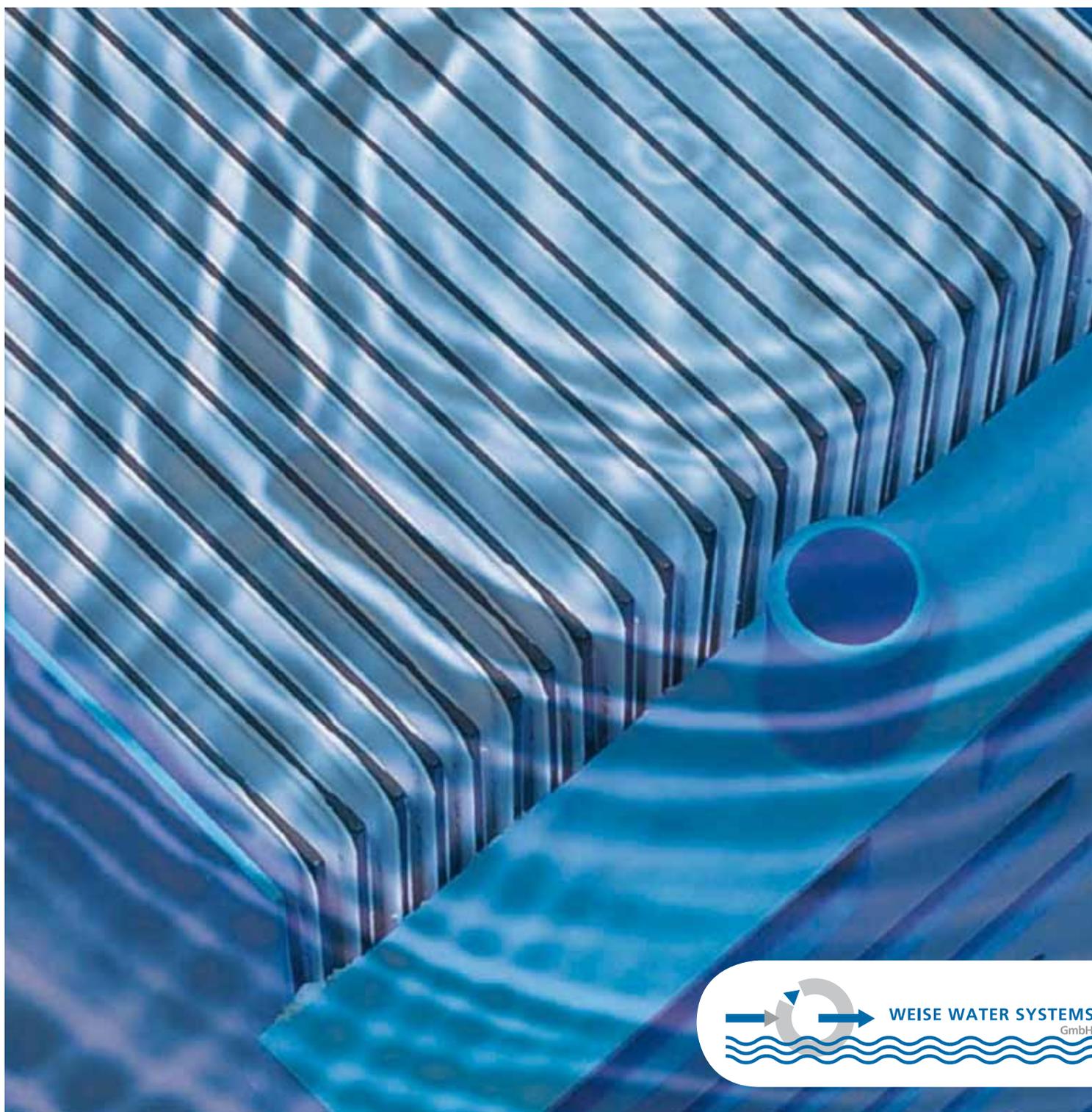


Weise Water Systems

MicroClear®

Submerged Ultrafiltration –
for precious water



Our philosophy

outstanding technology for precious water



As a pioneer in membrane filtration technology, Weise Water Systems developed the MicroClear® filter which has since been successfully installed around the world in over 1000 systems. The result: precious water can be recycled following a problem-free filtering process that operates on a purely physical basis.

The ecological and economic advantages of the innovative MicroClear® system open up new possibilities for many users to produce germ-free, clean water – in the communal area, in industrial applications, for relief organisations and also as a decentralised solution for private households.

Common to all fields of application: users and consumers profit from the robust technology, simple handling and high level of safety in operation. The output values attained after filtration are substantially below the strict limits set by the EU bathing water regulation.

This innovative system, with its unique self-cleaning mechanism, is patented for the European region (EP 1016449).



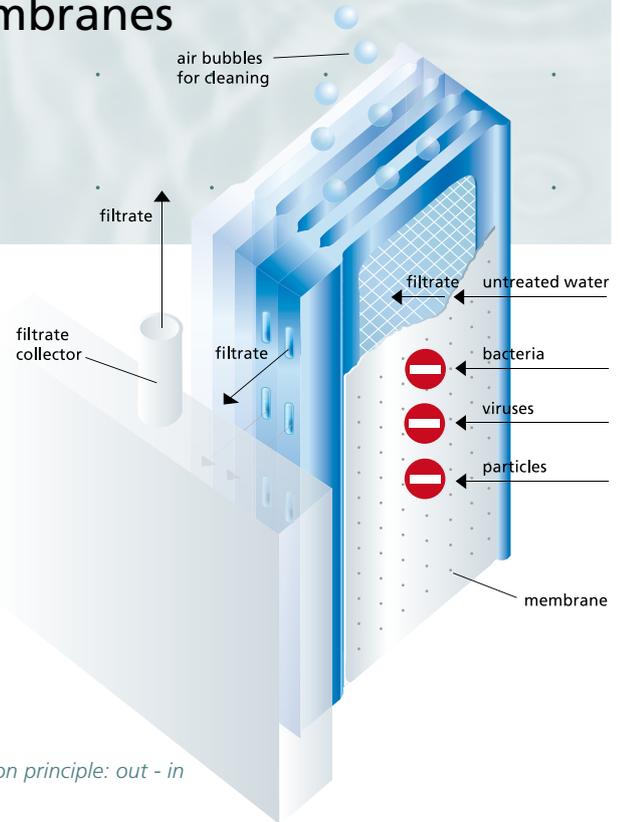
Joint BMBF research project with the University of Applied Sciences Gießen-Friedberg

The Aquacell system with MicroClear® Ultrafiltration technology has been tested by the Test Institute for Waste Water Engineering and has passed the tests for EN 12566-3 with excellent results.



Our technique

ultrafiltration with submerged membranes



The innovation:

submerged ultrafiltration cassettes with clear advantages from the patented plate principle

Our filters are fundamentally based on a robust plastic plate covered on both sides with an ultra-filtration membrane. Wastewater flows from an external source through the membrane inside the plate before being drawn through a filtrate collector by a negative pressure of only 0.1 bar. Particles, bacteria and even viruses are securely blocked physically! This is because of the membrane's minute pore size of only 0.04 µm.

The filtration principle: out - in

		Particle size and filtration spectrum for MicroClear® filters						
		<raster electron microscope		<direct light microscope			<visible to the naked eye	
Micrometer		0.001	0.01	0.1	1.0	10	100	1000
relative size in comparison		dissolved salts	active charcoal	colour pigments		hair		
			pyrogens			yeast cells		sand
		metal ions		viruses		bacteria		fog
				tobacco smoke		coal dust		
					respiratory hazardous dust	red blood corp.		pollen
	atom radius		sugar	colloidal silica particles				
separation process		reverse osmosis			micro-filtration			
			nano-filtration				particle filtration	
			ultra-filtration					

Defined air bubbles combined with the absolutely unique structure of the filter plates, produce a self-cleaning effect that continuously cleanse membrane surfaces in an environmentally friendly manner.

This is why MicroClear® filters need chemical cleaning only once or twice a year – even when sustained flux is as high as 30 l/m²h.

Our products – modular, flexible, economical

MicroClear® – Ultrafiltration cassettes

From 3.5 m² to 875 m² per unit; for decentralised wastewater recycling right up to systems built for central clarification plants, always the suitable filter size.

The basic building blocks for MicroClear® systems are the MC03 and MCXL modules that can be configured in a completely flexible manner. Whether in small clarification systems for 4 to 50 residents or large central clarification plants for up to 100,000 residents formed by modules rated at 875 m² each, the unique advantages of the MicroClear® filter are always convincing.

Depending on purpose, the appropriate configuration size can be selected. The compact MC03 filter module is predestined for creating a small water treatment plant whereas the MCXL module offers necessary flexibility for larger systems.



*MicroClear® MCXL
MicroClear® MC03*

The MC03 and MCXL in comparison

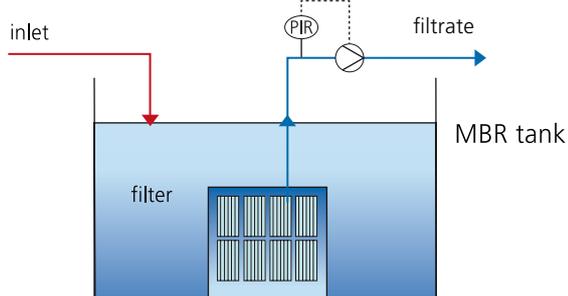
Filter designation	MicroClear® MC03	MicroClear® MCXL
Dimensions	L x W x H: 207 x 207 x 492 mm	L x W x H: 415 x 207 x 490 mm
Protective pockets	2	2
Number of active plates	24	21
Plate spacing	5.5 mm	5,5 mm
Filter area	3.5 m ²	7 m ²
Packing density	160 m ² /m ³	160 m ² /m ³
Membrane material	Polyether sulphone (PES)	Polyether sulphone (PES)
Weight	4.5 kg	11.5 kg
Connection	DN 25	DN 25
Filtration pressure	0.1 ... 0.15 bar	0.1 ... 0.15 bar
Backflush pressure	0.05 bar	0.1 bar
Mean flux	15 ... 30 l/m ² h	15 ... 30 l/m ² h
Maximum flux	50 l/m ² h	50 l/m ² h
Cut-Off	150 kDa	150 kDa
Retention size	0.04 µm	0.04 µm
Application	Membrane bioreactor	Membrane bioreactor

Our products – maintenance friendly, complete, safe

Filter housings – the interface to your system

Membrane bioreactors (MBR) are designed with internally arranged membranes (primarily in small, decentralised systems) or with externally positioned filter elements (for larger systems).

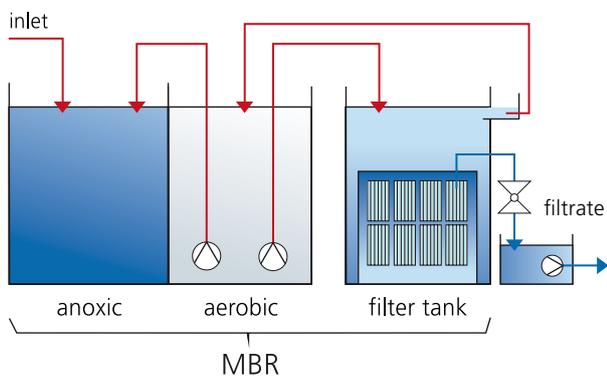
Internal setup with filtrate extraction



Advantages:

- smallest investment
- simple system structure

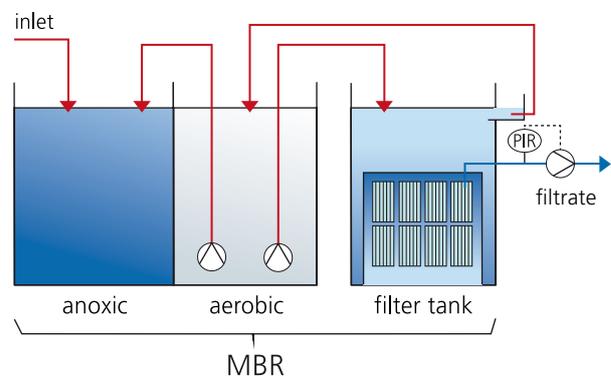
External setup with gravity filtration



Advantages:

- simple cleaning
- filter removal for cleaning is not necessary
- robust, reliable concept

External setup with filtrate extraction



Advantages:

- simple cleaning
- filter removal for cleaning is not necessary
- flexible arrangement in any number of tanks

Application example



External arrangement of a MicroClear® system for wastewater treatment in the pharmaceuticals industry

Our products – modular, flexible, economical

MicroClear® – UF cassette modules the versatile solution for new systems

The modular structure:

2 to 5 layer arrangements of MicroClear® modules for any installation site.



The new MB filter modules:

The new MicroClear® MB series can be stacked horizontally and vertically in various configurations. Combinations of MB2 and MB3 are the building blocks used to configure MB4 and MB5 series filter modules. The advantage: maximum flexibility and the lowest possible energy requirement for cross-flow aeration. The MB2 housing series is particularly well suited for relatively flat tanks, e.g. in containerised and shipboard clarification plants. In contrast, the MB5 housing series is used for large clarification plants with deep basins where the air can be better utilised with the 5-fold stacking of MicroClear elements.



Type	Dimension L x B x H cm	Filter area/ m ²	Capacity* m ³ /day	Nr. of MCXL
MB2-1	130 x 70 x 135	70	50	10
MB2-2	130 x 112 x 135	140	100	20
MB2-3	130 x 154 x 135	210	150	30
MB2-4	130 x 196 x 135	280	200	40
MB2-5	130 x 238 x 135	350	250	50

*Values depend on wastewater condition

Type	Dimension L x B x H cm	Filter area/ m ²	Capacity* m ³ /day	Nr. of MCXL
MB3-1	130 x 70 x 185	105	75	15
MB3-2	130 x 112 x 185	210	150	30
MB3-3	130 x 154 x 185	315	225	45
MB3-4	130 x 196 x 185	420	300	60
MB3-5	130 x 238 x 185	525	375	75

*Values depend on wastewater condition

Our products – maintenance friendly, complete, safe

MicroClear® – UF cassette modules replace the plate filters of other manufacturers



MB4-1

Replacement for all plate filters: more performance in the smallest possible space.

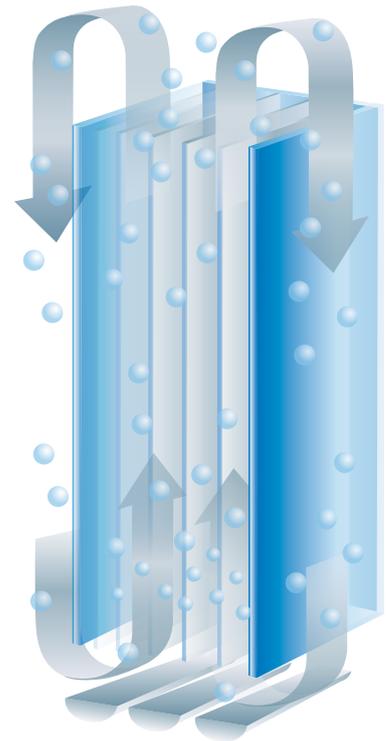
The MicroClear® system can be used to replace any type of plate filter - at only half of the space requirement. The packaging density (i.e. membrane area with respect to housing volume) for MB5-5 filter modules

is 115 m²/m³. Beyond the aforementioned innovations, a specially developed, maintenance-free aeration system with medium-sized bubbles ensures thorough cleaning of the membrane even where stubborn contaminants are present, e.g. fine particles. The filtrate rating in waste water is 30 l/m²h, and this rating is achieved with only 2 chemical cleanings per year. This means:

less membrane surface area and lower investment cost.

Newly optimised aeration arrangement:

The new filter housing style with aeration elements located beneath the water intake zone permits significantly greater cross-flow speed and thus better cleaning with a reduced volume of air. The result of this optimisation is an air requirement of only 0.28 Nm³/m²h for the MB5.



Alignment of aerators in MB-housing series

Type	Dimension L x B x H cm	Filter area/ m ²	Capacity* m ³ /day	Nr. of MCXL
MB4-1	130 x 70 x 245	140	100	20
MB4-2	130 x 112 x 245	280	200	40
MB4-3	130 x 154 x 245	420	300	60
MB4-4	130 x 196 x 245	560	400	80
MB4-5	130 x 238 x 245	700	500	100

*Values depend on wastewater condition

Type	Dimension L x B x H cm	Filter area/ m ²	Capacity* m ³ /day	Nr. of MCXL
MB5-1	130 x 70 x 295	175	125	25
MB5-2	130 x 112 x 295	350	250	50
MB5-3	130 x 154 x 295	525	375	75
MB5-4	130 x 196 x 295	700	500	100
MB5-5	130 x 238 x 295	875	630	125

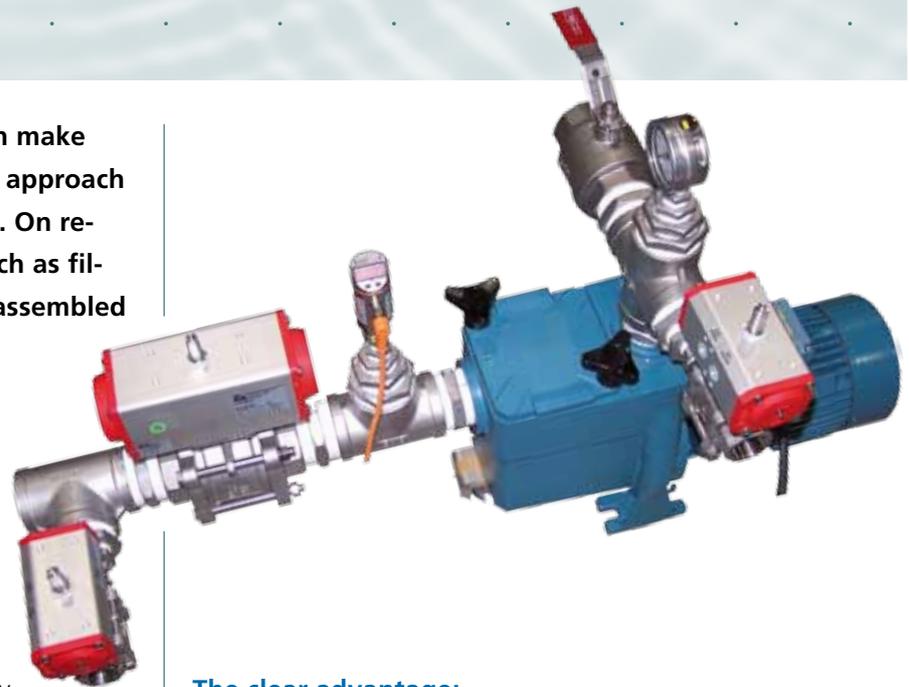
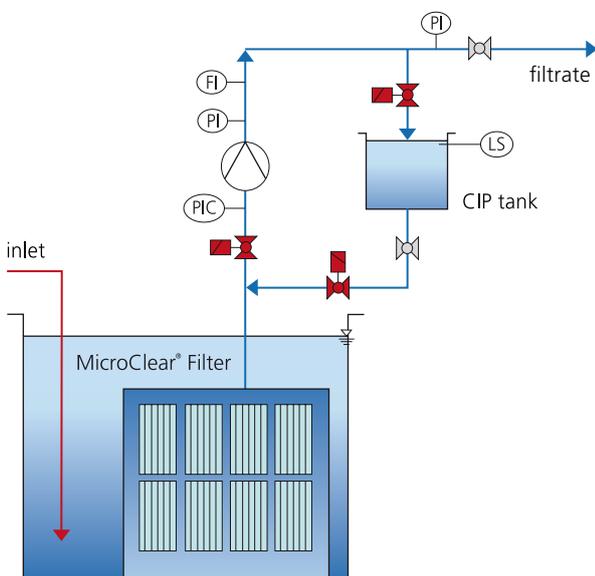
*Values depend on wastewater condition

Our products – maintenance friendly, complete, safe

Filtrate extraction – suitable for filter housing systems

Simple configuration and installation make the MicroClear® system a convincing approach when deployed for a specific project. On request, supplementary accessories such as filtrate extraction systems can be pre-assembled and delivered in a ready-to-connect condition.

For every MicroClear® module there is a pre-configured filtrate outlet optimally matched to the given size. Filtrate outlets of size FA-50 or larger always include a speed-controlled pump, a pressure sensor and a frequency converter. This ensures a constant filtration pressure without pressure fluctuations. Filtrate outlets of size FA-500 or larger are additionally equipped with the valves needed for the backflush process. Simply connect it to a backflush tank and the MicroClear® filter module – finished.



The clear advantage:

MicroClear® filters can be simply and economically installed in any basin. The MicroClear® filtrate extraction can always be adapted to meet on-site conditions. Pressure regulation is optimally matched to the MicroClear® filter to ensure long-term, trouble-free operation.

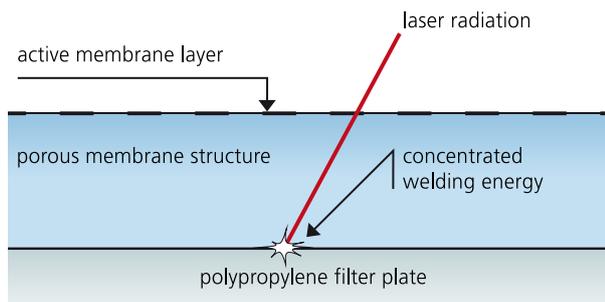
Type	for filter housing	Filtrate rating in m ³ /h	Connected load in kW
FA-5	MA03-1, MA03-2 MA03-XL	0,5 – 5	0,1
FA-50	MA03-XL2, MB2-1	5 – 50	0,55
FA-500	MB2-2, MB2-3, MB2-4, MB2-5, MB3-1, MB3-2, MB3-4, MB3-5, MB4-1, MB4-2, MB4-3, MB4-4, MB4-5, MB5-1, MB5-2, MB5-3, MB5-4	50 – 500	1,2
FA-1500	MB5-5	500 – 1500	2,2

In detail

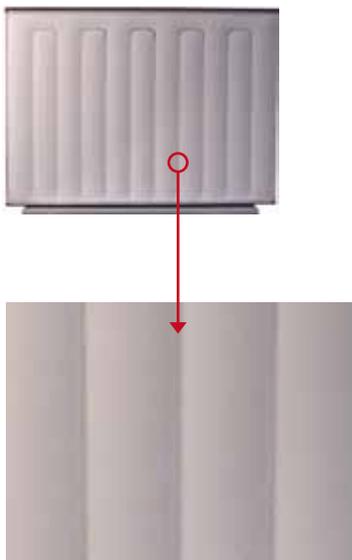
unique innovation & patented technology

Innovative laser welding process

The filter's high retention rate and strength are assured by a laser welding process especially developed for filter production. As state-of-the-art technology, the laser welding process has clear advantages over conventional welding processes.



Welding energy is tightly concentrated to protect the important membrane layer yet bond the membrane permanently and securely to the filter plate.



Uniform welding seam

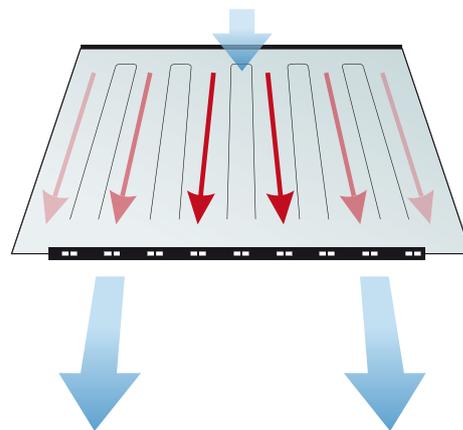
Patented construction, optimal performance

The unique, patented principle of the MicroClear® filter is a result of the many filtrate exits at the side of the filter plate.



MCXL plate with many filtrate exits

This guarantees an even distribution of pressure over the entire membrane surface. Partial deposit formations caused by local flux excesses are therefore effectively counteracted.



constant pressure distribution across the filter plate

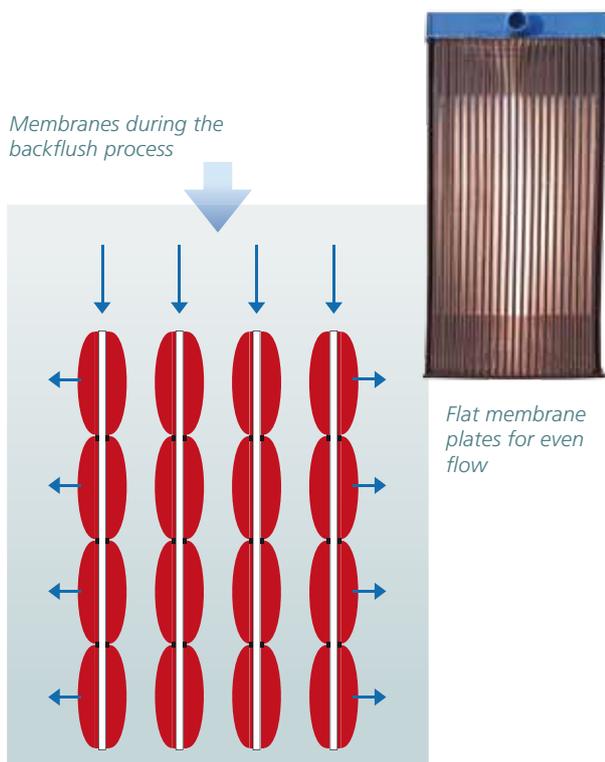
In detail

a well-designed structure

True backflush capability

The constant spacing between filter plates and their absolute evenness ensure a precisely distributed flow and cleaning.

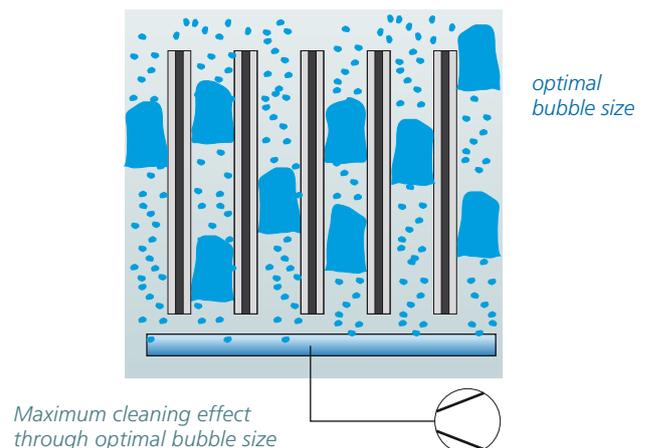
The laser welding process is also advantageous for the filter membrane's backflushing capability. Because the weld seam is spread out over the surface, membrane bloating is limited to small sections so the membrane is able to handle larger backflush pressures. Individual membranes do not touch one another during backflush procedures, this assures unhindered exodus of the cleaning medium. This is how the MicroClear® filter combines all the advantages of a plate module with the operational potential of hollow fibre modules.



Cleaning without chemicals

Optimised aeration (with continuously-rising, fine air bubbles spaced at intervals) produces a cleansing effect on filter plates. This simultaneously ensures oxygen content in the activated sludge of the membrane bio-reactor. This efficient method of self-cleaning reduces the need for chemical cleaning to an absolute minimum.

Aside from the volume of air introduced and the form of the filter housing, the size of the air bubbles is decisive for successful air rinsing. Intensive development work was done to find the bubble size perfectly matched to the spacing between plates.



A construction without seals

The MicroClear® filter is built without seals, such as O-rings. Thus gradually-incurred leakage, as is often the case with sealing elements, has been eliminated altogether.

In detail

safety

Hygienic safety

We use only quality membranes whose retention rates and mechanical characteristics are documented thoroughly. Only in this manner are we able to trap not only bacteria but even 99.9999% of viruses (measurement assessed with 20 nm bacteriophage).

The resulting service water not only exceeds the limit values set by the EU bathing water guideline but can also be used in compliance with DIN 19650 for watering public areas, such as parks and schools.

Uninterrupted quality assurance

High filtrate quality is not only a question of membrane quality but also a matter of maintaining very tight tolerances in production. Quality control checks are first made of each filter plate individually and then another quality check is made of the assembled filter's integrity.

The service life of the MicroClear® filter is as much as 10 years.



MCXL filter sheet under pressure test

Proven safety

The operational safety of the MicroClear® system is put to the test daily in many benchmark reference systems.

Capacity [m³/day]	Number of systems	Type of application	In operation since
< 1	1000	grey-water recycling, residential small sewage treatment plants	2001
1 - 10	> 300	residential and decentralised small sewage treatment plants, grey-water recycling	2001
10 - 100	99	industrial and municipal wastewater treatment	2001
100 - 1000	8	industrial and municipal wastewater treatment	2004
1000 - 2000	1	wastewater treatment in a vacation resort	2005
> 2000	1	wastewater and water treatment for golf courses	2005
> 4000	1	water recycling and use in public parks	2010

MicroClear® System

the safe filter at a glance

MicroClear® advantages – Ultrafiltration modules

- Very high sustained flux of up to 30 l/m²h
- True backflush capability permits rapid, simple cleaning
- Highest integrity and strength through patented welding process
- Even pressure distribution through patented filtrate collector
- Middle bubble aeration for resource-saving self-cleaning of modules
- Premium quality water results; virus retention of 99.9999%
- Module plates constructed without any adhesives or seals

The highest performance – safe discharge values

The MicroClear® filter is convincing because of its outstanding discharge values that are even far below those mandated by stringent statutory reuse regulations (e.g. DIN 19650).

Parameter	Unit	Layout	Guarantee
BOD ₅	mg/l	< 5	
COD	mg/l	< 50	
TSS	mg/l	< 1	< 1
TKN	mg/l	< 5	
Turbidity	NTU	< 1	< 1
pH value		6.5 ... 8	
E-Coli	x/100mL	<1	<1
Virus retention	%	99,9999	99,99

MicroClear® advantages – filter housing system

- Modules can be stacked to reduce space requirements, high packaging density
- Available filter housings from 3.5 to 875 m²
- Middle bubble aeration with proven membrane diffuser, thus:
 - ↳ the diffuser system does not need to be cleaned with chemicals
 - ↳ higher flow speed between filter plates for better filtration performance
- Maintenance friendly: filter and diffusers can be removed out to the side
- Modular system with many replicated parts, economical
- Robust system proven over more than 5 years of daily operation in clarification plants

Covers a broad range of applications

Whether the application is municipal, industrial, in international deployment with relief organisations or in private use; the MicroClear® system can bring its advantages to the benefit of users and water users anywhere. Typical applications:

- Membrane bioreactors
- Process water recycling
- Decentralised water supply
- Reuse of grey-water

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