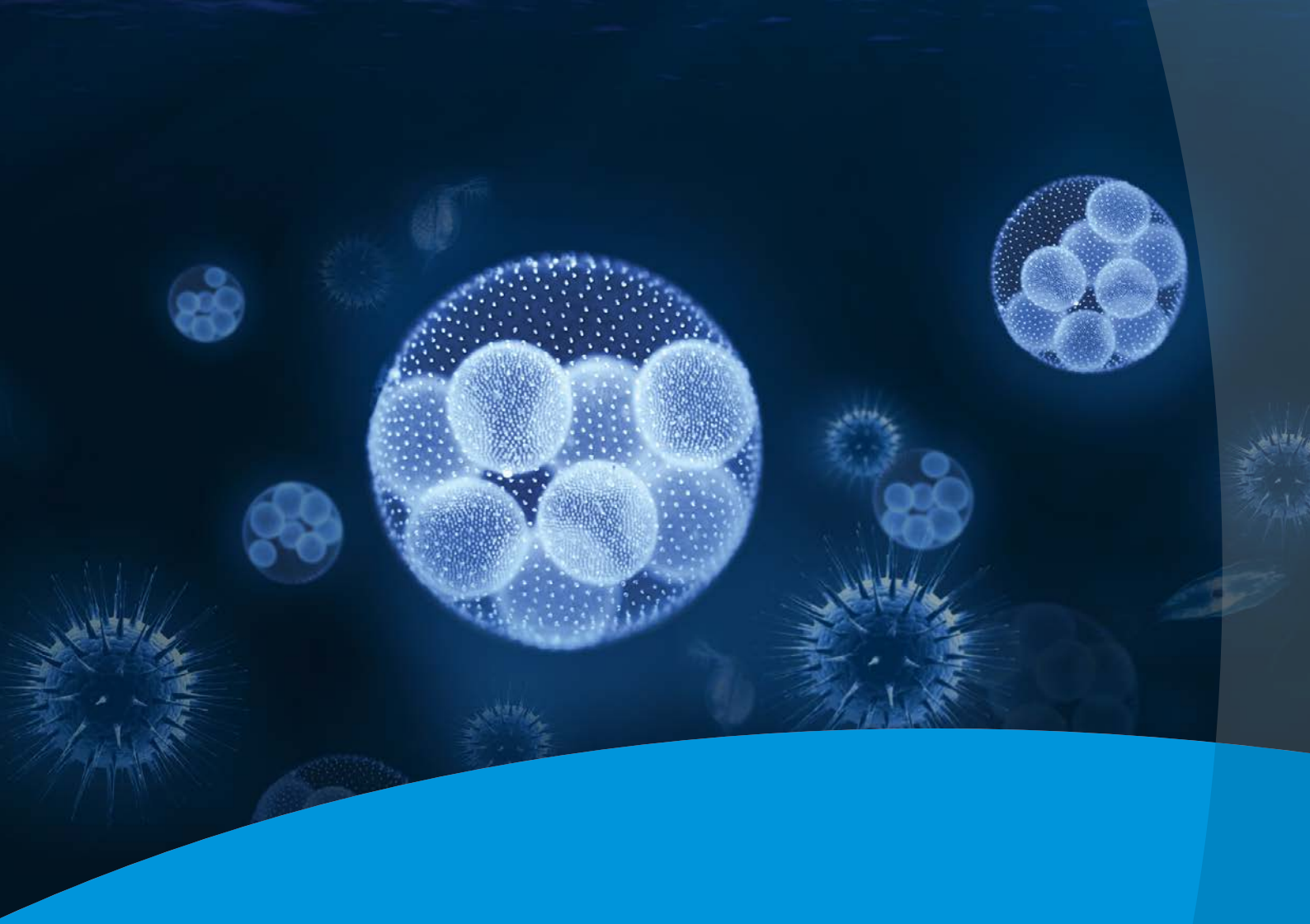


GEA BallastMaster

Just add water

engineering for
a better world

gea.com

Stopping the Invaders of the Sea

The undesired spread of species from ballast water puts aquatic ecosystems under threat

Every year, over ten billion tonnes of ballast water are transported all over the world by the international trade fleet. When ballast water is taken on, animals, plankton, bacteria and viruses are also taken on board as stowaways. These then land in foreign waters at the ship's destination when the ballast water is pumped out. This damages the aquatic environment, poses a threat to humans and causes economic and ecological damage that costs billions. The UNO considers this undesired spread of so-called invasive species one of the greatest threats to the maritime environment.

This is why new regulations for ballast water have been put in place by the IMO convention. These strict guidelines state that ballast water management systems may not harm the environment. The substances used must be biodegradable and may not present any kind of additional risk to humans, the environment or the ship.

NEW WORLD – MICRO-MOVING

Harmful organisms, if introduced into any aquatic environment, may create problems for marine ecosystems, human health, property and resources. They can also impair biological diversity and interfere with other legitimate uses of such areas.

Invasive species can be microorganisms like bacteria, viruses and micro-plankton as well as plants or animals including fish and shells.

Ecological facts

Worlwide every
9 weeks
a new species becomes established

Over
10^{12}
tonnes of ballast water a year are transported all over the world

4500 up to
10,000
aquatic species are transported per day with ballast water all over the world

IMO

IMO | International Maritime Organization

In response to the problem of stowaways and damage caused by ballast water, the IMO agreed to the "International Convention for the Control and Management of Ships' Ballast Water and Sediments" in 2004. This Convention will enter into force 12 months after a total of 30 states, representing 35 % of the world's shipping tonnage, have ratified it.

USCG | United States Coast Guard

The USCG amended its regulations on ballast water management by establishing a standard for the allowable concentration of living organisms in ballast water discharged from ships in waters of the United States. The USCG's final rule addressing "Standards for Living Organisms in Ship's Ballast Water Discharged in US Waters" (BWDS) was published in the US Federal Register on 23 March 2012. This rule became effective on 21 June 2012.

The Economically and Ecologically Sound Solution

Just add water

With the **Ballast**Master, it is very simple to ensure that there is only water in your ballast tanks – with no harmful organisms such as plankton, bacteria or viruses. Everything beneath the waves is under control, so you don't have to worry about it. Water goes in – easy. This reliable and future-proof system combines pre-filtration and UV-C. It doesn't need any chemical substances or generate any hazardous by-products. It uses a low pressure UV treatment, which is energy-efficient and requires no cooling.

Master and commander

Providing advanced, reliable solutions, GEA is a global leader in the marine business. As part of the GEA **seaprotect**solutions, the **Ballast**Master provides you with an all-round, worry-free system which meets current and future IMO and USCG standards for ballast water treatment.

Exceeding the standards

The IMO convention requires that new and currently operated ships must have ballast water management systems. These new guidelines may lead some shipowners and operators into uncharted territory. It's important to have a ballast water treatment system that is easy to use, complies with the terms of the convention and can be used for many years to come. Your solution is the **Ballast**Master.

The worry-free solution for ballast water treatment	
High-performance / low maintenance	**Ballast**Master is a well conceived system that uses advanced (patented) technologies for highest performance at lowest TCO.
Green and safe	**Ballast**Master uses the most eco-friendly, sustainable technologies to avoid any risk to the crew and the environment.
Reliable and future-proof	**Ballast**Master is a certified system that exceeds today's standards and requirements, making it a reliable solution for years to come. GEA is a reliable partner that will be on hand, whenever and wherever needed.
Flexible and adaptable	No matter if equipping a new vessel or retrofitting an existing one, **Ballast**Master is designed for easy installation – even at sea – and can be tailored to the required capacity.
One-stop shop	With **Ballast**Master you get everything you need from one single source: GEA takes care of the whole process and provides a complete turnkey solution.

*Type approval certificate for **Ballast**Master*

GEA BallastMaster ultraV

2-step treatment for ultra-efficiency and safety

The **Ballast**Master ultraV is a highly efficient mechanical and physical system for treating ballast water capacities of up to 1000 m³/h – including water with a high concentration of organisms and particles. The 2-stage system combines mechanical pre-filtration with subsequent disinfecting of the ballast water by UV-C. In this process, no chemicals are used and no hazardous by-products are created.

Initial cleaning by mechanical filtration

In the first stage, a mechanical filtration process removes all organisms and sedimentary particles larger than 20 microns. This prevents particle deposits from accumulating in the ballast water tanks, as the terms of the IMO convention stipulate. It also guarantees optimum results in the second stage, the ballast water disinfecting. The filter module is cleaned automatically by vacuum extraction (self-cleaning process).

Disinfection by means of UV-C

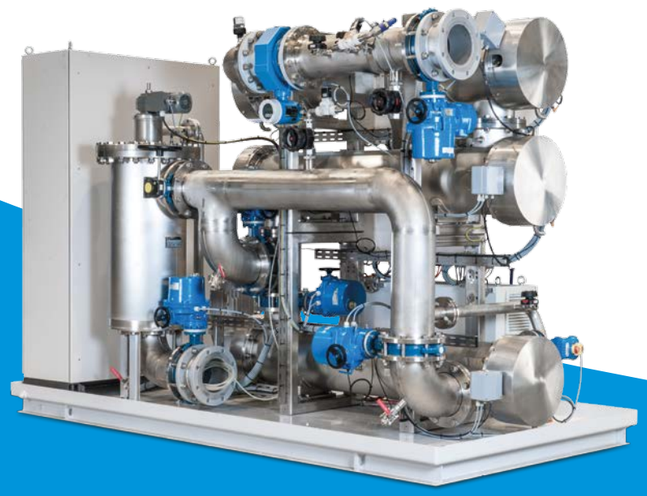
In the second stage, the pre-filtered ballast water is then disinfected by UV-C radiation. The monochromatic UV-C radiation (254 nm) eliminates organisms such as bacteria or phytoplankton. The micro cavitation delivered by ultrasonic guarantees that the biofilms and nonorganic deposits on the UV-C tubes are cleaned off efficiently and remain permanently clean.

Reliable disinfecting to IMO and USCG standards

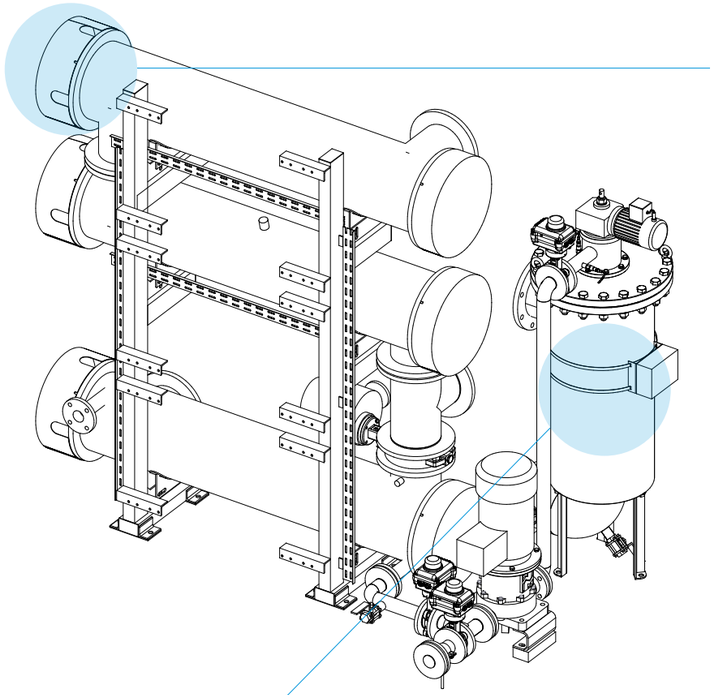
UV-C disinfection and ultrasonic cleaning provide consistent, high quality disinfecting in accordance with IMO guidelines and awarded with USCG AMS acceptance letter. This ensures that harbour checks of any kind are passed without problems.
The type approval for the **Ballast**Master ultraV was issued by BSH in 2011.

The benefits at a glance

- Chemical free operation, no by-products, no hassle, no waste disposal
- High-energetic efficiency of low pressure UV
- UV-C light affects DNA of organisms
- Constant high disinfection rate
- Monitoring of UV intensity by sensor
- Safe inactivation of even chlorine-resistant pathogens, e.g. Cryptosporidia
- Low maintenance requirement and incredibly easy menu control
- Small footprint, simple installation
- For new buildings and retrofit applications

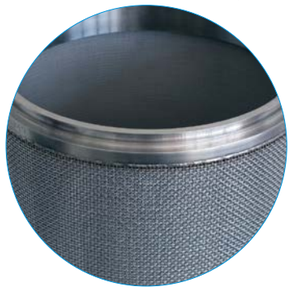


Highest performance, lowest possible cost – quality, efficiency and reliability in every detail



1 UV-C disinfection technology

2 20 µm mesh filter technology



Reduction of sediment, particles and organisms to an outstanding range

- Self-cleaning vacuum filtration
- Reliable operation with heavy loads of sediment & organisms
- Five layer sintered metal mesh screen
- Inside out water flow
- Cleaning nozzles over the entire filter surface
- High confidence towards Port State Control

GEA **Ballast**Master marineX, powered by Trojan Marinex

Creating synergistic effects by integrating filtration and UV within one unit

BallastMaster marineX is a product of a partnership with Trojan Technologies to market and sell Trojan Marinex ballast water treatment systems.

2-step treatment for ultra-efficiency and safety

The **Ballast**Master marineX is a highly efficient mechanical and physical system for treating ballast water in a large range of capacities, with higher capacities achievable by placing multiple units in parallel. The 2-stage system combines mechanical pre-filtration with subsequent disinfecting of the ballast water by UV-C lamps.

Initial cleaning by mechanical filtration

During ballasting, a mechanical filtration process removes large organisms and sedimentary particles. This prevents particle deposits from accumulating in the ballast water tanks and also enables optimal results in the second stage, the ballast water disinfecting. The automatic backwash thoroughly cleans the filter, ensuring relentless treatment and longer run times.

Disinfection by means of UV-C

The second treatment stage is UV. As the water flows through the array of TrojanUV Solo Lamps, organisms' reproductive capabilities are destroyed, rendering them non-reproductive and unable to grow, colonize or cause an infestation. During deballasting, water bypasses filtration and is again directed through the UV chamber for treatment.

SOLO LAMP TECHNOLOGY

TrojanUV Solo Lamp™ Technology

Low-pressure lamps offer high efficiency and long lamp life. Medium-pressure lamps have higher UV output. The TrojanUV Solo Lamp combines the best features of both. This technology is proprietary, and has over six years of development, lab and field testing behind it.

Features and benefits include:

- Life expectancy of beyond 12,000 hours of ballast water treatment operation
- Efficient performance throughout poor water qualities and cold water temperatures
- Consistently lower power draw, regardless of salinity, temperature or water quality
- Over 50 million operating hours throughout many water treatment applications

Robust type approval

BallastMaster marineX is IMO type approved and has received USCG Alternate Management System (AMS) acceptance for all water qualities: fresh water, brackish water and marine water.

Installation flexibility

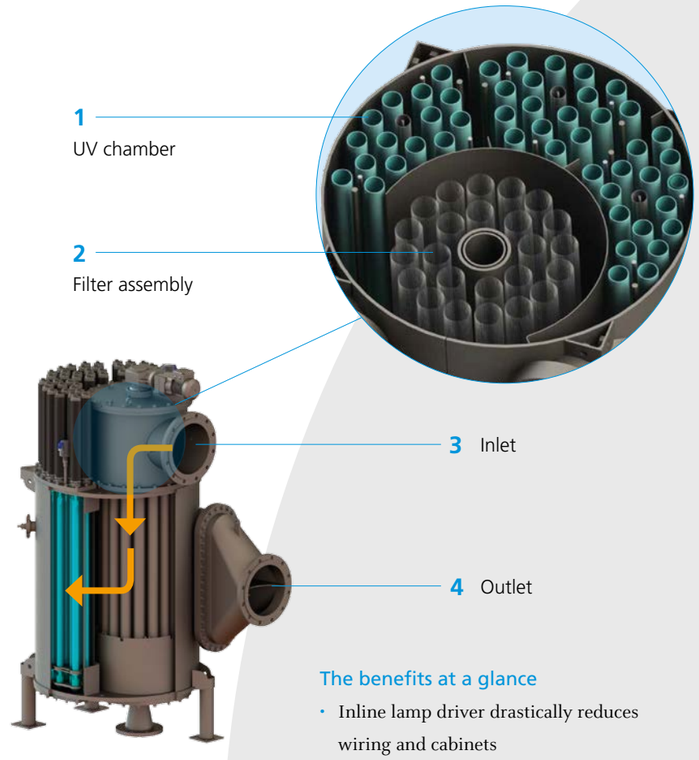
Until now, lamp drivers have needed additional electrical cabinets to house and protect them from the harsh elements. However, our inline lamp drivers give a new meaning to compact footprint.
They connect directly to the lamps, eliminating the need for additional cabinets and cables.

Low power draw

We've harnessed the true power of TrojanUV Solo Lamp Technology, and found the perfect balance between filtration and UV. The end result: The lowest installed power draw (at least 50 % less) of other systems in the industry.

Compact footprint

BallastMaster marineX is purpose-built for the marine environment and provides filtration and UV in a single, compact unit. The ballast water flows through the filter directly to the UV. The flow rate is consistent, pressure drop is minimal, and no interconnecting pipes are needed.



The benefits at a glance

- Inline lamp driver drastically reduces wiring and cabinets
- No interconnecting pipe between filtration and UV
- Up to 50 % smaller than others in the industry
- The lowest installed power draw (at least 50 % less) of other systems in the industry
- Designed to fit through narrow hatches and doorways
- Tested and approved to one of the lowest UV transmittance (UVT) values in the industry, under full flow conditions
- Explosion-proof version available
- Physical process, no chemicals used
- No increased risk of tank corrosion and no impact on coatings
- Automatic lamp sleeve cleaning and filter backwash

GEA seaprotectsolutions – Clear Waters to the Horizon and Beyond

Cutting-edge, future-proof solutions that protect the aquatic ecosystem and your investment

Water is the source of all life on our planet – it covers 70 % of the earth. Today, over 90 % of world trade is carried out using international shipping lanes, by some 50,000 vessels. While vital for trade and transportation, the seas, oceans and waterways are also highly sensitive ecosystems of crucial importance to humans and the environment. They need protection.

New standards, new challenges

The International Maritime Organization (IMO) and national legislators have issued strict guidelines for the treatment of oils, slurries and bilgewater. For shipowners and operators, it is important to combine ecological requirements and economic objectives in order to comply with the laws, optimize costs, avoid penalties and reduce risks. That's why GEA developed a concept specifically to meet the needs of shipowners, operators and the environment – **seaprotect**solutions.

Customized solutions

With a wide-ranging portfolio of cutting-edge, "made in Germany" technology, **seaprotect**solutions exemplifies long-term commitment to safeguarding the investments of our clients and partners while protecting the marine ecosystem. We work closely together with shipowners and operators in order to deliver customized solutions for the treatment of bilgewater, ballast water, sludge and fuel.

Clear waters

With an extensive service network and leading innovations such as the **Ballast**Master, **seaprotect**solutions provides efficient, future-proof systems in line with IMO standards. These systems remove potential hindrances so the operations of our clients and partners run smoothly and reliably. Nothing can get in your way. Yes, clear waters to the horizon and beyond. And that goes for our oceans as well, because **seaprotec**tsolutions safeguards and protects the marine ecosystems of our waters.

Answers to every challenge

- Fuel oil treatment
- Fuel oil conditioning system
- Lube oil treatment
- Sludge treatment
- Bilgewater treatment
- Water desalination system
- Hydraulic oil treatment plants
- Scrubber water treatment
- Ballast water treatment

Proactive Service for Optimum Reliability on Board

Customer benefit orientated service product solutions

We have a strong commitment to our clients and partners. Ship-owners benefit from traditional services such as inspection, maintenance, original spare parts and repair work provided by the original manufacturer. Plus, they also benefit from proactive solutions which avoid risk, e. g. Condition Monitoring. Together with an extensive service network, these preventive services promote smooth operations and reduce potential delays.

If problems do occur or if a spare part is required at short notice, relax. With dedicated GEA experts in more than 50 sales and service companies, we have highly trained and experienced field service engineers available to board your ships quickly. Depending on the complexity, we are able to carry out repair work in our authorized workshops around the world or in the dedicated GEA factories. Wherever you need us: the worldwide organization of our service network means that we are always nearby.

Training provided on site or in our modern training center ensures that the vessel's staff receive training in the proper handling of the high-tech installations. This provides additional safety.

Comprehensive protecton for investment

GEA service stands for maximum operating reliability, machine availability, process efficiency and budget security. Our focus is always on the achieved overall benefit for the customer over the entire life cycle of the equipment.

engineering for
a better world

We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

GEA Germany
GEA Westfalia Separator Group GmbH
Werner-Habig-Straße 1
59302 Oelde, Germany
Tel +49 2522 77-0
Fax +49 2522 77-1778
sales.germany@gea.com
gea.com