

Alfa Laval PureBallast 3 Ultra

Introduction

Alfa Laval PureBallast 3 Ultra is the latest ballast water management system built on proven PureBallast 3 technology. Offering increased performance in challenging waters and even easier installation, it can be configured for ballast water flows of 42–3000 m³/h, as well as Ex requirements.

PureBallast 3 Ultra treats ballast water without chemicals, combining high-performance filtration with enhanced UV treatment. In the UV reactor(s), specially designed synthetic quartz lamp sleeves transmit an extended wavelength spectrum that provides more UV light. Together with the internal reactor design, this ensures optimal UV dosage with very low energy consumption. An expanded range of reactor sizes further reduces power needs in specific configurations.

Application

PureBallast 3 Ultra is a modular, inline system for the biological disinfection of ballast water. Using PureBallast 3 technology that has been type approved by IMO and the U.S. Coast Guard (USCG), it removes organisms in accordance with set limits.

PureBallast 3 Ultra can be used in all water types – fresh, brackish or marine. With its enhanced UV treatment, it also provides unmatched disinfection performance in low-clarity water. Moreover, its upgraded filter design provides greater protection against clogging.

PureBallast 3 Ultra uses the same treatment technology as type-approved PureBallast 3 systems. Updated type approvals are in progress due to the new configurations.

Benefits

- Superior Performance in any waters and challenging conditions
- Minimized power consumption
- Easy installation with minimized footprint
- Delivered Connectivity-ready
- Designed and supported for the whole vessel lifetime

Superior Performance in any waters and challenging conditions

PureBallast 3 Ultra offers unmatched biological disinfection performance in any type of water: fresh, brackish or marine.



This includes liquid water at sub-zero temperatures. When operating in IMO-regulated areas with brackish or marine water, it maintains full flow where the UV transmittance is as low as 42%.

In addition, PureBallast 3 Ultra is prepared for challenging water with high sediment levels. An upgraded filter design with a faster gear motor improves the backflushing efficiency, which significantly reduces the risk of filter clogging.

Minimized power consumption

An expanded range of UV reactor sizes ensures a close match between PureBallast 3 Ultra and the ballast pump capacity. For certain flows, this reduces power needs by up to 19% over previous systems.

In all configurations, automatic power management minimizes the energy consumption. With this feature, PureBallast 3 Ultra

runs at just 50% of its potential operating power in many situations. Yet it can ramp up to full power to maintain flow in challenging waters. By supporting higher flow rates, PureBallast 3 Ultra uses less energy than competing systems in relation to the ballast water volume.

Easy installation with minimized footprint

The major components of PureBallast 3 Ultra are installed inline, with the filter and UV reactor(s) incorporated into the ballast water piping. System layout is simplified by the smaller design of the upgraded filter, as well by the integration of the Cleaning-In-Place (CIP) unit and pressure monitoring device into the UV reactor module. These factors minimize system footprint, reduce piping work and maximize installation flexibility for the shipyard.

Delivered Connectivity-ready

To simplify connectivity, the PureBallast 3 Ultra scope of supply includes a built-in field gateway. The system is delivered ready to take advantage of Alfa Laval PureBallast

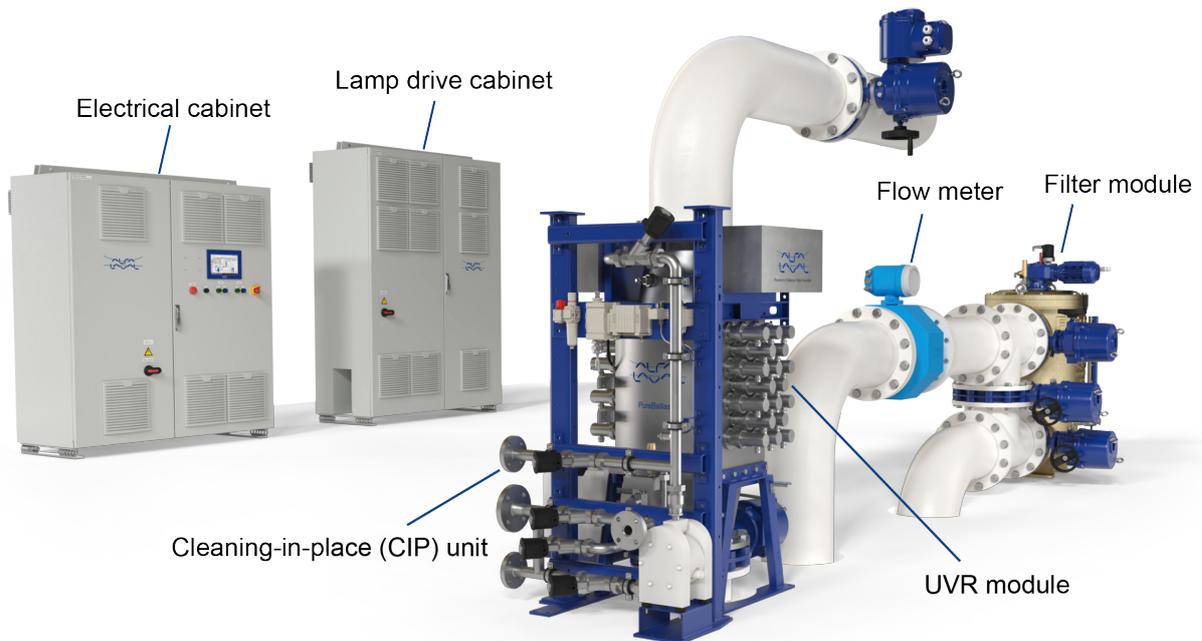
Connect, a secure digital service portal that provides remote access to system information – anytime, anywhere. Available on a subscription basis, PureBallast Connect offers ways to maximize uptime, reduce workload and optimize fleet-wide.

Designed and supported for the whole vessel lifetime

PureBallast 3 Ultra is designed for enduring performance. The filter and UV reactor(s) are made with best-in-class materials and built to last the whole vessel lifetime. Features such as electric actuators on the main valves, which minimize the risk of pressure waves, secure system reliability.

Our robust design principles enables us to provide a sustainable supply chain for the entire vessel lifetime.

Adding to the peace of mind are Alfa Laval's skills, resources and global service network. We provide shipyards with close local support, and we deliver parts and optimization throughout the system lifetime - wherever the vessel sails. Alfa Laval is a partner to rely on, always.



Treatment Components

Biological disinfection comprises an initial filtration stage followed by enhanced UV treatment in a specially designed reactor. Both stages are integrated into the ballast water as inline components.

Filter Module



A filter is used during ballasting operations to block the intake of larger organisms and reduce sediment in the ballast water tanks. Bypassed during deballasting, the filter is cleaned via automatic backflushing using a small portion of the system flow. This not only improves backflushing efficiency, but also increases overall filter effectiveness by producing a higher net capacity.

In combination with the reactor, the effective basket filter design enables treatment of fresh, brackish and marine water in conditions with low UV transmittance.

UVR Module



The enhanced UV treatment stage occurs within a reactor. Eight reactor sizes are available for PureBallast 3 Ultra systems, each with a flow-optimized interior that ensures high turbulence and the concentration of the UV dose.

The reactor lamps employ specially designed lamp sleeves of synthetic quartz. These support transmission of a broader wavelength spectrum, thus providing more UV light during disinfection. Temperature and level sensors within the reactor ensure its safety.

The reactor design, which draws on treatment technology from Wallenius Water, is specially developed for marine applications. The reactor construction is of super duplex steel, which ensures a long lifetime without corrosion.

An integrated and automated Cleaning-In-Place (CIP) safeguards the UV lamp performance. Which circulates a non-toxic and biodegradable cleaning solution that prevents any UV-impairing buildup.

Support Components

The additional components are support systems that can be flexibly placed for an optimal design.

Electrical Cabinet



The PureBallast 3 Ultra, electrical cabinet provides power to the UV lamps and can be placed up to 100 m away from the UV reactor. It features a 10" graphical touchscreen interface that is easy and intuitive to use. Operation can be started or stopped with a single touch. The control system can be integrated with onboard automation systems via Modbus, allowing access to all functions through the vessel's Integrated Ship Control System.

Lamp Drive Cabinet



For flows of 800 m³/h and above, additional lamp drive cabinets are required to power the UV lamps.

Flows of 800 - 1500 m³/h require one additional cabinet (LDC1), while flows of 2000 m³/h require two (LDC1 and LDC2) and flows of 3000 m³/h require three (LDC1, LDC2 and LDSC2).

Each cabinet is physically separated from the UV reactor and may be placed up to 100 m away. This saves space in the engine room and simplifies the design of PureBallast 3 Ultra systems.

Auxiliary Equipment

A broad range of auxiliary equipment is available to support integration into any vessel, including backflush pumps, sampling points, valve packages and remote control panels.

Flow Regulation

For flows of 2000 and 3000 m³/h, a greater mass of water and longer piping impact the installation, compared to smaller systems. To prevent peaks in pressure and flow velocity, there must be smooth flow regulation that allows a soft start and stop of the system. Control over the PureBallast 3 Ultra inlet flow, e.g. by means of a VFD (recommended) or flow control valve, is therefore mandatory for these flows. Though not mandatory, inlet flow control is recommended for other system sizes as well.

Filter Backflushing

Sufficient backflush pressure is crucial for maintained filter performance. Due to the greater distances and height differences for flows of 2000 and 3000 m³/h, systems with these flows are delivered with a backflush pump to ensure sufficient differential pressure.

Operating Sequence

Ballasting

The ballast water treatment process is fully automated. When initiated, the system undergoes a brief startup sequence.

When ballasting begins, the incoming ballast water first passes through the filter stage. This removes any larger organisms and particles, which improves the quality of the water for treatment. The filter stage is of benefit for operation in cloudy coastal waters and fresh water.

After filtration the water continues through the reactor stage, where it is disinfected by means of enhanced UV before entering the ballast water tanks.

Once ballasting is complete, reactor cleaning is performed via an automatic Cleaning-In-Place (CIP) cycle. This cycle is prompted immediately after ballasting and should be performed within 30 hours. The reactor stage is rinsed with fresh water when the CIP cycle begins and filled with fresh water upon its completion. The filter stage is also filled with fresh water once ballasting is completed.

De-ballasting

The de-ballasting process is essentially the same as the ballasting process. However, the filter stage is bypassed during de-ballasting since the water has already been filtered.

After leaving the ballast water tanks, the outgoing ballast water passes through the reactor stage to eliminate any re-growth of microorganisms that may have occurred in transit. Having thus been disinfected to the established limits, it is discharged into the receiving water at the deballasting site.

The same startup and shutdown sequence, including CIP, is employed during both ballasting and de-ballasting.

PureBallast 3 Ultra Ex systems

PureBallast 3 Ultra Ex systems are configured according to ATEX and IECEx, Zone 1, IIC and T4. Ex designs are simplified by the flexible placement of the electrical cabinet and lamp drive cabinets, which shall be located outside the hazardous zone and up to 100 m away from the reactors they serve.

Safety features, such as the connection of the reactor temperature and level sensor via safety relay that bypass the PLC, increase safety in operation.

Operation

Maintenance intervals:

- Filter inspection once per year
- Lamp replacement after 3000 hours of operation (a safe and easy procedure performed in minutes)
- CIP fluid replacement, typically every 3–12 months

The System Manual provides detailed information in electronic or printed format:

- Installation instructions
- Operating instructions
- Alarms and fault finding
- Service and spare parts

- Commissioning and technical services are available from all Alfa Laval offices to start up the system and to provide advice about operation and maintenance.
- Onboard training for the crew is available upon request.

Optional Equipment

- Remote control panels (max two per system)
- Backflush pump (required for 2000 and 3000 m³/h)
- Sampling device
- Bypass valve

Technical Data

PureBallast 3 Ultra and Ultra Ex

Power consumption, 135 m ³ /h	12 kW - 20 kW (at full ramp-up*)
Power consumption, 170 m ³ /h	12 kW - 20 kW (at full ramp-up*)
Power consumption, 300 m ³ /h	18 kW - 32 kW (at full ramp-up*)
Power consumption, 500 m ³ /h	31 kW - 57 kW (at full ramp-up*)
Power consumption, 600 m ³ /h	34 kW - 64 kW (at full ramp-up*)
Power consumption, 800 m ³ /h	45 kW - 84 kW (at full ramp-up*)
Power consumption, 1000 m ³ /h	54 kW - 103 kW (at full ramp-up*)
Power consumption, 1200 m ³ /h	70 kW - 134 kW (at full ramp-up*)
Power consumption, 1500 m ³ /h	82 kW - 159 kW (at full ramp-up*)
Power consumption, 2000 m ³ /h	105 kW - 204 kW (at full ramp-up*)
Power consumption, 3000 m ³ /h	163 kW - 317 kW (at full ramp-up*)

* Power consumption can be increased to handle low clarity water with low UV transmittance.

Power supply: 3x400 VAC/50 Hz or 3x440 VAC/60 Hz

Working pressure: Max 6 bar

Capacity Range (Flow in m³/h)

PureBallast 3 Ultra	135	170	300	500	600	800	1000	1200	1500	2000	3000
PureBallast 3 Ultra Ex			300	500	600	800	1000	1200	1500	2000	3000

For flows in excess of 3000 m³/h, multiple systems are installed. With this configuration strategy, PureBallast 3 Ultra is competitive over the entire flow range up to 6000 m³/h.

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