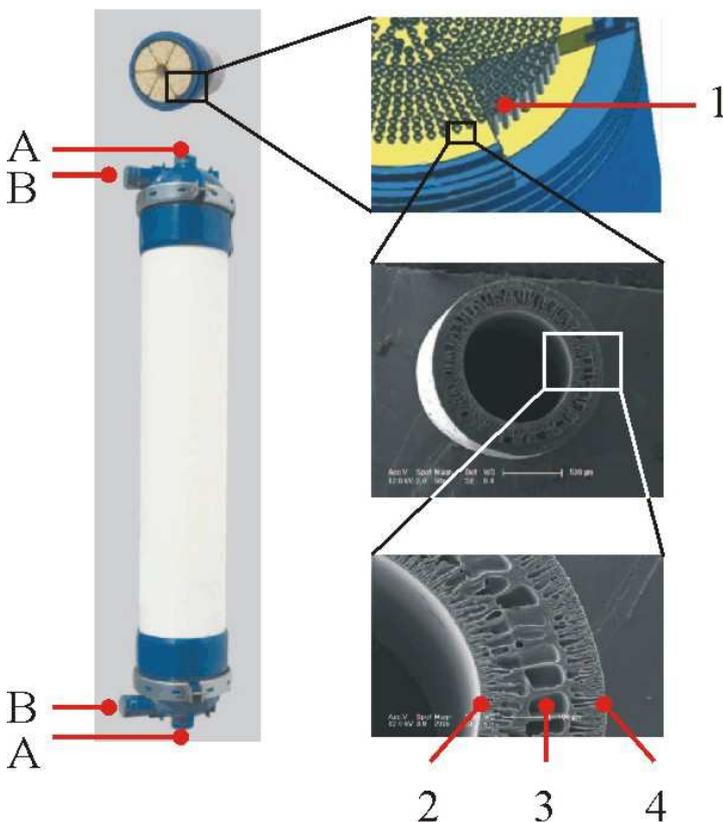


Some producers of membranes counts ultrafiltration to the range of microfiltration, because predominantly hydraulic processes occur that affect flow and rejection. In the lower range of pore size diffusion processes becomes stronger and hydraulic processes take a beck seat.

By some authors the transition to pure diffusion membranes (reverse osmosis) is called nanofiltration. Here some of small molecules and large salts are rejected at least partial. Large salt ions like calcium and sulfate are rejected to high amounts (e.g. 95%), smaller ions like sodium and chloride has only rejections of 40-60%.

If smaller salts are rejected to high percentages the range of reverse osmosis is reached. In this range only diffusion processes are important. Pores, that you imagine as small holes, are not existing. Only gases are diffusing nearly untouched. For this reason permeate of a reverses osmosis membran has a lower pH than the feed water: the carbonic acid in form of carbon dioxide diffuses through the membrane, in contrast the buffer capacity (e.g. hydrogen carbonate) not. The carbon dioxide in the permeate forms carbonic acid and lowers the pH.

From microfiltration to reverses osmosis the needed pressure is rising. Microfiltration is normally done under or slightly over 1 bar, because only the mechanical resistant of the membrane must be overrided. Reverse osmosis need in the extrem range (landfill seepage water) up to 200 bar. The higher the salt concentration the higher the osmotic pressure the higher the needed operation pressure for the membrane.



Structure of a hollow fibre module

- A: Feed water and concentrate
- B: Filtrate (Permeate)
- 1: single hollow fibre
- 2: inner surface of a hollow fibre
- 3: support of the fibre
- 4: outer surface of a hollow fibre

Hollow fibre modules and spiral wound modules for standard R.O. housings are available, too.



Field of application

Microfiltration for aquaristics is not very common - until now. But for some applications nearly sterile water makes sense. For phytoplankton breeding it is very important that foreign organisms are not introduced. Even one "wrong" algae may overgrow the wished culture.

If you breed fish larvae introduced bacteria, protozoa, predacious copepodes and other parasites may kill the defenseless breed and a lot of work is destroyed. Alternatively you can use fresh mixed sea water. But this must mature and you must adapt the quality carefully to the old water. Mistakes may kill the breed.

In "naked" quarantine systems (without ground, without porous material, but with currents) microfiltration may effectively filter out pathogen swarmers and destructive bacteria, even large

viruses are rejected. For very sensitive organisms a microfiltration unit reduces the losses compared to medical treatments.

Operation of a unit

Microfiltration is a very fine filtering system. All particles (even large colloids) over 0.1 µm, bacteria and large viruses are rejected and washed out with the concentrate flow. The rejection is about 95% and higher, compared to 10-25% with reverse osmosis (without antiscalling substances). The concentrate is normally put back into the main aquarium system.

Technical data

Type	MFW-0020	MF090-100
Flow*	with sea water about 6-10 litres per hour with built in pump; maximum 40 litres per hour (with pre pressure)	800 litres per hour
Pre filtration	100 µm (washable)	100 µm
Type of operation	Cross flow	Dead end
Recovery	95-99%	
Membrane type	spiral wound module	hollow fibre module
Membrane material	polysulfone	PVC modifiziert
Membrane size	1812	UF90
MW Cut Off (MWCO)	ca. 100 kD	ca. 100 kD
Pore size in nm	ca. 30 nm	ca. 30 nm
Material of housing	PP	PVC and ABS** on request in PMMA (acrylic)
Dimensions in mm	410 × 410 × ca. 150	1600 × 850 × ca. 350
Weight in kg	6	50

* at 25°C

** you may glue connectors made of ABS with PVC glue