

# Membrane bioreactor

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## The advantages of the ClearFox® membrane bioreactor

- Modular system, adaptable to any application
- High performance with high quality, Made in Germany
- Stable and very robust process technology



The wastewater quality is improved by a high-performance ultrafiltration membrane. The compact wastewater treatment plant consists of modular membrane modules which are installed in filter tanks. Municipal and industrial wastewater must always be pre-treated before passing through the membrane bioreactor. Pre-treatment ensures that the wastewater is as biologically inert as possible and that solids with a diameter greater than 0.25 mm as well as grease and oil are removed. These conditions are necessary to prevent fouling and scaling (accumulation of organic materials) on the membrane surface. The pre-cleaned wastewater finally flows through the membranes, whereby the sludge is retained on the outer walls of the membrane. The resulting permeate is then drawn off and collected in a permeate tank. The sludge is removed from the membranes through recurring cleaning cycles. Chemicals such as citric acid and sodium hypochlorite are also added to remove stubborn residues.

## The system consists of the following parts

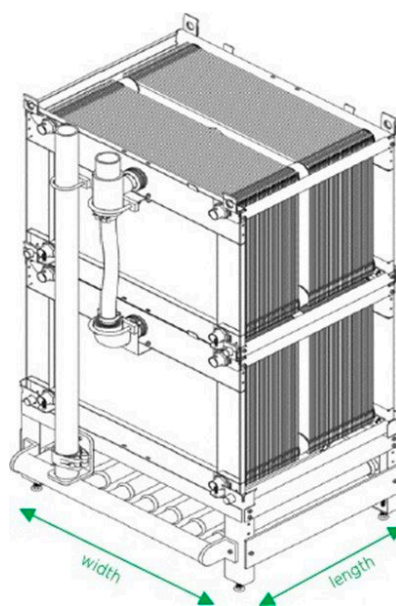
- Container
- Inlet 7/13 m<sup>3</sup>
- MBR-Module
- Permeate tank
- Permeate pump
- Backwash pump
- Dosing pump for citric acid
- Dosing pump for NaClO
- Sludge pump
- Ventilation with side channel blower
- Siemens SPS
- Optional: Dosing pump for chlorine (disinfection)

## Technical data MBR

Module	M200+
Membrane surface	200 m <sup>2</sup>
Dimensions (L/W/H)	1084 x 1221 x 2310 mm
Net weight	250 kg
Gross weight	365 kg
Control system	Control box; steel housing for indoor installation
Max. solids concentration	15 g/l
Pore size	0,06 µm
Membrane material	Polyvinylidene fluoride (PVDF)
pH range	2 - 11
Temperature range	5 - 40
Permeate tank connection	PVC-U 90 mm diameter / DN80 flange adapter possible
Ventilation connection	PP 90 mm diameter / DN80 flange adapter possible

### Options on request

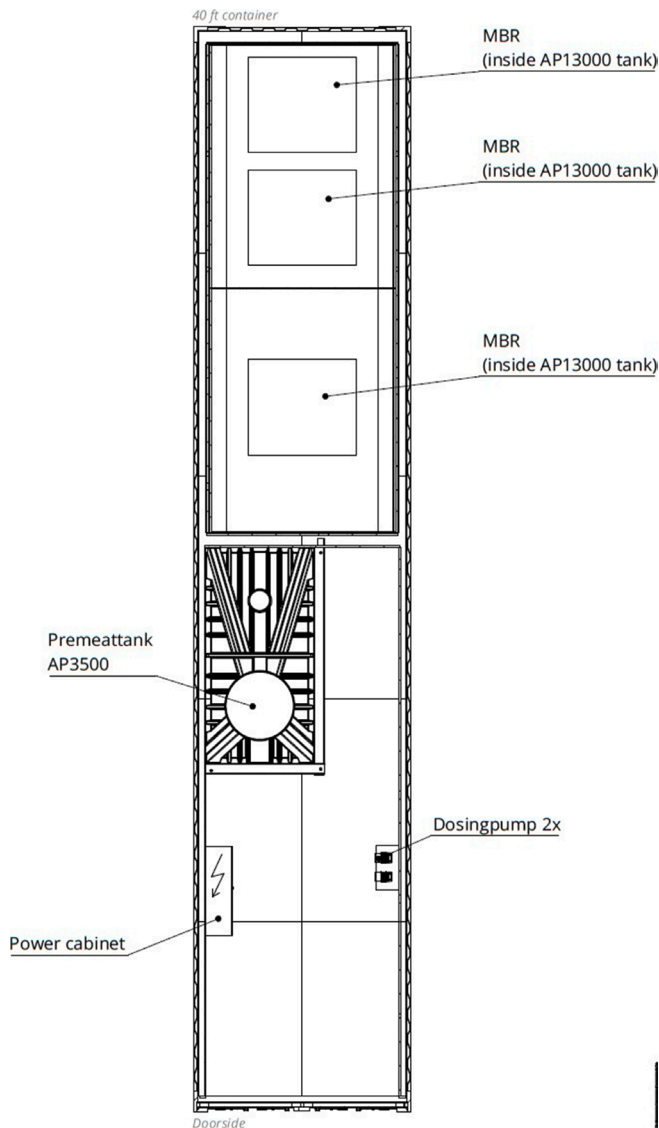
- Emergency overflow
- Insulation for transport section / compressor
- Screen mesh size: 0.25 mm (wedge wire) 2/3/4/5/6/7/10 mm (round hole)
- Housing for control cabinet



## Auslegung MBR

PE	Hydr. load	Org. load	Number of moudules	MBR volume required	Usable tank volume	Container	Number of inlets	Number of lines	Compressor
Quantity	m <sup>3</sup> /d	mg BSB <sub>5</sub> /l	Pcs.	m <sup>3</sup>	m <sup>3</sup>	Pcs.	Pcs.	Pcs.	kW
140	63	149	1	6	6,5	1 x HC 20 ft.	0,5	1	2,2
280	126	298	2	12	12,5	1 x HC 20 ft.	1	1	2,2
440	198	469	3	18,9	19	1 x HC 20 ft.	1,5	1	2,2
580	261	618	3	24,9	25	1 x HC 20 ft.	2	1	3
720	324	767	4	30,9	31,5	1x HC 40 ft.	2,5	2	4
860	387	917	5	36,9	37,5	1 x HC 40 ft.	3	2	4
1020	459	1087	5	43,7	44	1 x HC 40 ft.	3,5	2	4
1160	522	1236	6	49,7	50	1 x HC 40 ft.	4	2	5,5
1300	585	1386	7	55,7	56,5	1 x HC 40 ft. 1 x HC 20 ft.	4,5	2	5,5
1440	648	1535	7	61,7	62,5	1 x HC 40 ft. 1 x HC 20 ft.	5	2	7,5
1600	720	1705	8	68,6	69	1 x HC 40 ft. 1 x HC 20 ft.	5,5	3	7,5
1720	774	1833	9	73,7	75	1 x HC 40 ft. 1 x HC 20 ft.	6	3	7,5
1900	855	2025	9	81,5	81,5	2 x HC 40 ft.	6,5	3	11
2020	909	2153	10	86,6	87,5	2 x HC 40 ft.	7	2	11
2160	972	2302	11	92,6	94	2 x HC 40 ft.	7,5	2	11
2300	1035	2451	11	98,6	100	2 x HC 40 ft.	8	3	11

The number of MBR modules, the required filter volume and the resulting number of containers are shown here in tabular form.



## Dimensioning of the biology

The volume of wastewater treated by the MBR only works with upstream biological treatment. The reactor volume required for this biology is listed per population equivalent (PE) in the table below.

PE	Tank size, 60% of the volume flow
<i>Quantity</i>	<i>m<sup>3</sup></i>
140	84
280	168
440	264
580	348
720	432
860	516
1020	612
1160	696
1300	780
1440	864
1600	960
1720	1032
1900	1140
2020	1212
2160	1296
2300	1380

## Application

For all types of domestic, municipal and industrial wastewater. In each case, the design must be individually tailored to the purpose. The wastewater that is to be treated specifically using an MBR system must also fulfil the characteristics listed in the table below.

## Features of the ClearFox<sup>®</sup> MBR system

- Compact
- Modular

Parameters	Value
Temperature	5 – 40 °C
pH	6 – 8
Dissolved BOD <sub>5</sub>	< 5 mg/L
Dissolved COD	< 50 mg/L
Dissolved ammonium	< 2 mg/L
Particle sizes	< 1 mg/L for particles < 2 mm < 10 mg/L for particles < 1 mm

## Permeta tank dimensioning and chemical dosing

PE	Permeate tank volume	Inlet volume	Inlet	Number of containers*1	Permeate pump	Permeate pump, capacity	Sludge pumps Recirculation	NaClO	C <sub>6</sub> H <sub>8</sub> O <sub>7</sub>	Dosing pumps
Quantity	m <sup>3</sup>	m <sup>3</sup>	Designation	Pcs.	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	l/h	l/h	kW
140	0,7	0,7	Tank 1250	i.MBR	3,2	1,1	13,3	7	10,6	0,062
280	1,4	1,4	Tank 2250	i.MBR	6,3	1,1	26,5	13,9	21,2	0,062
440	2,2	2,2	Tank 2250	i.MBR	9,9	1,1	41,7	21,9	33,3	0,062
580	2,9	2,9	Tank 3500	1 x HC 20 ft.	13,1	1,1	54,9	28,8	44	0,062
720	3,6	3,6	AP7000	i.MBR	16,2	1,1	68,2	35,8	54,6	0,062
860	4,3	4,3	AP7000	i.MBR	19,4	1,1	81,5	42,8	65,2	0,062
1020	5,1	5,1	AP7000	i.MBR	23	1,1	96,6	50,7	77,3	0,062
1160	5,7	5,8	AP7000	1 x HC 20 ft.	26,1	1,1	109,9	57,7	87,9	0,062
1300	6,5	6,5	AP7000	i.MBR	29,3	1,5	123,2	64,7	98,5	0,062
1440	7,2	7,2	API3000	1 x HC 20 ft.	32,4	1,5	136,4	71,6	109,1	0,062
1600	8	8	API3000	1 x HC 20 ft.	36	2,2	151,6	79,6	121,3	0,062
1720	8,6	8,6	API3000	1 x HC 20 ft.	38,7	2,2	162,9	85,5	130,4	0,062
1900	9,5	9,5	API3000	i.MBR	42,8	2,2	180	94,5	144	0,062
2020	10,1	10	API3000	1 x HC 20 ft.	45,5	2,2	191,4	100,5	153,1	0,11
2160	10,9	10,7	API3000	1 x HC 20 ft.	48,6	2,2	204,6	107,4	163,7	0,11
2300	11,6	11,4	API3000	1 x HC 20 ft.	51,8	2,2	217,9	114,4	174,3	0,11

The volume for the required permeate tank and the quantity of chemicals per population equivalent are shown in this table.

\*1 The specification i.MBR is used if there is still space for the permeate tank in the container with MBR tank (see MBR layout)