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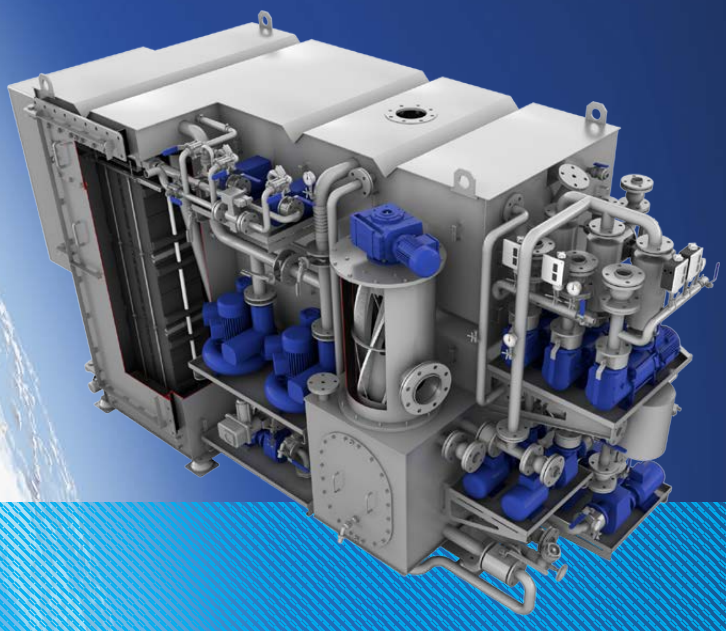
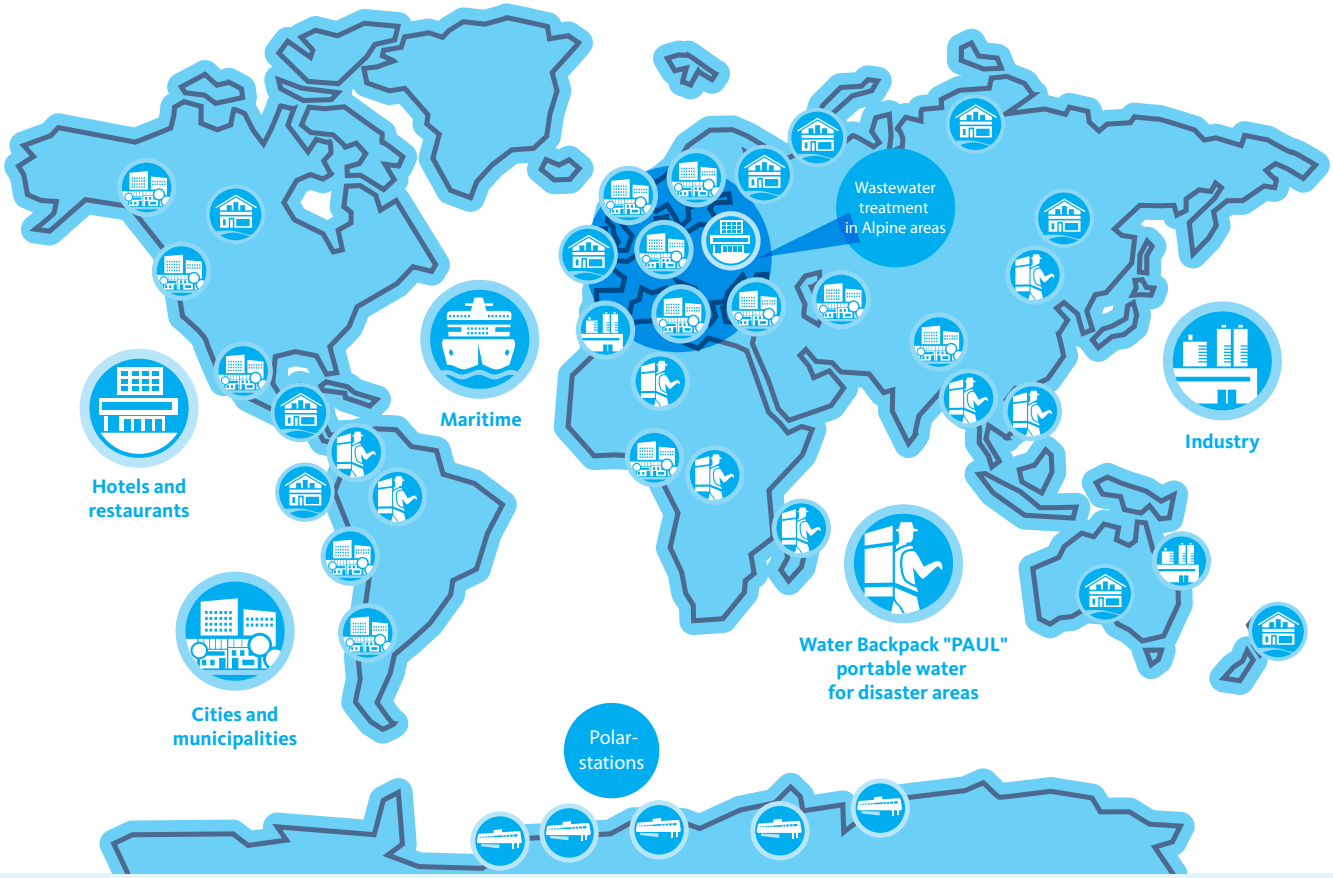
Advanced Wastewater Treatment Technologies **for Vessels & Offshore Installations**



Life is good – with clean water

MARTIN
Membrane Systems



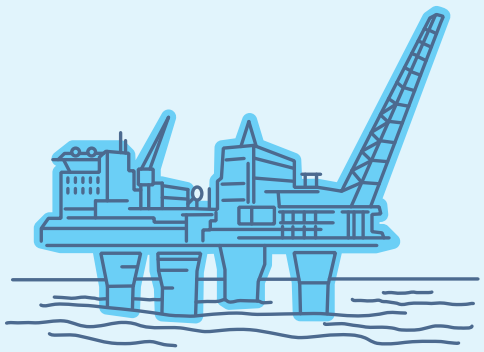
MARTIN Membrane Systems

MARTIN Membrane Systems is an international wastewater treatment company. We offer complete on-board systems for maritime applications, including

- Vacuum systems,
- Flotation systems for the treatment of galley water,
- Transfer pump units,
- Tank equipment,
- Mechanical pre-treatment units,
- High-efficiency biological treatment systems,
- Membrane filtration systems and
- Sludge handling equipment.
- Food Waste Systems

All **MARTIN Membrane Systems** have a compact design, requiring small tank capacities and spaces and are bespoke solutions, tailored to the individual requirement of each ship.

Our range of German-engineered and manufactured wastewater treatment systems provides a superb effluent quality, reducing suspended solids to effectively zero and fulfilling the latest international and local requirements without chemicals consumption.

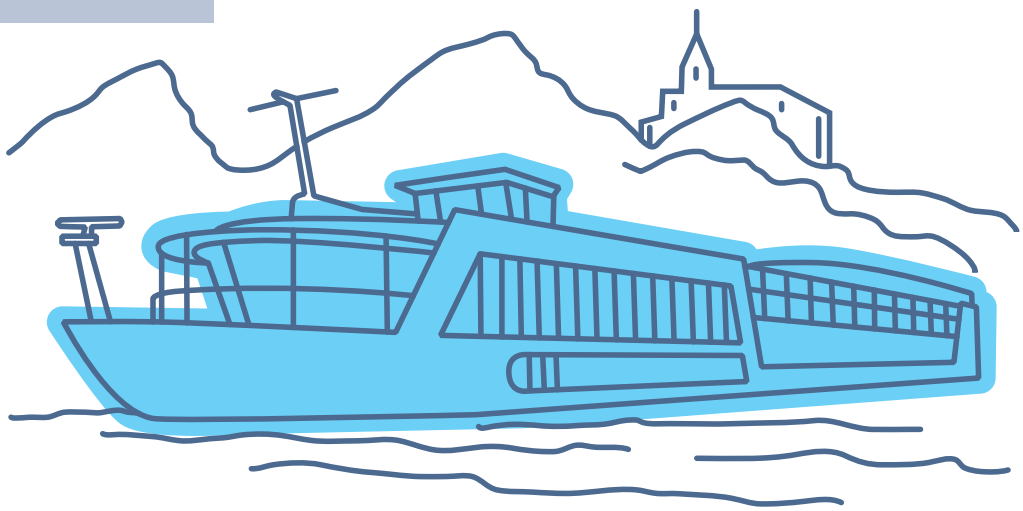


Our project teams support you throughout the entire process lifecycle: from pre-planning, during the construction and building phase through to commissioning. We offer individual customized solutions for refit and new buildings.

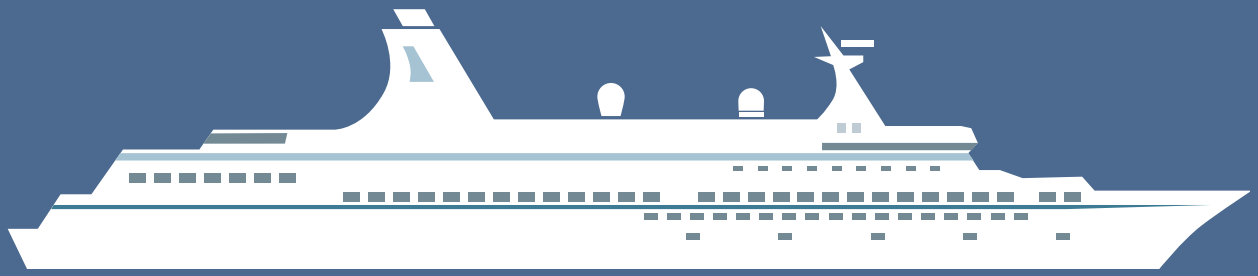
MARTIN Membrane Systems is also your partner for worldwide service and maintenance.

Riverside

Leading in MBR maritime wastewater treatment for river cruise vessels



- Vacuum systems
- Flotation systems
- Transfer pump units
- Food Waste Systems
- Mechanical pre-treatment units
- Biological treatment systems
- Membrane filtration systems
- Sludge handling equipment



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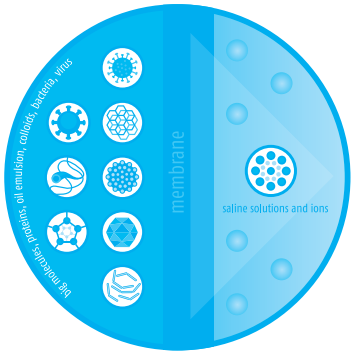
siClaro® membrane filters

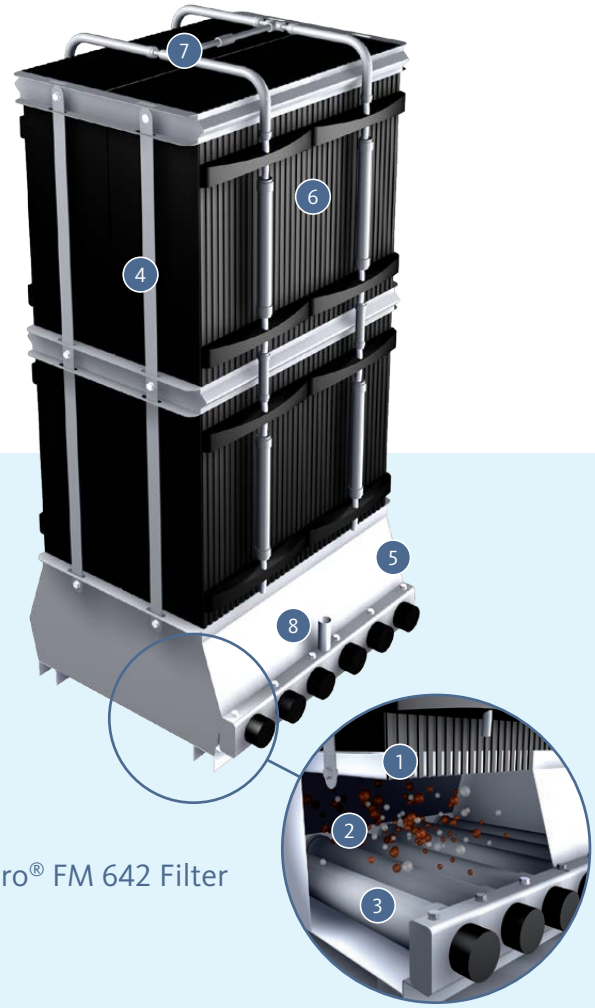


The mean pore diameter of the membranes is only thirty-five millionths of a millimetre (0.000035 mm).

In comparison, the diameter of an enteric bacteria (E-Coli) is approx. one thousandth of a millimetre (0.001 mm), so that the siClaro® membrane represents an impassable barrier for these bacteria.

The ultra-filtration membrane used for wastewater treatment physically separates smallest particles down to colloids from liquids on the basis of its defined pore size (<0.1 µm). The membrane holds these substances back without changing them either physically or chemically. This means that dangerous substances cannot even be produced. We utilise user-friendly flat membranes made of organic polymers which, in combination with the sophisticated filter design, effectively prevent clogging of the filter due to hairs, fibres or other unhygienic coarse matter.

This technology is a combination of the proven activated sludge technology and the innovative membrane process and offers a number of advantages over conventional aeration plants. The membrane filters are installed directly in the aeration tank or in downstream filtration chambers and ensure that activated sludge, bacteria and viruses are safely retained there. A conventional secondary settling tank is thus no longer needed to achieve the highest effluent quality.

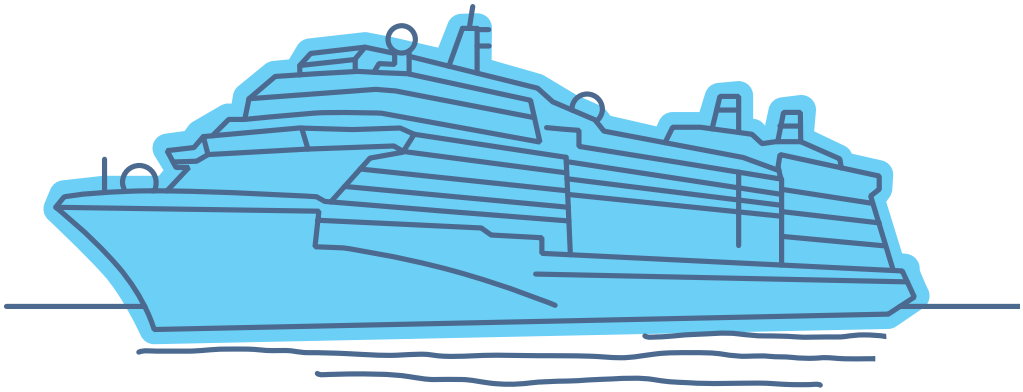


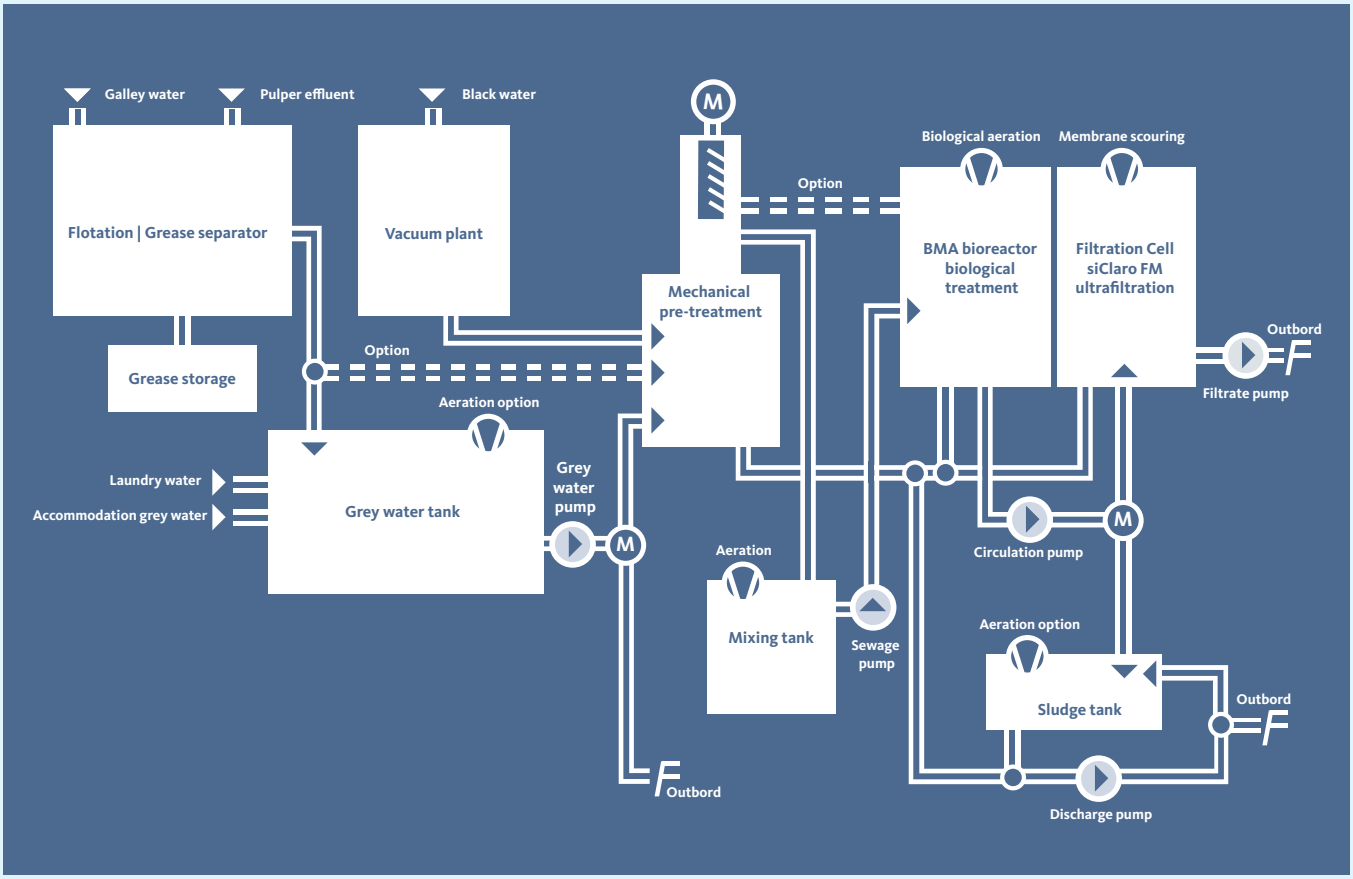
siClaro® FM 642 Filter

1. siClaro® filter
2. Activated sludge-air mixture
3. Diffusor
4. Skid mounted
5. Streaming-up foot with diffuser
6. Filter module
7. Air tube
8. Air scouring connection

Across the Ocean

MBR supply for cruise vessels, special vessels, navy vessels and super yachts





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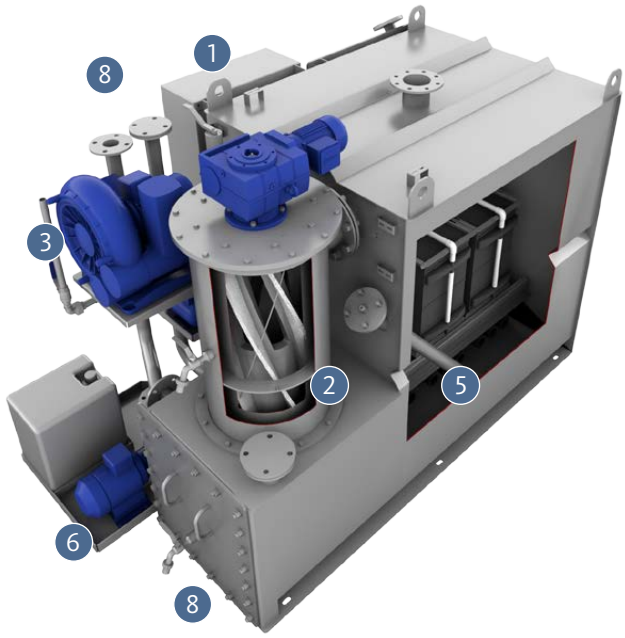
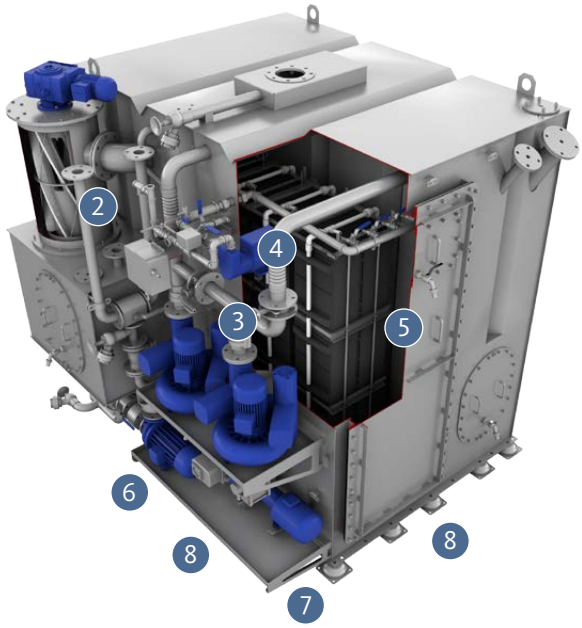
siClaro® BMA®
10–75 | standard



siClaro® BMA®
100–300 | standard



The BMA system was developed to allow ships to be operated globally and ensure reliable compliance with the stringent worldwide sewage standards. Effluents from BMA systems comply with the requirements of IMO MEPC.159(55), USCG including Alaska Title and Miami Dade and Baltic Sea Convention.

The BMA plants with membrane filtration meet the advanced nutrient requirements for nitrogen and phosphorus for future expected Helcom regulations, thanks to the integration of anoxic treatment stages and selected phosphate elimination.

Split arrangement
We also provide pre-assembled filtration units for all capacities. The biological treatment stages are integrated in the structural tanks. Please ask for a detailed offer.

Low investment costs:
Compact design requiring small tank capacities and spaces.

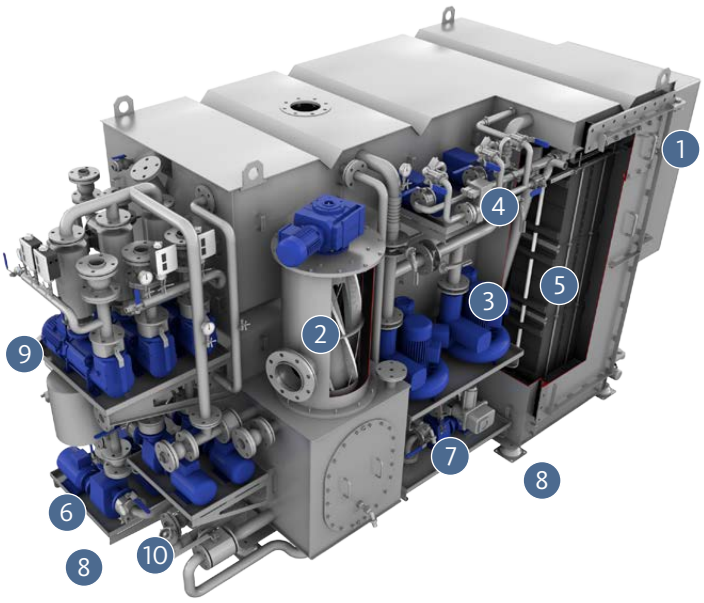
Low operation costs:
Minimal energy demand | Long membrane lifecycle | Simple maintenance | No risk of blocking or clogging | Fully automated filtration operation

Guaranteed compliance to hygienic standards
Certified according to IMO standard MEPC.159(55) and CDNI

BMA Standard (*)				Maximum dimensions	LCP	Service area	Weight	Weight
Type	Average daily flow		BOD5 Load	L1 x W1 x H1/H2	W2	S1	empty	filled
	nom. m³/d	max. m³/d (**)	kg/d	mm	mm	mm	kg	kg
BMA10	1,85	2,6	0,98	1.650 x 1.140 x 1.900/1.900			700	1.800
BMA30	5,5	7,6	2,93	1.850 x 1.310 x 1.900/1.900	300	600	1.200	3.000
BMA50	9,2	12,7	4,92	2.370 x 1.570 x 1.900/1.950			1.400	4.300
BMA75	13,9	19,2	7,38	2.450 x 2.000 x 2.100/2.050			2.000	6.800

BMA® + Yacht Line

Solutions for Super Yachts



1. Control cabinet
2. Mechanical pre-treatment
3. Biological and scouring blower
4. Filtrate pump
5. Biologic treatment with siClaro FM ultrafiltration
6. Drain pump
7. Circulation pump
8. Service area
9. Vacuum pump
10. Sewage pump

Higher organic loading and hydraulic flows on board super and mega yachts require adapted solutions for wastewater treatment systems. The BMA+ line meets these demands considering a hydraulic flow of up to 300 l and an organic load of 150 g BOD5 per person per day (ex food drainage). The plants are manufactured and painted to the highest quality standards.

Note:
Advanced wastewater treatment systems in the BMA line comply with the high requirements of IMO MARPOL in terms of disinfection without additional UV irradiation.

BMA Standard (*)				Maximum dimensions	Service area	Weight	Weight
Type	Average daily flow		BOD5 Load	L2 x W3 x H3/H4 (***)	S2	empty	filled
	nom. m³/d	max. m³/d (**)	kg/d	mm	mm	kg	kg
BMA100	18,5	25,5	9,84	2.800 x 2.270 x 2.000/2.050		2.200	8.500
BMA150	27,7	38,2	14,76	3.500 x 2.620 x 2.000/2.050	800	2.400	11.400
BMA200	37	51	19,68	4.100 x 2.600 x 2.200/2.280		3.800	16.400
BMA300	55,5	76,6	29,5	4.500 x 3.200 x 2.200/2.280		5.500	23.500

Remarks: External mixing tank and sludge tank required.

(*) BMA Standard: Type certified plants according IMO MEPC.159(55), with 98,4g/(p*d) organic BOD5 load according to type test and 185l/(p*d) hydraulic capacity.

(**) 38% Hydraulic overload according to IMO certification, max.24h.

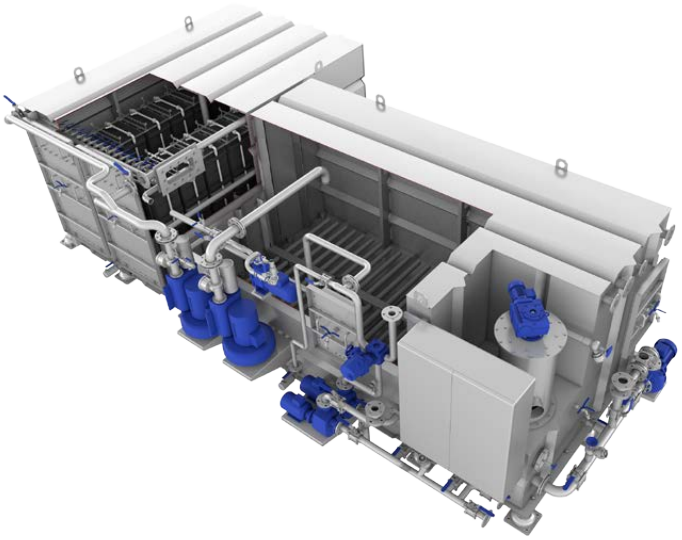
(***) Tank is also available in H3=2.600mm. Dimensions upon request.

BMA 10, 30: Fine screen, 3 l/s
BMA 50, 75: Fine screen, 5 l/s
BMA 100–300: Fine Screen, 7 l/s

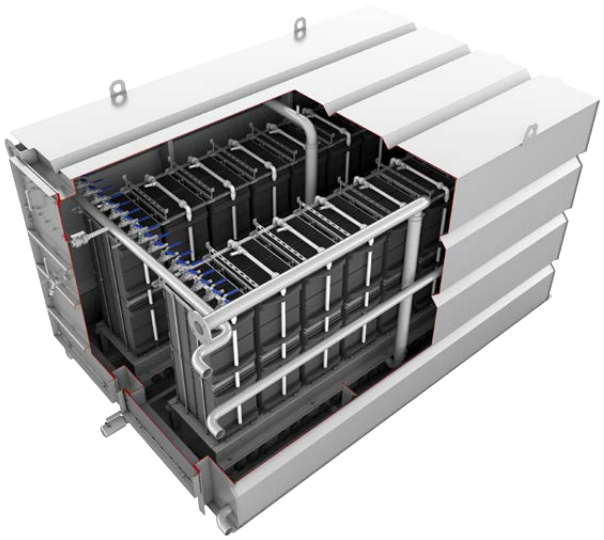
Vacuum plant: Jets Vacuumarator
BMA 10, 30: 1 No. Jets 15 MB-D, L x W x H = 720 x 360 x 850 mm, 90 kg
BMA 50: 2 No. Jets 15 MB-D, L x W x H = 720 x 500 x 850 mm, 180 kg
BMA 75–100: 2 No. Jets 25 MB-D, L x W x H = 880 x 620 x 950 mm, 220 kg

All other systems with vacuum collecting tank; available upon request.
Subject to technical alterations.

BMA® R
Solutions for River Cruisers



BMA® C
Equipment for Cruise Ships



BMA R Cruise Line®

The BMA R line is customized for river cruise/ long ships used on the Rhine, Danube and other inland waterways. These plants are preferably integrated in the ship's structural tanks or installed as pre assembled containerized systems.

These plants comply with the requirements of CDNI and the Danube Commission's recommendation on the organisation of the collection of ship-borne waste. The plants are certified according to the 3rd BinSchUO Abweichung VI (technical requirements for inland waterway vessels). The following standard sizes are available:

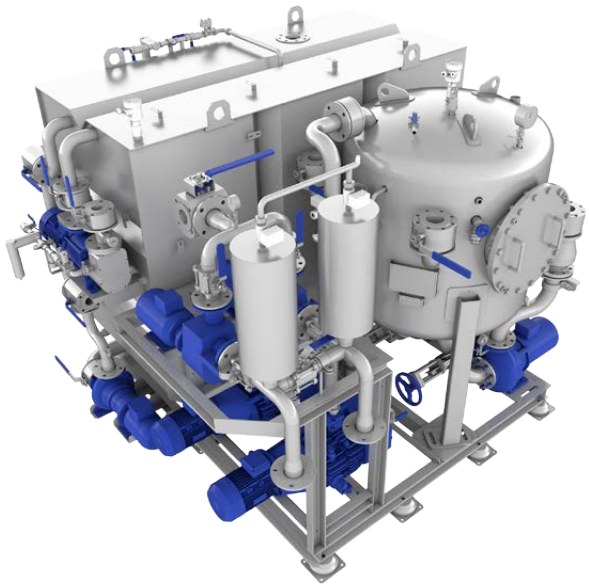
BMA® C

The scope of supply mainly consists of the delivery of prefabricated, factory tested Filtration systems,
as well as equipment sets for the Mechanical pre-treatment, Mixing, Aeration and Sludge tank that are installed in ship integrated structural tanks.
The BMA® C system is certified according to the current requirements.

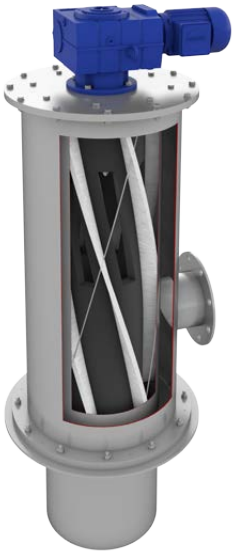
BMA® C (m²)	500	700	1.000	1.500
FM624	10	14	20	30
Dimensions L W H	 3.600 2.240 3.000	 4.400 2.240 3.000	 5.600 2.240 3.000	 7.500 2.240 3.000
Wet Weight	15,5 to	20,5 to	28 to	40 to
Power (50/60Hz)	7,3/ 7,1 kW	9,5/ 8,7 kW	14,6/ 12,1 kW	19/ 16,5 kW

Type	BMA 5 R	BMA 13 R	BMA 20 R	BMA 35 R	BMA 50 R	BMA 75 R
Average daily flow	5m³/d	13m³/d	20m³/d	35m³/d	50m³/d	75m³/d
BOD load	4,8 kg/d	12,6 kg/d	19,4 kg/d	34 kg/d	48,6 kg/d	72,9 kg/d

Vacuum and Food
waste Systems



siClaro®
Mechanical pre-
treatment units



Vacuum and Food Waste Systems

Martin offers Vacuum systems and equipment for the collection of Black and partly Grey water. Our Vacuum stations mainly have dual Vacuum and Discharge pumps, as well as a Vacuum collecting tank providing an excellent vacuum performance, especially at simultaneous use.

High food waste quantities on board of ships affect the performance of the wastewater system. Our food waste systems reduce the biological load to a minimum, resulting in smaller sewage systems. In addition, our food waste plant are easy to use and require minimal maintenance.

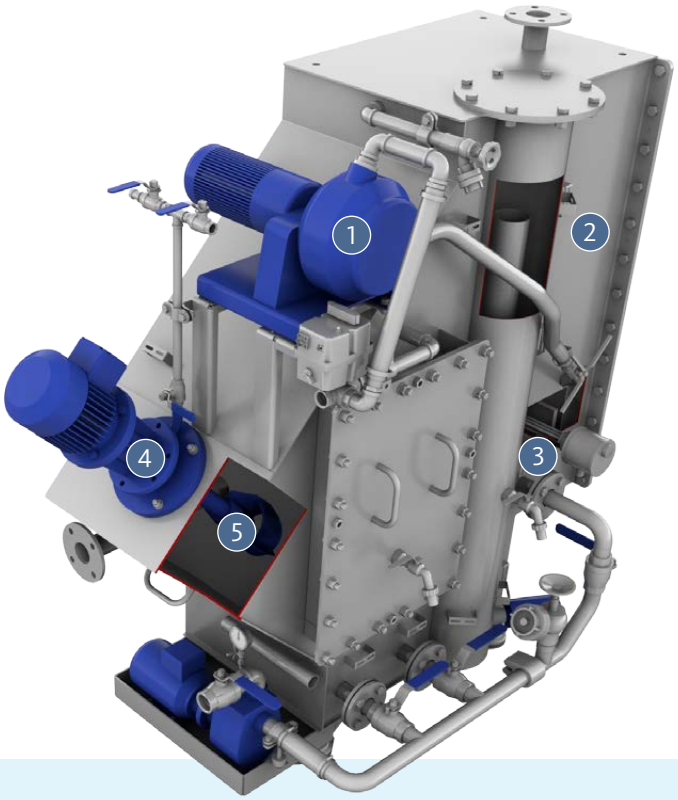
Fine screen

Hairs, fibrous materials, etc. can form unwanted agglomerations and clog the membrane bioreactor and therefore have to be separated from the raw wastewater to ensure the membrane aeration plant's safe and low-maintenance operation. But the organic contents of the screenings should be returned to the biological treatment stage as a carbon source. Distributed membrane wastewater treatment plants need a simple and low-cost mechanical pre-treatment to separate screenings and sand. The siClaro® fine screen combines a vertical fine screen with screenings washer and a circular grit chamber and thus satisfies these requirements.

The separated solid matter can be discharged via a dewatering screw press but the collected screenings and sand can also be sucked off directly from the tank with a suction vehicle.

Medium	Wastewater containing solid matter		
Designation	siClaro® fine screen		
	RA 200	RA 350-600	RA 350-1000
Material	1.4301/ 1.4571**/ PP		
Max. flow rate [l/s]	2	5	7
Screen length [mm]	440	813	1000
Screen pipe diameter [mm]	200	350	
Screen openings [mm]	0,5 / 1 / 3		
Outlet	Flange DN 100	Flange DN 150	
Output [kW]	0,12	0,37	

siClaro® Flotation systems for the treatment of galley grey water



1. Grease pump
2. Grease tank
3. Electric heater
4. Jetstream mixer
5. Flotation reactor

Flotation

The flotation system is designed for the removal of fats, oil and grease from the galley water and ensures a failure-free plant operation. In comparison to a grease trap, the flotation system works fully automated and has a much higher removal rate for FOGs, resulting in a better MBR performance. It further handles the effluent from the pulper (food waste system).

Type	Persons	Principle	ADF	PHF	Dimensions	Dry weight	Net weight	Grease tank	Galley collecting tank (*)
	Approx.		m³/d	L/h	L/W/H in mm	kg	kg	Litres	m³
MSF450F	100	Compressed air/ flow principle	5	450	1.720 / 1.070 / 1.790	500	1.270	260	n.a.
MSF600FG	250	Jetstream mixer / batch process	12,5	600	1.970 / 980 / 1.830	800	1.200	260	2,5
MSF600G	250	Jetstream mixer / batch process	12,5	650	1.690 / 1.2230 / 1.830	800	1.450	separate grease tank (*)	2,5
MSF550FG	200	Jetstream mixer / batch process	10	500	150 / 1210 / 1700	650	1250	240	2,0

* Collecting tank to be provided by others. ** ADF= Average daily flow 50/l(p*d)

References

Shipboard-wastewater treatment plants and offshore applications

Maritime wastewater treatment
for cruise vessels

Maritime wastewater treatment
for special vessels

Maritime Wastewater treatment
for navy vessels

Maritime wastewater treatment
for super yachts

Maritime wastewater treatment
for river cruise vessels

Maritime wastewater treatment
for merchant & offshore vessels

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