Alfa Laval PureBallast 3 Std & Ex

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

600 m³/h system

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 water salinities – 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 all water salinities*
  PureBallast 3 Std and Ex systems offer unmatched biological disinfection performance in all water salinities: fresh, brackish and 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.

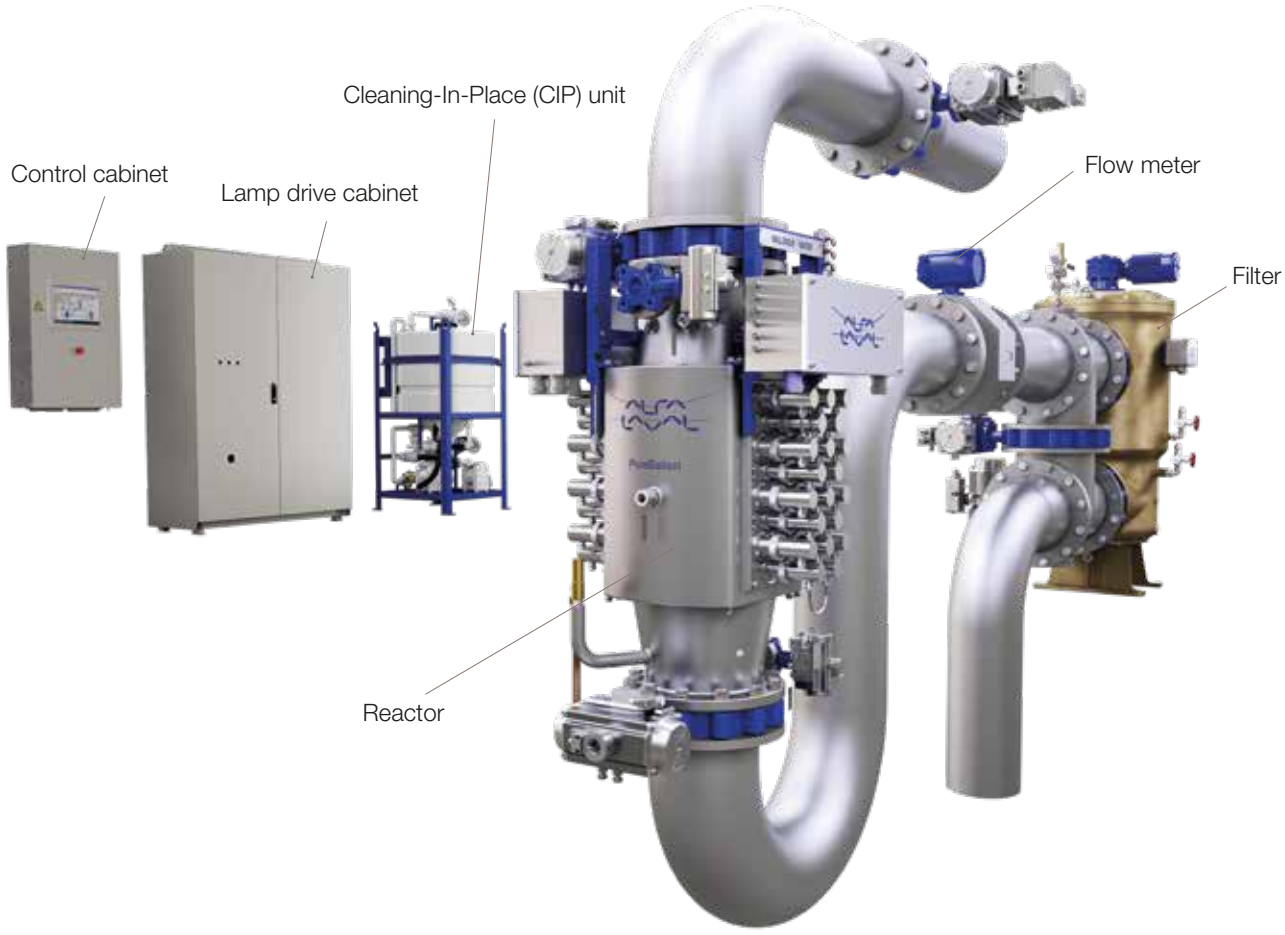
- *Effective power management*
  Automatic power management minimizes energy consumption in IMO-regulated waters, including when USCG-certified systems operate outside the United States. With this feature, PureBallast 3 Std and Ex systems run at just 50% of their potential operating power in most situations. 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.



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 piping 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 build-up. 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.

Technical data

PureBallast 3 Std & Ex		PureBallast 3 Std & Ex, USCG HP
Power consumption, 300 m³/h reactor	17 kW (32 kW at full ramp-up*)	
Power consumption, 600 m³/h reactor	33 kW (63 kW at full ramp-up*)	Power consumption, 300 m³/h reactor
Power consumption, 1000 m³/h reactor	52 kW (100 kW at full ramp-up*)	Power consumption, 500 m³/h reactor
Power consumption, 1500 m³/h reactor	81 kW (156 kW at full ramp-up*)	Power consumption, 750 m³/h reactor

** 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 m³/h)

PureBallast 3 IMO & USCG	250	300	500	600	750	1000	1200	1500	2000	3000
PureBallast 3 USCG HP	250	300	500	600	750	1000		1500		

For flows in excess of 3000 m³/h (not applicable for PureBallast USCG HP), multiple systems are installed.
With this configuration strategy, PureBallast 3 is competitive over the entire flow range up to 6000 m³/h.

Component dimensions

PureBallast 3 Std & Ex, IMO & USCG				PureBallast 3 Std & Ex, USCG HP
	Size (mm) (W × D × H)	Net/dry weight (kg)	Volume (L)	
Reactor, 300 m³/h	700 × 650 × 1310	250	80	Reactor, 150 m³/h
Reactor, 600 m³/h	855 × 765 × 1400	320	100	Reactor, 300 m³/h
Reactor, 1000 m³/h	1030 × 950 × 1500	400	190	Reactor, 500 m³/h
Reactor, 1500 m³/h	1120 x 1110 x 1480	650	205	Reactor, 750 m³/h
Lamp drive cabinet for 300 m³/h reactor	900 × 480 × 2000	250		
Lamp drive cabinet for 600 m³/h reactor	1350 × 610 × 2000	370		Lamp drive cabinet for 300 m³/h reactor
Lamp drive cabinet for 1000 m³/h reactor	1350 × 610 × 2000	400		Lamp drive cabinet for 500 m³/h reactor
Lamp drive cabinet for 1500 m³/h reactor	1350 x 610 x 2000	400		Lamp drive cabinet for 750 m³/h reactor
Lamp drive cabinet slave for 1500 m³/h reactor	1040 x 610 x 2000	360		Lamp drive cabinet slave for 750 m³/h reactor
CIP unit	740 × 870 × 1800	155	Max 250	CIP unit
Control cabinet	650 × 310 × 1100	50		Control cabinet
Basket filter, 250 m³/h	460 × 498 × 1146	360	61	Basket filter, 250 m³/h
Basket filter, 300 m³/h	490 × 503 × 1201	400	82	Basket filter, 300 m³/h
Basket filter, 500 m³/h	610 × 637 × 1296	620	146	Basket filter, 500 m³/h
Basket filter, 750 m³/h	730 × 715 × 1579	860	241	Basket filter, 750 m³/h
Basket filter, 1000 m³/h	765 × 786 × 1753	1020	370	Basket filter, 1000 m³/h
Basket filter, 1500 m³/h	775 × 794 × 2248	1150	480	Basket filter, 1500 m³/h
Basket filter, 2000 m³/h	1000 × 1008 × 2367	1780	890	Basket filter, 2000 m³/h
Basket filter, 3000 m³/h	1300 × 1288 × 2476	2595	1700	Basket filter, 3000 m³/h

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.

Type approvals

- *IMO*
  PureBallast 3 Standard and Ex systems have IMO revised G8 type approval, which means systems purchased today can be installed after the stricter IMO guidelines take effect on 28 October 2020. When operating in IMO-regulated waters, PureBallast 3 systems make maximum use of their power management and other capabilities.
- *USCG*
  To address differing needs in United States waters, there are standard and high-power versions of PureBallast 3 Standard and Ex under USCG type approval. Standard systems, which utilize flow control in waters with low UV transmittance, are configured as for IMO-regulated waters 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. High-power systems are configured to allow full flow in the vast majority of United States waters.

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.

Operation

- Maintenance intervals:
- Filter inspection once per year
- Lamp replacement after up to 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
- High-pressure system (up to 10 bar) for use with high-pressure ballast water pumps
- Sampling device
- Bypass valve

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Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineering solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

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