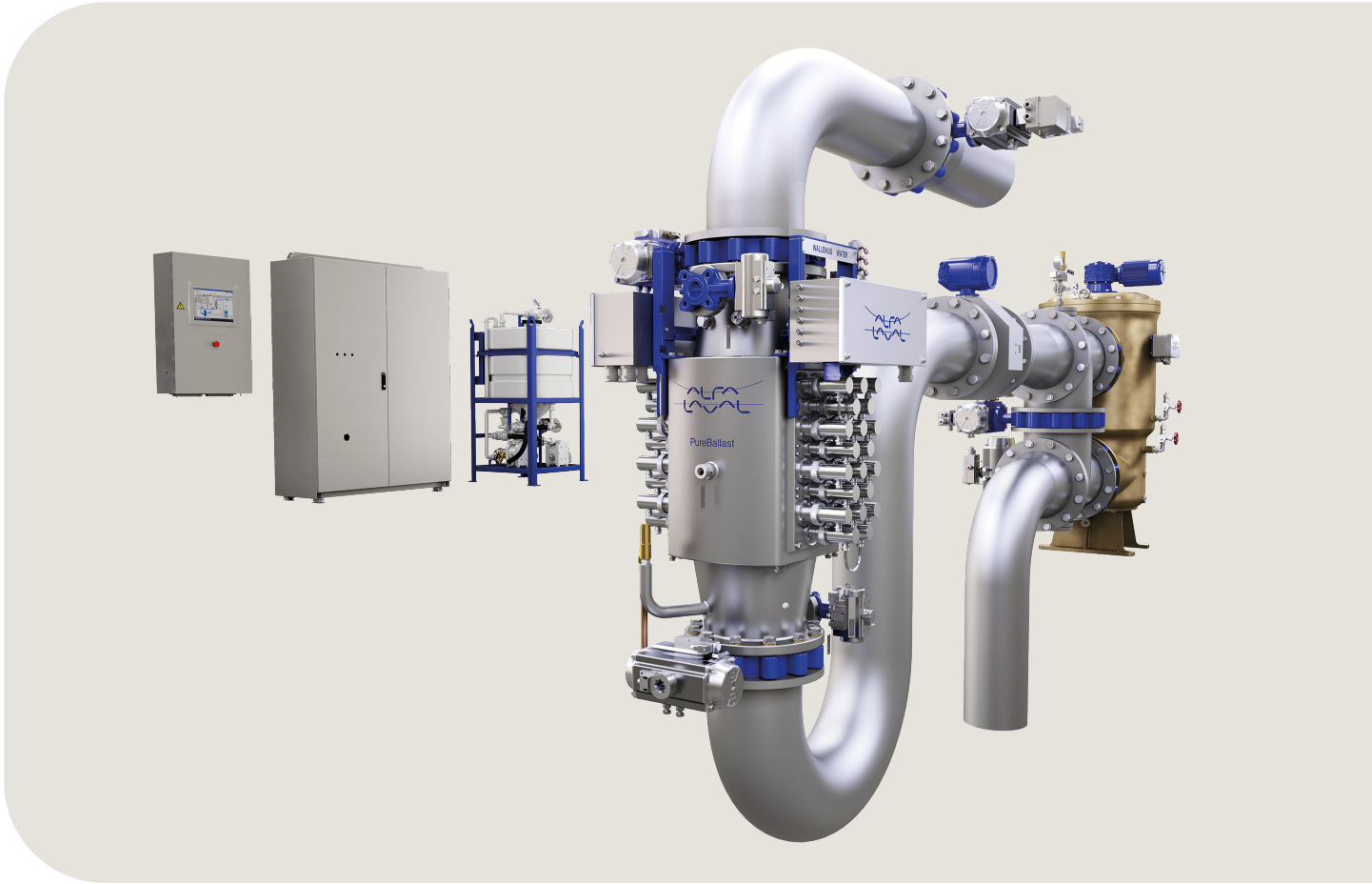
Alfa Laval PureBallast 3 Std & Ex

Ballast water treatment systems for the widest flow range and Ex requirements



Introduction

Now in its third generation, Alfa Laval PureBallast is an automated inline treatment solution for the biological disinfection of ballast water. Operating without chemicals, it combines initial filtration with an enhanced form of UV treatment to remove organisms in accordance with stipulated limits.

The main component of the modular system is an enhanced UV reactor in which disinfection treatment occurs. The special design of the reactor's synthetic quartz lamp sleeves supports transmission of a broader wavelength spectrum, providing more UV light during disinfection. Combined with the reactor's internal design, this ensures optimal UV dosage and low energy consumption.

This leaflet covers PureBallast 3 Std, which handles the widest flow range and is also available in PureBallast 3 Ex configurations for potentially explosive onboard environments.

Application

Type approved by IMO and the U.S. Coast Guard (USCG), PureBallast 3 Std and Ex systems are designed for ballast water treatment in all types of water – fresh, brackish and marine. They can be configured for flows of 250–3000 m3/h, with multiple systems used for larger capacities.

Due to their enhanced UV technology and power ramp-up capabilities, these systems provide unmatched biological disinfection performance in low-clarity waters. When operating in IMO-regulated waters, full-flow treatment is possible where the UV transmittance is as low as 42%.

Benefits

Superior performance in any waters

PureBallast 3 Std and Ex systems offer unmatched biological disinfection performance in any type of water: fresh, brackish or marine. This includes water in liquid form at frigid temperatures. In addition, the systems excel in low-clarity water conditions. When operating in IMO-regulated waters, they perform at full flow where the UV transmittance is as low as 42%.

Ease of use

PureBallast 3 Std and Ex systems are fully enclosed, fully automated and thoroughly integrated with the ballast water system. They requires no manual intervention.

Effective power management

Automatic power management minimizes energy consumption in IMO-regulated waters, including when USCG-certified systems operate outside the United States. With this feature, PureBallast 3 Std and Ex systems run at just 50% of their potential operating power in most situations. They can then ramp up to full power for the most challenging waters.

Space-saving inline construction

PureBallast 3 Std and Ex systems are inline systems in which the major components (filter and reactor) are incorporated into the ballast water piping. The reactor diameter, in particular, is only marginally larger than that of the piping itself. This simplifies installation and reduces footprint.

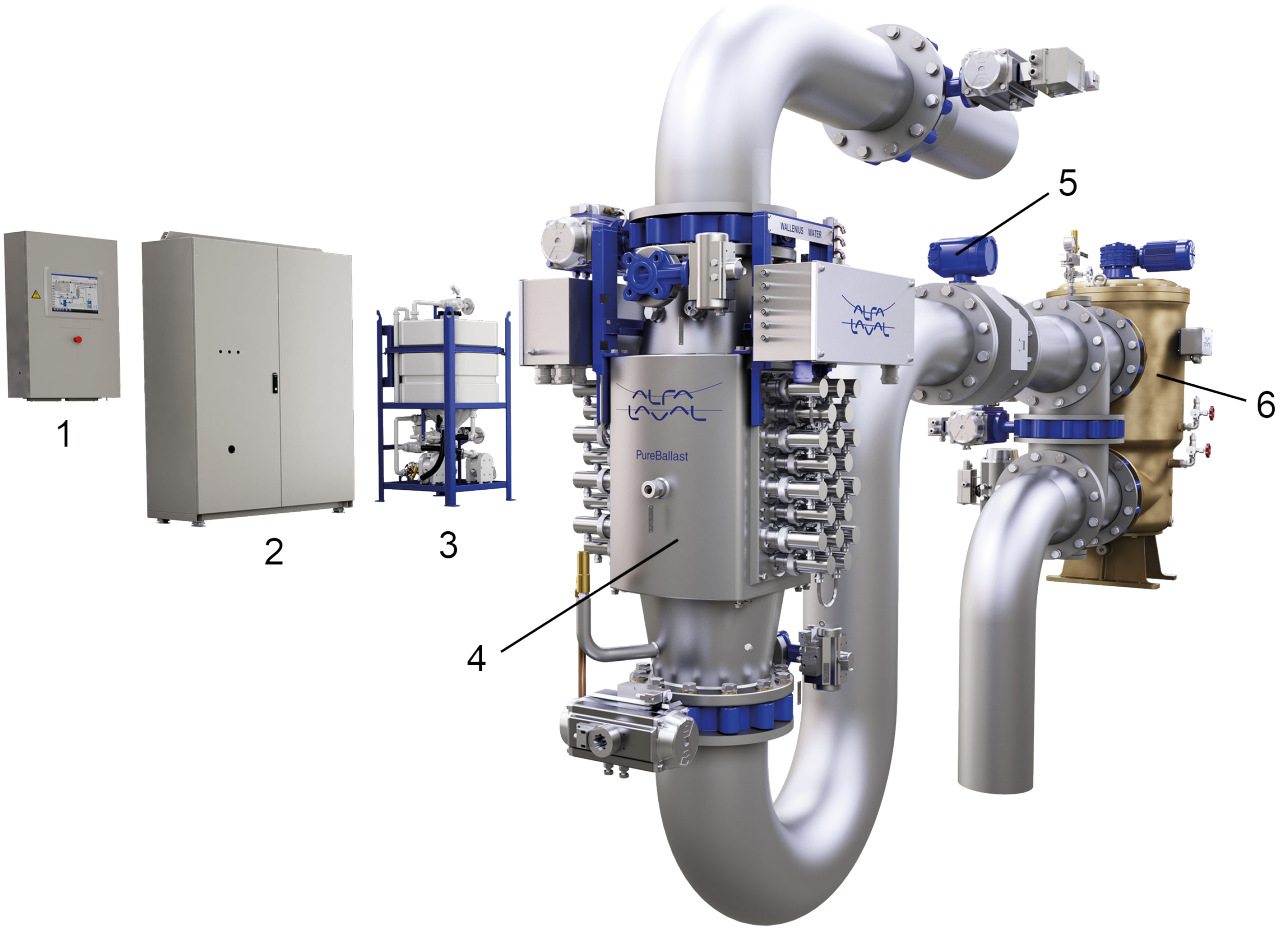
System design is further simplified by the free placement of the lamp drive cabinet up to 150 m away. This allows additional space to be saved in the engine room, and it enables placement outside the hazardous zone for PureBallast 3 Ex systems.

Chemical-free operation

PureBallast Std and Ex systems meet biological disinfection requirements without the addition of salt or chemicals, even when operating in fresh water. No dosing is required, and there are no tanks or ventilation systems needed to manage consumables and residuals.

Complete worldwide support

Alfa Laval is a global supplier and an experienced partner in ballast water treatment, with a complete range of solutions for both newbuild and retrofit needs. Shipyards and engineering companies can expect clear and thorough documentation, as well as expert consultation. Ship owners have access to far-reaching ownership support, including Performance Agreements and other services for cost- efficient peace of mind.



(1) Control cabinet, (2) lamp drive cabinet, (3) cleaning-in-place (CIP) unit, (4) reactor, (5) flow meter and (6) filter.

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

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.

Reactor

The enhanced UV treatment stage occurs within a reactor. Five reactor sizes are available for PureBallast 3 Std and Ex 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-austenitic stainless steel, which ensures a long lifetime without corrosion.

Support components

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

Lamp drive cabinet

The UV lamps are supplied with power by a lamp drive cabinet associated with the reactor. The cabinet is physically separated from the reactor and may be placed up to 150 m away. This saves space in the engine room and simplifies the design of PureBallast 3 Ex systems.

Cleaning-In-Place (CIP) unit

UV lamp performance is safeguarded by an automatic CIP cycle. The CIP unit circulates a reusable, non-toxic and biodegradable cleaning solution that prevents any UV-impairing buildup. Such build-up cannot be removed by wiping, which would also risk scratching the sleeve surface.

Control cabinet

The PureBallast 3 control cabinet features a graphical touchscreen interface that is easy and intuitive to use. Operation can be started or stopped with a single touch. The control system can also be integrated with onboard automation systems via Modbus, allowing access to all functions through the vessel's Integrated Ship Control System.

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 inlet flow, e.g. by means of a VFD (recommended) or throttle valve, is therefore mandatory for these flows. Though not mandatory, flow regulation 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.

Deballasting

The deballasting process is essentially the same as the ballasting process. However, the filter stage is bypassed during deballasting 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 regrowth 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 deballasting.

PureBallast 3 Ex systems

PureBallast 3 Ex systems are configured according to ATEX and IECEx, Zone 1, IIC and T4. Ex designs are simplified by the flexible placement of the lamp drive cabinets, which can be located outside the hazardous zone and up to 150 m away from the reactors they serve.

Redundant safety features, such as the connection of the reactor temperature and level sensors via relays that bypass the PLC, increase safety in operation.

Type approvals

IMO

PureBallast 3 Std and Ex systems have IMO revised G8 type approval. When operating in IMO-regulated waters, they make maximum use of their power management and other capabilities.

USCG

PureBallast 3 Std and Ex systems have USCG type approv- al and provide the option of minimized holding time when operating in USCG-regulated waters. The minimized holding time is just 2.5 hours and is only needed when crossing between Captain of the Port Zones.

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)
- High-pressure system (up to 10 bar) for use with high-pressure ballast water pumps
- Sampling device
- Bypass valve

Technical data

PureBallast 3 Std & Ex	
Power consumption, 170 m^3/h reactor	11 kW (20 kW at full ramp-up*)
Power consumption, 300 m^3/h reactor	17 kW (32 kW at full ramp-up*)
Power consumption, 600 m^3/h reactor	33 kW (63 kW at full ramp-up*)
Power consumption, 1000 m^3/h reactor	52 kW (100 kW at full ramp-up*)
Power consumption, 1500 m^3/h reactor	81 kW (100 kW at full ramp-up*)

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

Power supply: 400–440 VAC, 50/60 Hz

Working pressure: Max 6 bar (up to 10 bar optional)

Capacity range (flow in m^3/h)

PureBallast 3 Std	NA	NA	500	600	750	1000	1500	2000	3000
PureBallast 3 Ex	250	300	500	600	750	1000	1500	2000	3000

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

Component dimensions

PureBallast 3 Std & Ex	Size (mm) (W×D×H)	Net/dry weight (kg)	Volume (L)
Reactor, 300 m^3/h	700 × 650 × 1310	250	80
Reactor, 600 m^3/h	855 × 765 × 1400	320	100
Reactor, 1000 m^3/h	1030 × 950 × 1500	400	190
Reactor, 1500 m^3/h	1120 x 1110 x 1480	650	205
Lamp drive cabinet for 300 m^3/h reactor	900 × 480 × 2000	250	
Lamp drive cabinet for 600 m^3/h reactor	1350 × 610 × 2000	370	
Lamp drive cabinet for 1000 m^3/h reactor	1350 × 610 × 2000	400	
Lamp drive cabinet for 1500 m^3/h reactor	1350 x 610 x 2000	400	
Lamp drive cabinet slave for 1500 m^3/h reactor	1040 x 610 x 2000	360	
CIP unit	740 × 870 × 1800	155	Max 250
Control cabinet	650 × 310 × 1100	50	
Basket filter, 250 m^3/h	460 × 498 × 1146	360	61
Basket filter, 300 m^3/h	490 × 503 × 1201	400	82
Basket filter, 500 m^3/h	610 × 637 × 1296	620	146
Basket filter, 750 m^3/h	730 × 715 × 1579	860	241
Basket filter, 1000 m^3/h	765 × 786 × 1753	1020	370
Basket filter, 1500 m^3/h	775 × 794 × 2248	1150	480
Basket filter, 2000 m^3/h	1000 × 1008 × 2367	1780	890
Basket filter, 3000 m^3/h	1300 × 1288 × 2476	2595	1700

200008589-1-EN-GB

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com