Electrical & Automation Solutions for Naval Vessels
Wärtsilä Electrical & Automation is a leading systems partner to the marine industry. We provide electric propulsion and drives, power generation and distribution systems, navigation, automation and communication systems, dynamic positioning, safety and security solutions, entertainment systems, as well as sonar and hydroacoustic sensor technology for vessels of all types and sizes.

Our products and solutions are state-of-the-art, efficient, reliable and cost effective, and are supported by 24/7 customer service around the world. The products and services of
- Wärtsilä SAM Electronics,
- Wärtsilä Lyngsø Marine,
- Wärtsilä Valmarine,
- Wärtsilä Dynamic Positioning
- Wärtsilä JOVYATLAS EUROATLAS and Wärtsilä ELAC Nautik
and are well known and respected throughout the navy market. We provide our customers with the latest technologies and greater opportunities for meeting their present and future needs. We can proudly claim that this makes Wärtsilä the marine industry’s leading Electrical & Automation provider.

Our experience in providing propulsion and powering solutions for navy and coast guard vessels is long standing: more than 90 countries entrust Wärtsilä with the supply of equipment for their naval fleet. Many Wärtsilä products meet special naval requirements such as noise reduction and shock resistance.

We optimize efficiency by looking at the whole picture and offer user-oriented, integrated solutions that ensure outstanding operability and maintainability.
TURNKEY SOLUTIONS

Wärtsilä SAM Electronics provides innovative and custom-made solutions for all types of naval vessels and takes over responsibility for the integration of the complete electrical and electronic packages up to turnkey solutions. Our scope ranges from highly sophisticated and proven system installations to standardized systems and individual products for naval applications like main switchboards, load center, distribution boards, power supply, conversion equipment, degaussing and magnetic ranging as well as navigation systems.

The turnkey solutions business unit offers the system integration competence and is acting in the sense of an EPC contractor for complete electrical packages – typically in a close partnership with shipyards. Your benefit is our systems engineering competence, creating clever solutions with less cost and less installation time. Combining this service with the overall responsibility of detailed design for the electrical systems, our focus is in optimization the entire system on board. In this role, we also take care of the interfaces to all shipyard’s sub-contractors.

Backed by 30 years of experience, we are proud to have participated in many national and international projects like Littoral Combat Ships for the Royal Malaysian Navy, MEKO Algerien and Offshore Patrol Vessels RMN. Our contribution to the German Navy is demonstrated through our performance on the Class 123, 124 and 125 frigates, Class 130 corvettes, and Class 702 combat support ships.

Our core competences are in system engineering and integration, project management, procurement and site supervision.

We are the shipyards single point of contact for the integration from bridge to propeller and provide:

- Project management
- System integration
- Planning
- Cable engineering
- Cables and supports
- Cable installation
- Lighting system
- Testing and commissioning
- Procurement of subsystems
- Training
- Logistic support
- Service worldwide.
PWM converters are usually designed in a 12 or 24-pulse arrangement or as transformer less Active Front End (AFE) solution. Optional the Wärtsilä’s patented Low Loss Concept (LLC) could be proposed. Active Front End PWM converters are also available with modular multi-level infeed up to 6.6kV. This converter type provides an almost sinusoidal input voltage, low harmonics without the use of additional line filter units.

**SWITCHBOARDS**

Wärtsilä SAM Electronics is offering the full range of switchboards for navy applications. Depending on the power demand of the vessel, from low voltage up to medium voltage. Our switchboard design considers shipbuilding and classification societies requirements as well as special requirements regarding shock resistance capabilities. On request, we offer system integration, short circuit and voltage drop calculations as well as selectivity studies as per classification society requirements.

**PROPULSION AND DRIVE SYSTEMS**

Our innovative diesel-electric propulsion systems are used on ships with special requirements. These systems are based on the principle of speed controlled AC motors in driving the propeller directly or by gearing. The most reliable and low noise design is the direct drive. Depending on the rated power the system will be designed in LV or HV-technology.

For propulsion power on board the most economical drive solution is to install synchronous or induction motors fed by frequency converters with LCI synchro converters or with PWM converters, depending on the arrangement of the propulsion system and on the operational profile of the vessel.

For protection and control of power supply systems, Wärtsilä SAM Electronics integrates its own developed protection system with the brand name GPM 500.

On request, an integrated power management function for control of the power supply system is available. The protection system can be operated as stand-alone or in combination with other systems via data bus. Interfaces to automation systems and other control systems can be provided.

**DEGAUSSING AND RANGING/TREATMENT SYSTEMS**

Wärtsilä SAM Electronics is one of the worldwide leading supplier of shipborne degaussing systems for all kinds of surface vessels and submarines.

Our expertise and know-how covers the full range of magnetic silencing. For all types of naval vessels our state-of-the-art degaussing systems provide a significant contribution for magnetic protection against the hazard of
magnetic sea mines. More than 220 systems have been contracted for the German Navy and for various navies abroad.

Our multi-influence ranging systems for acquisition of underwater signatures of naval vessels including but not limited to magnetic, acoustic, electric and pressure signatures for mobile and stationary employment enable navies to adjust and validate the degaussing settings of their vessels.

Sophisticated software for modelling and analysis of the ranging results forms an integral part of our supplies.

The design of all customized systems are based on corresponding modeling and calculations where Wärtsilä SAM Electronics has a many years of successful experience.

Wärtsilä degaussing and ranging application portfolio includes:
- Degaussing systems for ferro and non-magnetic vessels/submarines
- Signature modelling, FEM and dipole
- Mobile and stationary magnetic ranging systems
- Mobile and stationary multi-influence ranging systems (magnetic, acoustic, pressure and e-field)
- Treatment systems for surface vessels and submarines
- Component treatment and measurement systems.

WÄRTSILÄ EUROATLAS POWER CONVERTERS
Wärtsilä EUROATLAS is an experienced and reliable manufacturer of ruggedized power conversion products for advanced military and civilian applications.

For more than 50 years, we have been supplying advanced products for the world’s top military and civilian platforms, such as the: MEKO 200 class frigate, F125 frigate, Submarine classes U209, U212, A17, A19, A26, Collins, Agosta, S80, Tiger helicopter, Tornado, Saab Jas 39 Gripen, Airbus, Boeing, Fokker, Leopard 2, Fox, German Railway and many others.

We offer technical support during the customer’s design phase, with customer specific product design and qualification according to demanding standards. Thanks to our in-house production, monitoring and improvement services as well as our worldwide installation and after sales support, we are there for you whatever you need whenever you need it. We also provide fully Integrated Logistic Support (ILS).

Power converters and services for naval applications:
- AC/DC rectifier
- AC/DC converter
- DC/DC converter
- DC/AC inverter
- UPS solutions
- Customer specific solutions.
SOPHISTICATED INTEGRATED BRIDGE SYSTEMS FOR NAVAL SHIPS

For more than 10 years, Wärtsilä Valmarine has developed and supplied Integrated Bridge Systems (IBS) for high-profile naval ships.

The Wärtsilä Integrated Bridge System (IBS) includes a complete range of multi-functional workstations that form a versatile and extremely redundant system. The Wärtsilä IBS offers a full range of functions such as navigation radar, warship ECDIS, conning and sonar displays as well as the possibility to integrate several other systems.

Each workstation is a master containing software for all applications, rendering the system autonomous from other client or server based systems.

A variety of military and commercial radar heads may be employed as sensors. The Wärtsilä IBS offers full interfacing capabilities towards market leading combat management systems, platform management systems, integrated automation systems, INS and more. Ships with full integration between IBS and IPMS have been in service for several years. Furthermore, the IBS may be interfaced with a variety of other sensors and sub-systems.

Highly advanced integration technology allows all applications to be selected, monitored and even operated from any IBS workstation. This provides unmatched flexibility and redundancy. If one section of the systems should become inoperative, all functions will be fully accessible from any of the other multi-functional workstations (MFWs) on board.

The Wärtsilä IBS is based on rugged COTS components certified for the marine environment, which allows easy future upgrading of hardware and software. MIL STD components are optional. Quality assurance of software development and documentation follow MIL STD guidelines.

User-oriented design:
- Matching user needs, experts and novices
- Providing mode awareness (tracking and anticipation of system behavior)
- Providing feedback of states and trends
- Featuring a clear, consistent, intuitive and user-controlled interaction
- Using well-known paradigms, e.g. Explorer.
WÄRTSILÄ MULTIPILOT PLATINUM

Based on our proven navigation system Wärtsilä NACOS Platinum, Wärtsilä SAM Electronics has developed further the Wärtsilä Multipilot Platinum for use in demanding environments and with the possibility of extended interfacing for the needs onboard military and coast guard vessels.

The MULTIPILOT Platinum-N combines the IMO type approved radar and the ECDIS in one workstation. More applications like conning, automation or dynamic positioning can be integrated when available on board. This multi-functionality has promoted this COTS product to be the preferred solution for vessels where space counts.

The system is Ethernet LAN-based and scalable from stand-alone installations up to several workstations as part of the integrated bridge systems. Further workstations and radar antennas can be added without complex cabling.

Several optional hardware and software functionalities are available, like:
- Software package Naval Functions, including
  - Tactical symbols (STANAG 4420) for ARPA, AIS and synthetic targets
  - User-defined blanking or transmission sectors
- Sector stations for naval formations and station control
- Weapon danger areas for gunnery exercises
- Torpedo zones
- Target intercept calculations (own ship to target, target to target)
- Helicopter landing path
- Relative maps
- HSC for fast target tracking (speedboat, helicopter, etc.)
- Picture merging of up to four radar antennas to an IMO-approved ARPA radar
- Trigger output signals
- Type-approved WECDIS with the surface ship requirements of STANAGs 4564 and 7170 and with additional military layers AML v1.0, v2.1 and v3.0.
DYNAMIC POSITIONING SYSTEM

Wärtsilä DP (Dynamic Positioning) offers the latest generation ship control system. With more than 50 years of experience supplying DP systems, Wärtsilä combines industry-leading software with commercially available hardware components for an easy-to-operate, innovative and reliable system. Wärtsilä DP system satisfies the most demanding requirements of the community.

Completely redesigned with the help of ergonomics professionals, DP captains and ship controls experts, the Wärtsilä DP user interface represents a leap forward in intuitive ship control. Offering full touch operation to engage the user for safer and more efficient operation, we lead the way in connecting the operator with the control system.

The buttons are sized and located for actual touch operation similar to the familiar electronics in most households. The user-oriented design offers easy learning for both experienced operators and those new to ship controls. Only necessary and required information is presented, preventing confusion during critical operations. Simple page tabs allow access to more detailed parameters when desired.

INTEGRATED PLATFORM MANAGEMENT SYSTEM

The Integrated Platform Management System (IPMS) from Wärtsilä Valma-rine offers a high level of integration between the ship’s main control and monitoring systems, such as machinery automation, HVAC automation, emergency shutdown and integrated bridge systems.

Redundancy is built into all levels of the system, preventing a system failure from causing loss of control, monitoring or safety functions.

The workstations are multi-functional and any station can be used for any task. The System Communication Network is redundant and based on fiber optics.
Process Control Stations have main and reserve units distributed in different compartments. I/O field buses are redundant with electrically isolated branches for ensured availability and operational safety.

The system integrates control and monitoring of all the basic machinery systems such as:
- Propulsion plant
- Power plant
- Auxiliary machinery
- Fuel plant/bunker system
- Bilge system
- Power management
- Ventilation system.

SAFETY MANAGEMENT SYSTEM (BATTLE DAMAGE CONTROL)
The Safety Management System (SMS) is a central part of the Platform Management System for all activities concerning crew and ship safety.

The SMS provides access to all information and procedures related to the handling of incidents and emergencies. Layer-based graphics give the user the possibility to filter away information irrelevant to the actual incident or emergency.

The system can include control functions related to the interfaced safety systems. Efficient training of users and crew is supported by a simulation mode.

SAFETY, SECURITY AND ENTERTAINMENT SYSTEMS
The speed of technology convergence requires expertise in many systems, including internal communication.

The Wärtsilä Shipwide system includes:
- IP network
- Public address and general alarm system
- Satellite reception
- Security system and door access
- Fire detection
- CCTV
- Communication system
- People tracking
- IPTV systems.
NAVAL ACOUSTICS
Wärtsilä ELAC Nautik has supplied equipment and systems for surface vessels and submarines to more than 50 navies worldwide. We combine decades of experience with innovative solutions in order to develop high-end state-of-the-art and cost-effective systems.

Our particular strength is the quick and flexible implementation of customer-specific requirements that can not be fulfilled with standard systems.

Wärtsilä ELAC Nautik’s underwater communication systems are renowned worldwide. They form an important part of the security system onboard of submarines and at the same time, they perform operational communication tasks.

Passive and active sonar systems for surface vessels and submarines are also developed and produced at the Kiel facility in Germany. The acoustic sensors, transducers and hydrophones produced by Wärtsilä ELAC Nautik are integrated into systems of other well-known international manufacturers.

SONAR SYSTEMS
Obstacles such as shoals, reefs or lost containers as well as planned attacks by small submarines and mines pose extreme risks to surface combatants and submarines. Only sonar systems allow you to ‘look’ or ‘listen’ under water. Our systems – being especially adjusted to their separate tasks – enable the operator to get an exact picture.
Wärtsilä ELAC Nautik’s sonars perform integrated surveillance as well as automatic detection and tracking of surface or submerged contacts. For submarine distress operations, the sonar supports the rescue forces by detecting the damaged submarine by active and passive means.

Scope of sonar systems:
- Wärtsilä ELAC KaleidoScope – Open Architecture Sonar Suite for submarines
- Wärtsilä ELAC LOPAS – Compact and economic passive sonar system for submarines
- Wärtsilä ELAC VANGUARD – Navigation and detection sonar
- Wärtsilä ELAC SCOUT – Mine avoidance and bottom mapping sonar for submarines
- Wärtsilä ELAC PILOS – Pinger localization sonar for rescue ships.

ECHO SOUNDER
The naval echo sounder Wärtsilä ELAC VE 5900 is a compact modular system with one to four frequencies for surface vessels or submarines. Control and display elements are combined in a single unit, built according to military standard.

The Wärtsilä ELAC SBE 1 Sonar Emergency Pinger for Submarines is designed to transmit acoustic signals in case of emergency.

UNDERWATER COMMUNICATION
The Wärtsilä ELAC UT 3000 is the very first underwater communication system combining analog and digital communication in one unit. In addition to the telephony and telegraphy mode, the Wärtsilä ELAC UT 3000 offers unique features such as own noise measurement, horizontal distance measurement and transmission of SOS signals.

TRANSDUCERS
In addition to complete systems, Wärtsilä ELAC Nautik offers approx. 50 different sonar components. These include nearly the complete range of outboard sensor technology for submarines such as hydrophones or transducers for active, passive, intercept and flank array sonars as well as transducers for active sonars onboard of frigates.

NAVIGATION SYSTEMS
In order to avoid the collision of a submarine with an offshore structure, the German Navy requires a sonar transponder system to be installed at each edge of a wind farm.

We provide our customers with the sonar transponder Wärtsilä ELAC ST30, a compact system with minimal effort for installation and maintenance. The system consists of well-proven elements, in particular the transducer TSE5, which offers an outstanding longevity and has been in operation at navies worldwide for many years.
Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers.

www.wartsila.com

Turnkey Solutions, Navigation, Propulsion, Drives, Switchboards, Degaussing and Ranging: naval.sam.de@wartsila.com
Power converters: sales@euroatlas-wartsila.de
Navigation and Automation: sales.valmarine.no@wartsila.com; sales.lyngsoe.dk@wartsila.com
Dynamic Positioning: customeremail.dp.us@wartsila.com
Sonars and Hydroacoustic Systems: marketing@elac-wartsila.de

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