



# Wärtsilä Shaft Line Solutions



# Wärtsilä Shaft Line Solutions

We at Wärtsilä Shaft Line Solutions specialise in designing, manufacturing and servicing propulsion shaft lines for the marine markets. We sit within Wärtsilä Marine Systems and comprise our commercial marine business, our navy-focussed operations and Wärtsilä Underwater Services.

## **One supplier with everything you need**

As an original equipment provider and full-service integrator we have full control of the product process – from design to distribution – making it possible for an entire power or propulsion system to be fully serviced by one supplier.

Our multidisciplinary team of experts scattered around the world has the skills to support ship owners and operators throughout the whole life cycle of their vessel, above and below the water.

## **More than shaft line services**

Our expertise extends risk management and regulatory environments. Up-to-date with the latest global shipping standards – including International Organisation for Standardisation (ISO) – we can advise on best practice and regulatory compliance.

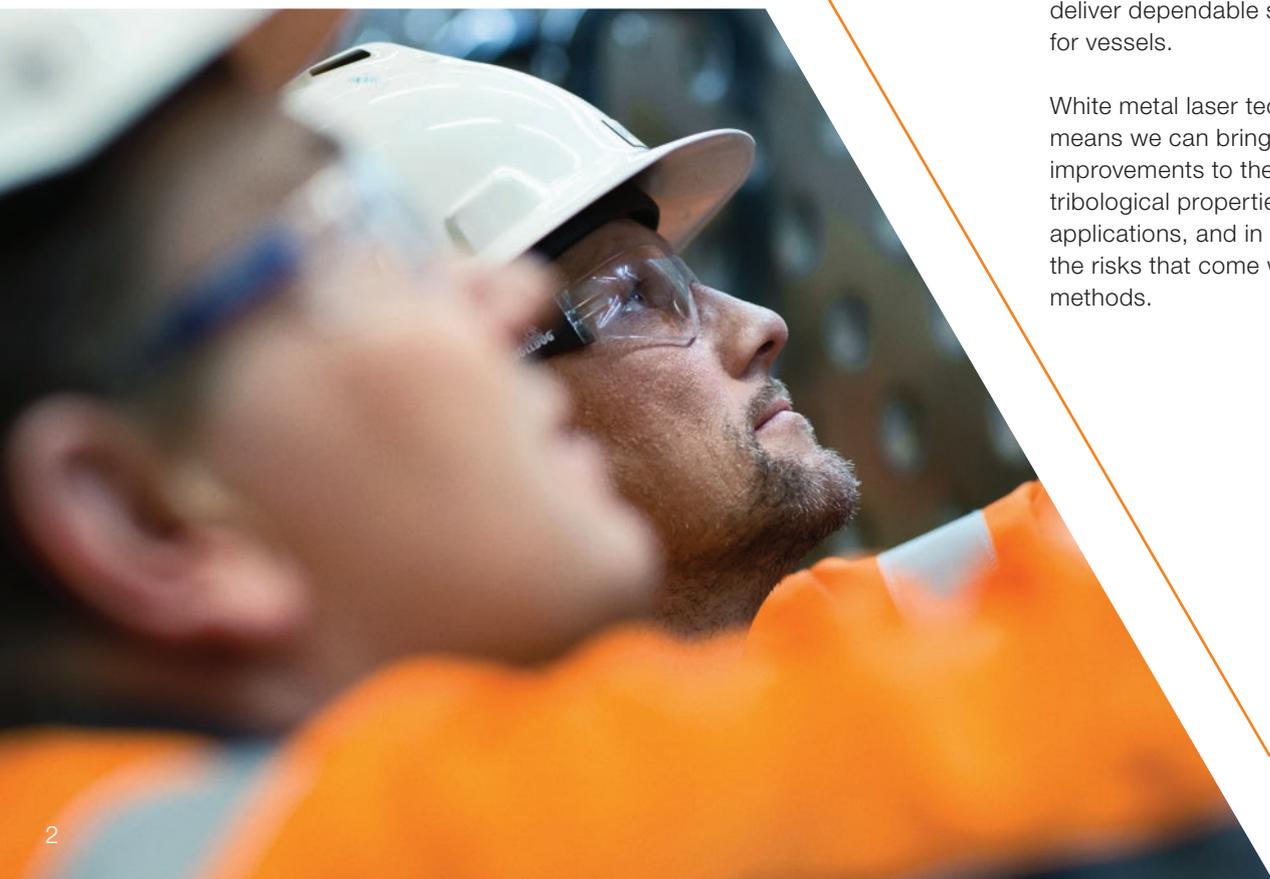
We're equally well-versed in technological trends and, through advanced data analysis and underwater drone technology, we're harnessing the possibilities of digitalisation to help make Wärtsilä's wider corporate vision for a digitally-connected Smart Marine Ecosystem a reality.

## **Innovative engineering**

Digitalisation is transforming the delivery of marine maintenance services. Through advanced data generation and specially-designed augmented reality (AR) goggles, we can now support entire fleets and offer ship owners and operators real-time support services anywhere in the world.

We are always looking for ways to improve our products and manufacturing processes. With advanced computational facilities (inc live machine monitoring), numerical tools (inc Finite Element Analysis) and fully integrated manufacturing and design programmes (inc Computer-aided manufacturing (CAM) and design (CAD) software), we have the means to carry out rigorous product testing and deliver dependable shaft line solutions for vessels.

White metal laser technology also means we can bring significant improvements to the mechanical and tribological properties of white metal applications, and in so doing reduce the risks that come with conventional methods.





### About Wärtsilä

Since its beginnings in Finland over 185 years ago, Wärtsilä has gone on to become a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets, with 19,000 employees and operations in over 200 locations in more than 80 countries.

### Military-capable solutions

At our research and development facilities, we perform rigorous product testing in line with MIL-S-901E, MIL-STD-167-1 and BR3021 standards to equip navies with military-capable shaft line solutions.

### Exceeding customer expectations

We have a comprehensive product and services portfolio spanning the whole life span of a vessel. Not only environmentally-sustainable, but our fully integrated systems, packages and products are also the culmination of years of research and development.

### Deliver on demand, across the globe

With globally-present project managers, alignment and measurement specialists and field service engineers, and in-house manufacturing facilities worldwide, we can push design boundaries and deliver innovative shaft line solutions for the shipping industry on demand.

In our position as an Original Equipment Manufacturer (OEM) we have the ability to create products as and when required and equip customers for the modern world.

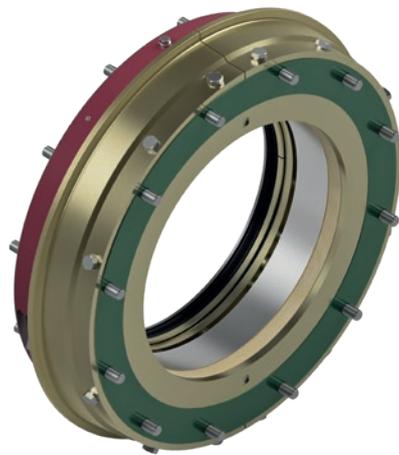
### A reputation that matters

Our reputation is bolstered by our commitment to research and development. With facilities scattered across the globe, we can carry out rigorous product testing to ensure we deliver unparalleled shaft line solutions for customers. Only when our products have successfully passed vigorous validation steps – both in our laboratories and the field – can they be delivered to the marine and energy markets.

# Wärtsilä oil lubricated seals

## Wärtsilä Sternguard OLS

Hard-wearing components and smart design make the Wärtsilä Sternguard Oil Lubricated Seal (OLS) a capable outboard sealing solution for marine applications. Together with operational abilities in harsh conditions, this seal has a fully split variant which allows for maintenance on-the-move.



## Wärtsilä Sternguard IWSS

A unique outboard sealing solution for the marine market, the Wärtsilä Sternguard In-Water Serviceable Seal (IWSS) keeps seawater out and stern-tube lubricants in, while allowing for in-situ repair. That way, customers remain in operation for longer.

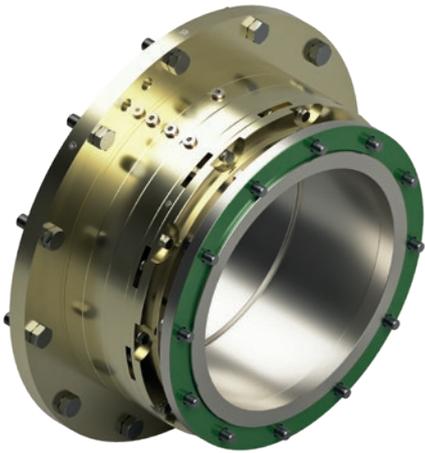
## Wärtsilä Sternguard EK

Engineered to operate in abrasive waters, the Wärtsilä Sternguard EK provides a dependable face sealing solution for small to medium vessels. Additionally, it complies with the US Environmental Protection Agency (EPA) 2013 Vessel General Permit (VGP).



## Wärtsilä Sternguard EJ

Hard-wearing Viton® rubber rings and a protective liner enable Wärtsilä Sternguard EJ to excel in abrasive waters. Not only designed to endure extreme vibrations and shaft movements well beyond the capabilities of traditional inboard face seals, this fully split seal also facilitates underwater repair.



## Wärtsilä Sandguard

Active fishing net protection (FSP type UNNET) and a built-in sand barrier device make Wärtsilä Sandguard a superior lip sealing solution for dredgers. Together with performance capabilities in harsh conditions, this seal is compatible with Environmentally Acceptable Lubricants (EALs) and ensures EPA VGP compliance.

## Wärtsilä Floodguard

Proven performance in harsh waters makes Wärtsilä Floodguard a reliable bulkhead seal for commercial applications. With this self-activating seal in place, ship owners and operators can simultaneously safeguard their vessel against inter-compartmental flooding and maintain structural integrity.

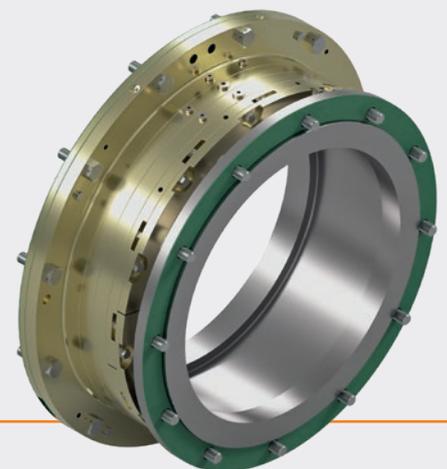


## Wärtsilä Steerguard E

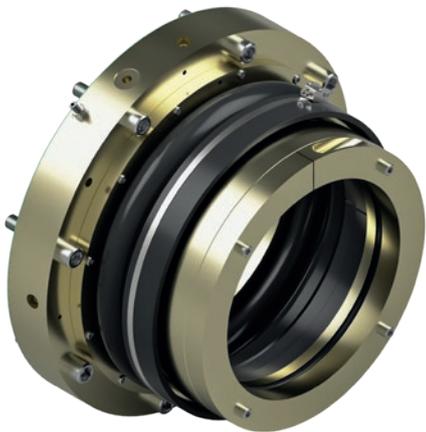
A significant part of our product portfolio, Wärtsilä Steerguard can be found on the rudder stocks of numerous vessels around the world. Made of neoprene rubber and high-grade cast iron, this face seal is hard-wearing and capable of operating in harsh conditions and also meets EPA VGP standards.

## Wärtsilä Airguard

Environmentally efficient, adherent to EPA VGP guidelines and a track record of zero oil leakages since its creation in 1988, the Wärtsilä Airguard is a market leading lip seal solution. An ideal solution for merchant vessels looking to safely operate in protected waters and reduce operational costs.



# Wärtsilä water lubricated seals



## Wärtsilä Enviroguard PSE

Available fully and partially split, the Wärtsilä Enviroguard PSE face seal is a water lubricated, environmentally compliant inboard sealing solution for vessels operating in blue-water and abrasive water conditions. With proven shock capabilities, these elastomer-bonded seals can accommodate shaft line misalignment and vibration.

## Wärtsilä Enviroguard M

Wärtsilä Enviroguard M offers minimal leakage, low lifecycle costs and exceptional performance in tough water conditions. It is adaptable, efficient and features a double inflatable emergency seal for low risk, diver-free repair and maintenance.

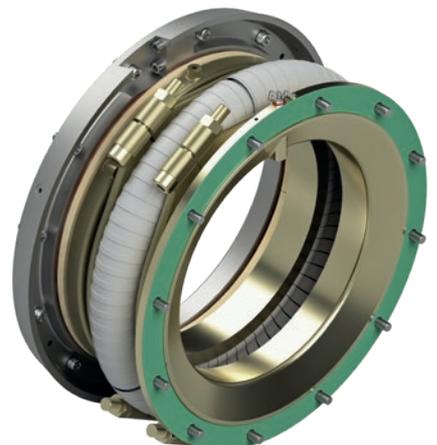


## Wärtsilä Enviroguard MB

With high wear, corrosion-resistant materials and “omega” bellows, the Wärtsilä Enviroguard MB face seal is an inboard, closed water lubricated type seal. It’s been specifically designed to withstand shock and high shaft movement to meet the demands of icebreaker applications. This face seal also facilitates in-situ overhauls and upgrades, due to its split wearing design, and can also be fitted with a double inflatable seal.

## Wärtsilä Enviroguard M4

Wärtsilä Enviroguard M4 is a closed outboard face seal designed for icebreaker applications. With “omega” bellows, this seal can withstand harsh environments where shock and high shaft movements are inevitable. It comes with partially split wearing components as standard to allow for in-situ upgrades and overhauls.



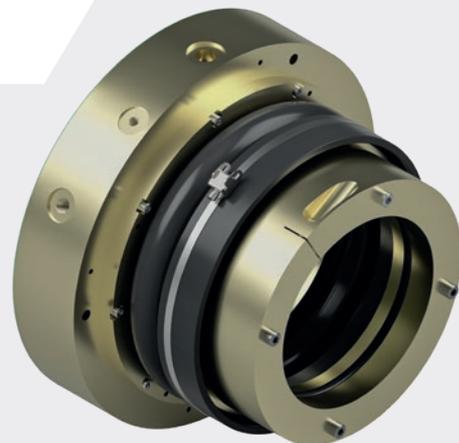


## Wärtsilä Enviroguard MG

Hard-wearing interface materials, corrosion-resistant metal components and flexible helical spring makes the Wärtsilä Enviroguard MG an ideal seal for enhancing vessel performance. Its double inflatable emergency seal enables simple repair and maintenance, while its flexible design makes it both vibration-tolerant and capable of enduring large and repeated axial shaft movements.

## Wärtsilä Jetguard PSE

The Wärtsilä Jetguard PSE face seal is able to withstand shock and pressure, making it ideal for both commercial and military vessels. Its hard-wearing, abrasion-resistant components enable it to operate in silty, sandy waters.



## Wärtsilä Floodguard

The Wärtsilä Floodguard has proven performance as a reliable bulkhead seal for military applications. With this self-activating seal in place, navies can safeguard their vessel against inter-compartmental flooding, while maintaining vessel integrity.

## Wärtsilä Sternguard EJ

A robust and reliable lip seal solution, the water lubricated Wärtsilä Sternguard EJ excels in abrasive waters due to its hard-wearing Viton® rubber rings and protective liner. It can endure extreme vibrations and shaft movements and as a fully split seal, underwater repair can be facilitated.



## Wärtsilä Steerguard E

A significant part of our product portfolio, Wärtsilä Steerguard E can be found on the rudder stocks of numerous vessels around the world. Made of neoprene rubber and high-grade cast iron, this face seal is hard-wearing and capable of operating in harsh conditions and also meets EPA VGP standards.

# Wärtsilä bearings

## Wärtsilä Sternsafe White Metal Bearing

Coated with tin or lead-based white metal, using our latest white laser technology, the Wärtsilä Sternsafe White Metal Bearing brings outstanding tribological benefits to commercial vessels. As well as strengthening the capabilities of stern tube applications and brackets, this bearing has optional temperature sensors for monitoring bearing health.



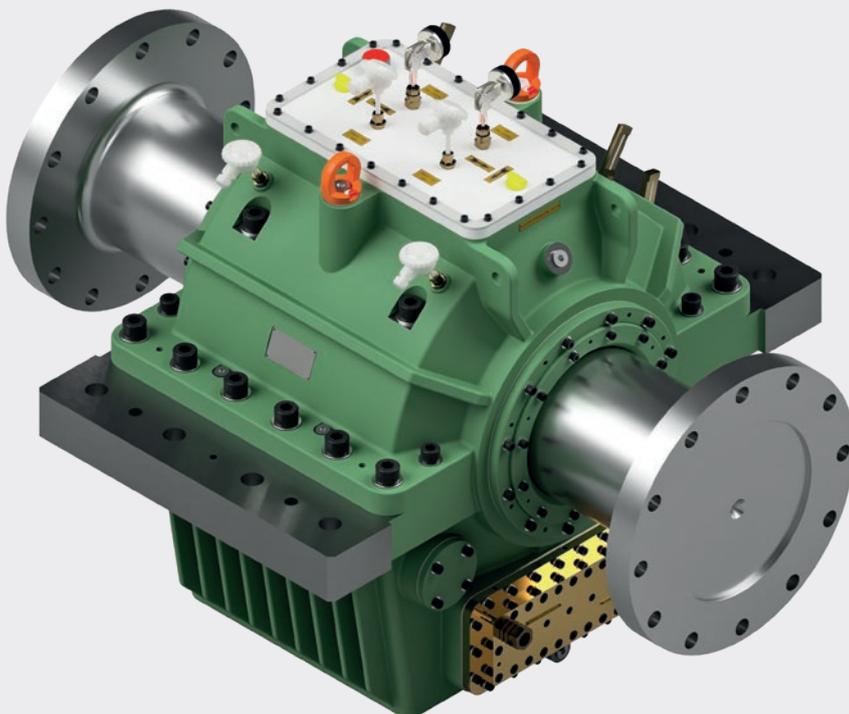
## Wärtsilä Sternsafe Composite Bearing

Unparalleled load handling and lubrication properties make the Wärtsilä Sternsafe Composite Bearing a vital addition to any stern tube application. With exceptionally high adhesion strength, this bearing can perform to a high standard, even in harsh conditions and under considerable pressure.

## Wärtsilä Thrust Bearings and Pads

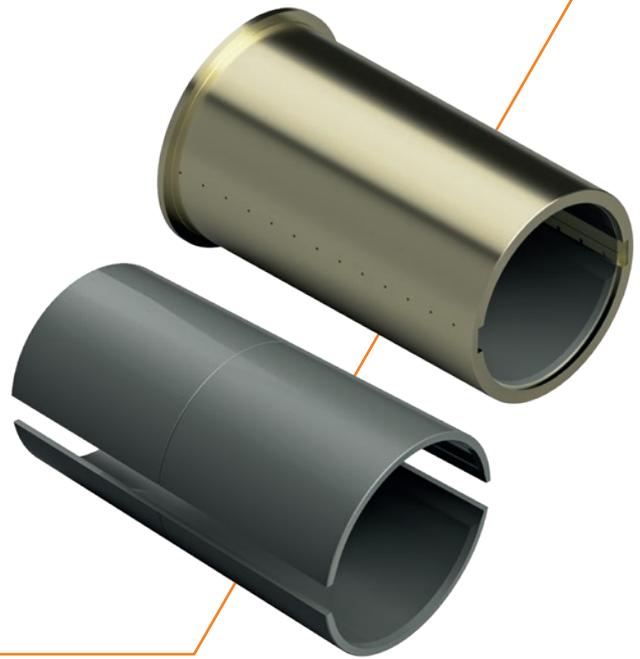
The Wärtsilä Thrust Bearing is a self-aligning, single collar unit with pivoting pads designed to carry axial loads in harsh conditions. Its adaptive design lends itself to modification, for ship owners and operators requiring an axial and radial load bearing solution.

This oil-circulating and cooling system is available either as a self-lubricated system with an integrated cooler, or as an external pump and cooler unit, and comes with a remote temperature and oil flow monitoring device for lifecycle management purposes.



## Wärtsilä Envirosafe

Years of research and development went into developing the Wärtsilä Envirosafe. Unlike like most traditional bearings, this composite bearing for stern tube applications is not only technologically-advanced, but also environmentally compliant and lubricated by seawater.



## Wärtsilä Steersafe

The Wärtsilä Steersafe bearing is designed to transfer high loads on rudders and stabilisers in extreme environments, reducing the risk of failure during service. Durable and water lubricated, this bearing is approved by all major Classification Societies and is compliant with US EPA regulations.

## Wärtsilä Linesafe

The Wärtsilä Linesafe is a fully split, hydrodynamic bearing with a self-aligning design. With its temperature sensors and transparent inspection plate as standard, it's designed to meet modern market demands and provide full visibility of equipment health to keep vessels out at sea.



# Wärtsilä hydraulic equipment

## Wärtsilä High Friction Couplings

Over 40 years of designing and manufacturing shaft line hydraulic couplings informed the development of the Wärtsilä High Friction Coupling. Increasing torque transmission capacity and eliminating the need for keyways, tapers or thrust rings, this innovative method for connecting shafts maximises propulsion efficiency in areas where previously it had been impossible, and brings substantial cost savings along the way.



**Fig.1** Wärtsilä OHSM-VX and OHSM-VXD High Friction Couplings.



**Fig.2** Wärtsilä OHSN-X High Friction Couplings.



**Fig.3** Wärtsilä OHSN-BX High Friction Couplings.



## Wärtsilä Hydraulic Bolts

Wärtsilä Hydraulic Bolts are designed to connect marine shaft line flanges, and at the same time meet the requirements of high torque transmission.

## Wärtsilä Hydraulic Nuts

Wärtsilä Hydraulic Nuts have been designed to support the installation of heavy equipment both as a tool and as a permanent nut. Fitted using a hydraulic procedure, it provides a straightforward and trouble-free solution for vessels on the move.

# Wärtsilä stern tube solutions



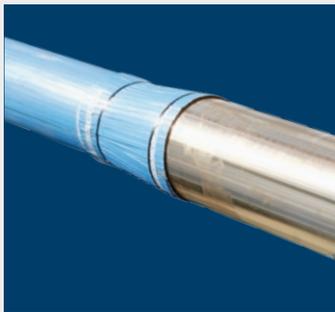
## Wärtsilä Stern Tubes

Our custom engineered stern tube solutions are made to meet individual customer specifications and come with a cast white metal coat to safeguard against harsh weather conditions. Compared to traditional methods, the installation and alignment process for our stern tube solutions is straightforward, saving time and money.

## Wärtsilä Tail Shafts, Shaft Journals and Shaft Coatings

We supply complete tail shafts with shaft journals and industry leading shaft corrosion protection. Alternatively, shaft journals and coatings are available separately, along with on-site installation support.

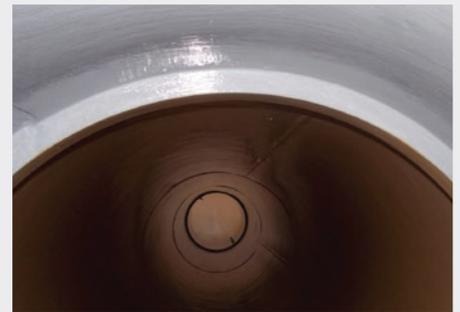
Shaft journal



Coated shaft



Coated stern tube



## Shaft line conversion services

From meeting environmental regulations to reducing lifecycle costs and increasing operational efficiency, a shaft line conversion can offer significant benefits to vessels. With OEM spare parts and extensive experience of carrying out the procedure, we can manage the whole process for you.



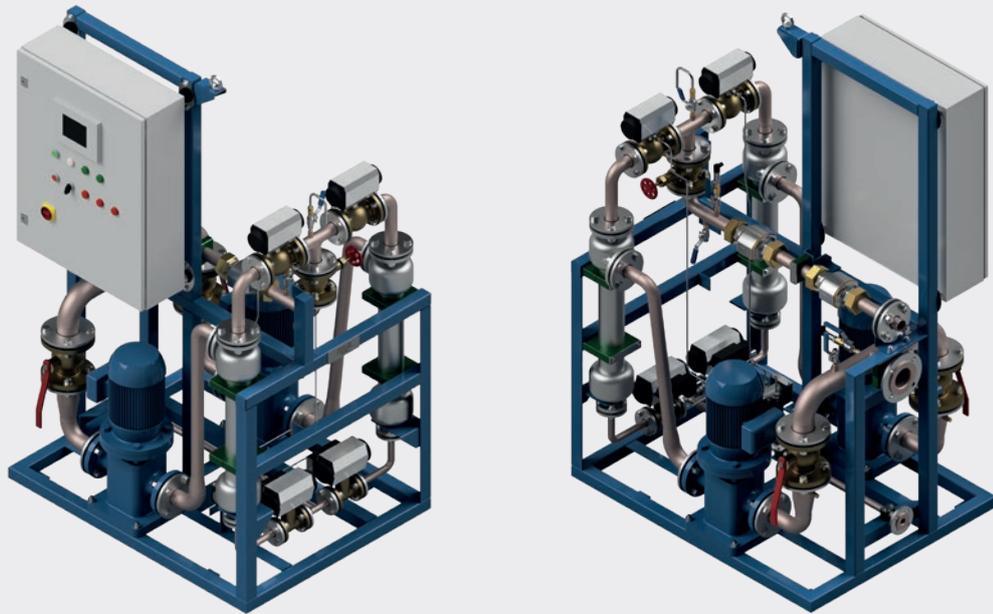
# Wärtsilä systems

## Wärtsilä Sea-Master System

Completely transforming shaft line asset management, the Wärtsilä Sea-Master System comes with an on-board and remote digital monitoring device for tail shaft performance, delivering unprecedented levels of data. It comes with a range of support and consultancy services, which help you make informed decisions about optimising operations.

This revolutionary platform also enables you to meet modern environmental legislations. By extending the maintenance intervals for water lubricated systems, the Wärtsilä Sea-Master System provides a window into vessel health so customers can lower cost of ownership and enhance the performance of their vessel. The system is available for installed, new build and retrofit applications.



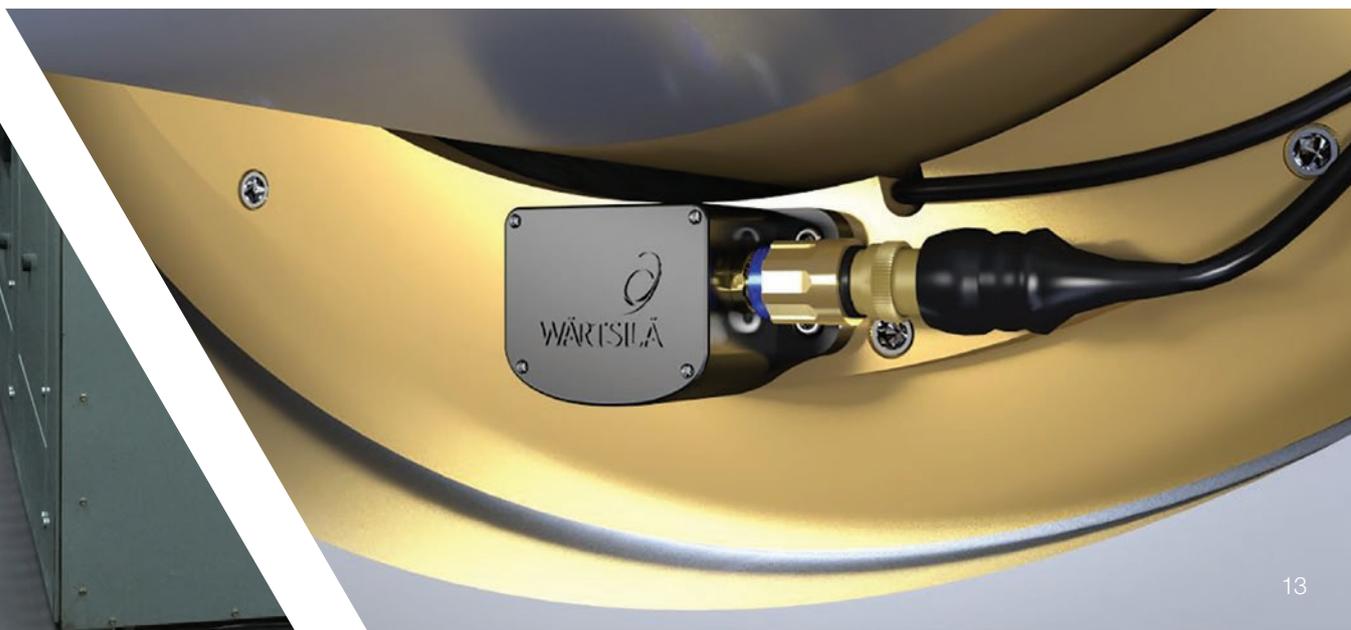


## Wärtsilä Water Quality System

The Wärtsilä Water Quality System provides conditioned water for open lubricated stern tube systems. It increases the life of seals and bearings by filtering the water supply to required standards, with a range of filtered supply systems available. A control panel oversees the safe operation and full monitoring of the system.

## Wärtsilä Bearing Wear Down Gauge

The Wärtsilä Bearing Wear Down Gauge remotely monitors the condition of stern tube or bracket bearings on water lubricated shaft lines by measuring the drop of the propeller shaft. The measurements are taken by a proximity sensor located in a fully potted submersive enclosure, which is mounted on the stern tube or bracket bearing keeper ring. This system can be fitted to both new build vessels and retrofitted to existing vessels with water lubricated shaft lines.



# Wärtsilä Shaft Line Repair Services

## We're here to help

We know how important it is to resolve shaft line problems as quickly as possible. That's why we developed Wärtsilä Shaft Line Repair Services, a quick response service for shaft lines damaged by a major marine incident or showing common symptoms of equipment failure.

### Help with any shaft line issue

Potential signs of shaft line failure can vary from noise and vibration to high temperatures and leaking seals. They often occur as a result of wear and tear or a major incident, like a fire, flooding, breakdown, collision or grounding. When the unexpected arises, we are here to help – wherever you are in the world.

### How we can help

We're recognised as a leading supplier of marine propulsion systems. Our all-encompassing portfolio brings customers the necessary services and innovations for getting a vessel's shaft line back to good health.

The benefits we provide include, but are not limited to:

- technical support, advice and consultancy;
- complete condition and failure investigations;

- measurement, calculation and analysis of alignment, torsional vibration and whirling;
- specialist, patented alignment tools and software including 4D gyro laser, strain gauge measurement, digital jack-up, etc;
- realignment and modifications to shaft line systems and associated equipment;
- dynamic alignment and vibration services;
- monitoring and alarm solutions;
- underwater class and measurement surveys, and NDT/MPI, hull (fouling), grounding and spot inspections;
- shaft line and stern tube equipment replacement, upgrades and overhauls (seals, bearings, couplings, line shaft bearings, liners, propeller repair, straightening, polishing);
- underwater shaft seal, bow thruster, stabilizer fine repair and exchange, and underwater rudder repair, removal and installation;
- ship husbandry: propeller polishing, hull cleaning, anodes renewal, blankings, and ICCP and cofferdam installations;
- specialist in-situ machining and welding services and supervision, including underwater welding repairs and weld repair plans;
- shaft repair, straightening and replacement (including removal and installation underwater);
- rudder, nozzle and underwater machinery/components repair and replacement; and
- project management, consultancy and support in handling class and insurance cases.





## Why Wärtsilä?

### Global expertise

You can rely on Wärtsilä for its extensive experience, technical know-how and high levels of professionalism.

### We'll come to you

Wherever you are in the world, whatever shaft line issue you have, we work fast to get your vessel operational again. Our Wärtsilä Shaft Line Repair Services team has field service engineers located around the world, handling every step of the way, so customers get the right people at the right time.

### Project management made simple

The driving force behind Wärtsilä Shaft Line Repair Services is the project manager. Your one point of call, the project manager is responsible for communications, driving production, overseeing logistics, preparing documentation, and much more. Having one point of contact communicating with experts and managing the delivery and installation of spare parts makes the process more streamlined and means that customers can focus on operations.

### The right specialist when you need them

Behind our project managers is a team of multi-disciplined experts. From onsite superintendents to skilled engineers, our team works together to remedy any shaft line issue. Their expertise in alignment and measurement, and their access to the necessary equipment and machinery for performing precise investigations, allows the team to identify the problem and correct it as quickly and as accurately as possible.

### Get your parts sooner

When you need replacement parts, we can help. Our factories around the globe have been designed to meet the demands of the marine market. Having the ability to produce almost any shaft line component in-house means that we bypass any processing problems and external parties to get parts to you sooner.



Green Award certifies ships that are ultra-clean and ultra-safe. Ships with a Green Award certificate secure various fiscal and non-fiscal advantages. By fulfilling high safety and environmental standards in shipping, the Green Award makes the highest standards of ship operation economically more attractive. Wärtsilä is an incentive provider for the Green Award. Our water lubricated offering has the Green Award stamp of approval and ensures your vessel's shaft line will be compliant with the regulations of this governing body. This guarantees that your vessel qualifies for all the benefits of being a part of the Green Award organisation.

## Wärtsilä's total lifecycle solutions

An industry leader in shaft line components Wärtsilä Shaft Line Solutions delivers a portfolio of end-to-end services and integrated solutions for the marine markets that builds on our core values: lifecycle efficiency, risk reduction, environmental leadership and design excellence. As an original equipment manufacturer operating in 75 countries, we have the capabilities to support customers on a global scale, and remain committed to providing in-country and round-the-clock expertise.

[wartsila.com/shaft-line-solutions](https://www.wartsila.com/shaft-line-solutions)

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