



SIEMENS

Ingenuity for life

SINAVY – Solutions for the Navy

More stability, more availability,
more power

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In navies, continual improvement and adaptation of vessel equipment and operations is necessary to keep pace with increasing requirements and the changing roles of navies in a wide range of deployments.

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Navy budgets are limited, both for new construction and Life-Cycle Management.

As a result of the changing deployment roles and new security-related conditions, the requirements on naval vessels are increasing with regard to availability, reliability and readiness.

Technical processes on vessels continue to become more complex.

Despite limited budgets for investment, tactical requirements are increasing, and optimized solutions are expected.

Permanent readiness, availability, and stability are what distinguish the very best navies in the world.

Can anyone afford to ignore the big picture and look at individual systems, process steps, or the life cycle as if they were separate issues?

Integrated solutions for the navy

Profit from our integrated solution provider
for the marine world



Global economic and ecological developments demand to invest efficiently and optimize vessel operating cost, while limiting the impact on the environment – throughout the entire life cycle of surface vessels and submarines.

As an integrated solution provider for the marine world, Siemens Marine is ideally positioned to fully support our customers, providing complete electrotechnical and propulsion solutions as well as service and modernization offerings to maintain and increase availability and readiness. In addition, our leading environmental solutions are aimed at optimizing energy efficiency, pollution control, and water management:

We help to:

- Create integrated solutions to minimize cost and risk for shipyards and navies
- Maintain the stability and availability of the fleet over the long term
- Reliably meet growing environmental requirements
- Turn governments’ and navies’ investments into performance
- Ensure transparency of life cycle cost, taking today’s operational profiles into account

It is time to take a new, integrated approach to improve performance across the platform!

The portfolio offered by the solution provider for Industry is bundled in our integrated solutions. These solutions are based on tested standards that we adapt to meet our customers’ specific requirements. They combine best-in-class products, systems, and services in a smart overall solution – resulting in a high degree of availability and readiness for new as well as revamped and modernized surface vessels and submarines.



In particular, integrated solutions help to:

- **Optimize overall vessel operation –** in all electrotechnical equipment and systems for propulsion, power generation, and distribution in all parts of a vessel. Our comprehensive approach ensures maximum operational safety, dependability, low energy consumption, and full compliance with environmental regulations.
- **Connect all IT and automation levels –** from sensors to the automation and control level, with maritime-specific IT solutions that gather and process all the data from the entire vessel, thus providing a solid basis for decision making.
- **Support our customers throughout the entire life cycle –** for everything from consulting and system integration to commissioning, documentation, training, and spare-parts procurement, as well as modernization.





SINAVY – Electrical Equipment for the navy

Better products. Better processes. Better performance.

Customized solutions for any class of vessel

Protecting shipping routes to allow the import and export of food and materials is important for all countries, not just those with access to the sea. It is playing an increasingly important and vital role in areas of tension. In times of limited state budgets, it's even more important to use available financial resources in a targeted and efficient manner from the very earliest stages. That means teaming up with a partner like Siemens Marine. We assume responsibility for complete systems integration, electrical power, and electronic systems, and our proven, standardized products will especially reduce cost throughout the entire life cycle of the vessel or submarine.

Navies demand a maximized level of reliability, compliance with the highest safety standards, and a reduction in both short-term and long-term operating and maintenance cost. Backed by our experience and expertise in all areas of electrical engineering, we can provide the products, components, and solutions that are needed to meet all of these requirements – all based on a certified quality management system.

Everything's under control: Efficiency for surface combatants

Each and every day, around the world, frigates, corvettes, and OPVs are at work securing shipping routes and coastlines. For these vessels, the ability to sustain long periods of time at sea is just as important as the ability to dislocate at high speed, obtain service worldwide, and, of course, have excellent control and monitoring capabilities over the platform.

With SINAVY, an optimal electrical concept is developed well in advance with the responsible parties and the shipyard. During this process, Siemens Marine engineers make use of existing design versions and modular part systems where possible. This not only saves money, but also allows the major systems to be pretested, which in turn reduces commissioning time. This enables that a high-performance, low-downtime vessel will be a reliable link in an integrated fleet concept.



Mission accomplished: Innovation for submarines

A submarine's flexibility is a vital backbone of any navy, so technological superiority is just as significant as complete technical reliability.

Based on our experience and extensive research, we've developed solutions for every aspect of submarine construction, for optimum results for time submerged, top speed, and cruising speed. Extremely sophisticated propulsion and energy recovery technology ensures minimized signatures. Our systems are built to make it much easier for the crew to guide and maintain the boat.



Our drives for superiority at sea

Power and performance for every task



Innovative drive solutions for surface and subsurface vessels

Vessels for military applications are subject to special regulations, and have completely different requirements compared to ships for civilian use. Specialized knowledge is called for, and that's exactly what Siemens Marine can deliver, thanks to more than 130 years of experience as an equipment supplier for navy vessels.

SINAVY Drive MV – Electric propulsion for surface vessels

Our drives are known for their high efficiency, extremely compact design, reliability, and minimized signatures.

These are all major features that have been established on vessels built for the German Navy, the navies of NATO members, and other allied foreign naval forces. Our modular system, which has proven itself in service on every ocean in the world, brings many benefits – especially financial ones – to every vessel outfitted. While the vessel itself is still in the planning phase, our experienced drive specialists work with the shipyard to develop a customized concept that can be tailored to technical and budgetary requirements. Furthermore, the crews feel safe knowing that they are leaving port with the quality of a world leader in electrical drive systems supporting them, and that they can always turn to our global service network if the need ever arises.

SINAVY Permasyn – Reliable, small, and hard to pin down: Permasyn submarine propulsion motors

Permasyn propulsion motors work with permanent magnets, which give them outstanding operating characteristics for all operational requirements. These innovative systems are not only smaller and lighter than conventional drive solutions because of their compact design, but they are also significantly more efficient, thanks to reliable high-performance electronics that make rate-of-speed changeovers unnecessary. Redundant system elements also ensure the high availability of the drive system. Low structure and airborne sound levels reduce the risk of being discovered, and the engine also has impressively low electrical and magnetic signatures.

SINAVY Drive DC – High availability and extremely high reliability: DC propeller motors for submarines

DC propeller motors for submarines set standards in reliability and robustness. Equipped with shockproof, proven double-armature technology, which uses two independently functioning partial motors, they achieve the highest levels of operational safety and efficiency at all speeds – even under extreme conditions.

Voltage adjustments for the rates of speed minimize operating noise. Maintenance is easy thanks to easily accessible components, and their minimal signatures make Siemens DC propeller motors a reliable drive solution already installed in more than 130 submarines.

SINAVY – Optimizing overall vessel operation:

We offer products, solutions, and services primarily aimed at the optimization of the stability and availability of the vessel during the operational phase. These solutions only reach their full potential when integrated with the associated systems in the vertical and life cycle levels.



Energy efficiency for naval vessels

Full speed ahead



SINAVY Power MV and LV – Energy generation and distribution on naval vessels

Every vessel is at the same time an electric power plant, a utility company, and a fuel depot. In each role the energy system must be adaptable to an extreme range of requirements. Noise and heat generation must be addressed in the planning stage, as must existing space constraints. Emission values and fuel consumption are playing an increasingly important role, and are now key elements in energy supply systems along with cost-efficiency and reliability.

To ensure that electric power gets where it's supposed to go, the distribution system too must function flawlessly. The power network must withstand the most diverse requirements with respect to variables such as frequency, voltage, and short-circuit behavior. Everything must be perfectly coordinated, and the energy flow must remain controllable and transparent.

We've used diesel generators and proven new energy concepts, such as fuel cells, to develop numerous solutions that can be perfectly tailored to the individual requirements. And we supply seamlessly compatible accessory equipment, such as transformers, converters, etc. for processing the generated power.

Our onboard power grid technology is distributed evenly across the vessel, redundantly arranged as appropriate for the respective vessel, providing maximum protection against a complete loss of power. Our top priority during the construction and installation of our onboard electrical systems is the protection of personnel. The materials used prevent damage or destruction to the highest degree possible.



Better performance with an integrated power solution.



Energy anytime:

Power management for naval vessels

Our comprehensive switchgear and power management solution enables the safe and efficient distribution of energy on board naval vessels. With its fully integrated individual components, it easily handles all operational, functional, and tactical requirements the high seas may demand. Because the sample-tested, reliable standard building blocks can be combined in any fashion, it's easy to adapt them to the individual vessel's specific requirements.

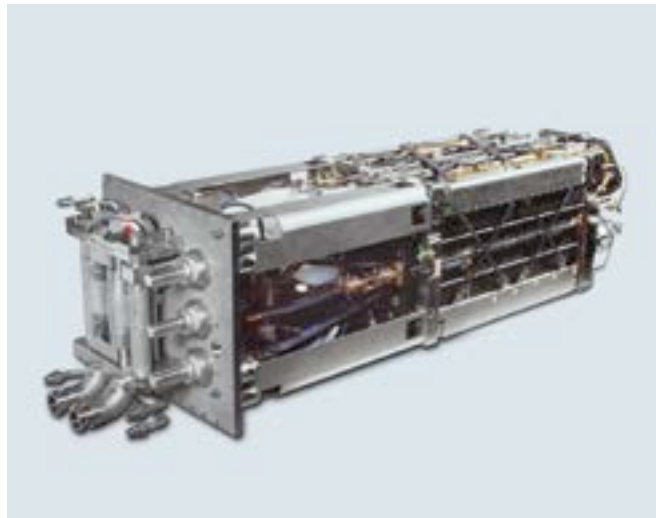
This prevents interface problems from ever cropping up. The modular, flexible structure ensures high availability from the very beginning. Robust, electromagnetically compatible, shockproof, and resistant to short circuits, our switchgear is unfazed by even the toughest ambient conditions. The compact design complies with all relevant standards, such as DIN, VDE, and the German Bundeswehr Construction Specifications.

Longer dives with low-temperature fuel cells:

SINAVY FC – PEM fuel cell

Siemens Marine's polymer electrolyte membrane (PEM) fuel cells are the wave of the future for external air-independent electric energy generation in submarines. As the cells need only hydrogen and oxygen as fuel, dive periods can be significantly extended.

This makes submarines equipped with these low-temperature fuel cells far superior to conventional submarines, which must surface fairly frequent to recharge their batteries. Our designs are much more efficient and emit no exhaust whatsoever. Thanks to their electro-chemical mechanism of action, which creates only water and heat in addition to electricity, the PEM fuel cell creates zero noise. Its robust, low-signature and nonmagnetic design was specially created for long-term use and has an expected service life of many years – and all in an effective and affordable life cycle support package.



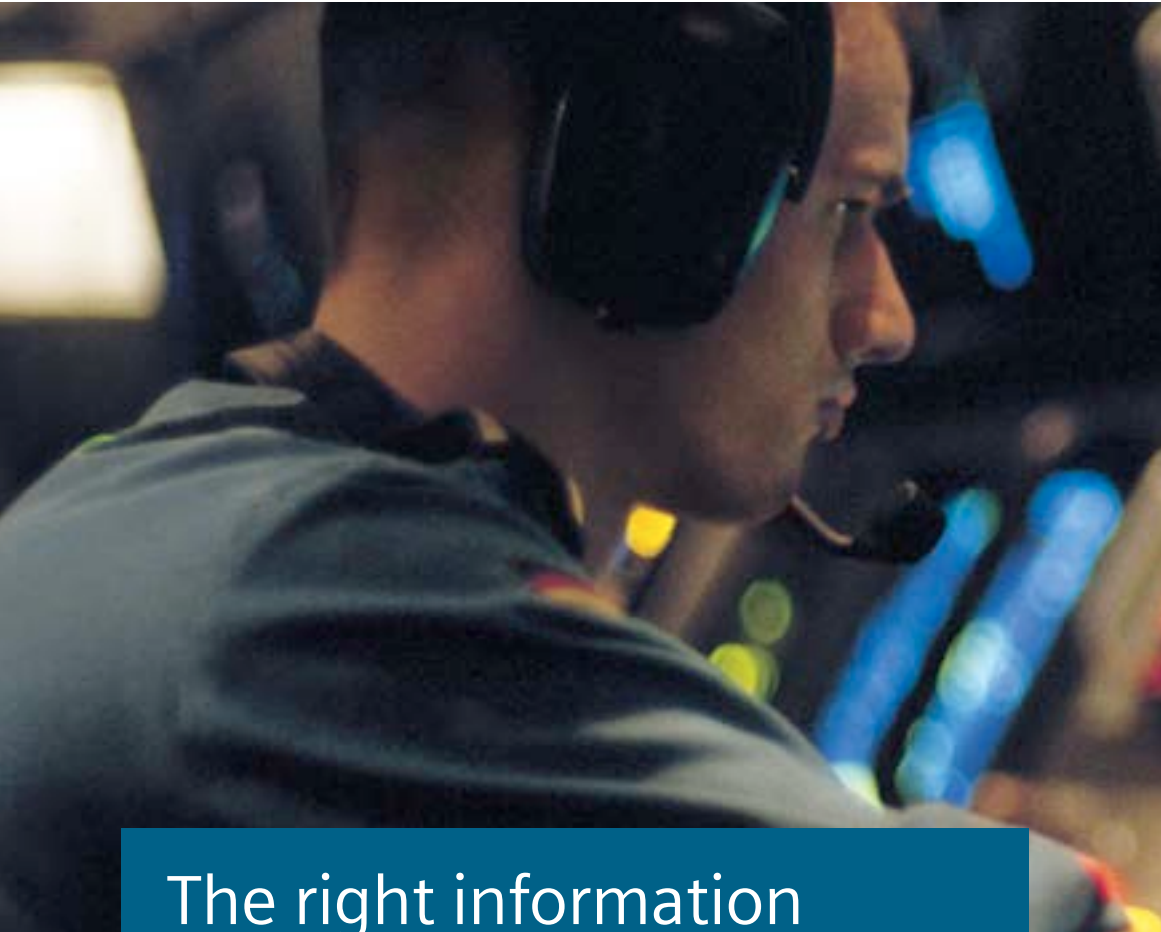
Made to handle extreme requirements:

SINAVY SG DC – Switchgear for submarines

Submarines are especially dependent on a safe and efficient energy supply. Siemens Marine's control panels and switchgear offer an energy distribution solution designed for the highest availability and reliability. An integrated development and production process makes it all possible. Perfectly matched standard components make interface problems a thing of the past.

As a special equipment provider with many years of shipbuilding experience, Siemens Marine also has the detailed knowledge necessary for smoothly customizing all onboard systems for underwater operation. As a result, our systems are known for their robust characteristics, such as shock resistance, resistance to short circuits, and low signatures, and their comprehensive compatibility with all established standards.





The right information

Always informed, always prepared

Networked automation concepts

Rapid information exchange at all levels is not only a requirement for lightning-fast response in an emergency situation, it is also a necessity for the vessel's processes to run smoothly. Hence we developed automation systems for both subsurface and surface vessels that relieve the crew of tedious, mundane tasks, protect the materials and equipment, and enable safety in any situation.

Subsystems such as the automatic remote control for the propulsion motors, a power management system that reliably guarantees the availability and proper distribution of electricity, and the battle damage control programs are centrally controlled and monitored. The advantages are clear: The system detects incorrect operations before they can even be executed. The decentralized arrangement of

the substations minimizes the risk of a general system failure, because if one subsystem, or even the control room, fails, the remaining subsystems will continue to operate. Simulation programs can provide the crew with realistic training conditions for onboard drills. Siemens Marine also offers proven individual systems for fire prevention, vessel stabilization, or telephone communication.

Intelligent solutions minimize the cost of installing the individual systems. Our many years of automation system experience in the industrial sector based on the Siemens SIMATIC automation product family ensure both our outstanding system quality and high availability of our products.

SINAVY IPMS – Integrated Platform Management System

More safety onboard:

Automation solutions for surface vessels

The integrated platform management system (IPMS) for naval surface vessels combines the highest levels of availability with optimized user-friendliness. The system’s comprehensive control functions relieve the crew from time-consuming routine chores, and a redundantly constructed bus system increases operational safety significantly, even if the system takes severe damage.

A realistic advance training program and an advanced and proven automatic damage control in the event of an emergency provide the crew with efficient support during the implementation of appropriate countermeasures. In addition, the decentralized modular architecture ensures smooth operation at all times, and at an affordable cost as well. Professionally matched Siemens Marine components from engineering to support make it all possible. Standardized handling processes accelerate maintenance and repairs, both at national and in foreign waters. Comprehensive life cycle management, available worldwide with customer services, additionally extends the service life of your system.



SINAVY EMCS – Engineering and Monitoring Control System

Highly available and highly efficient:

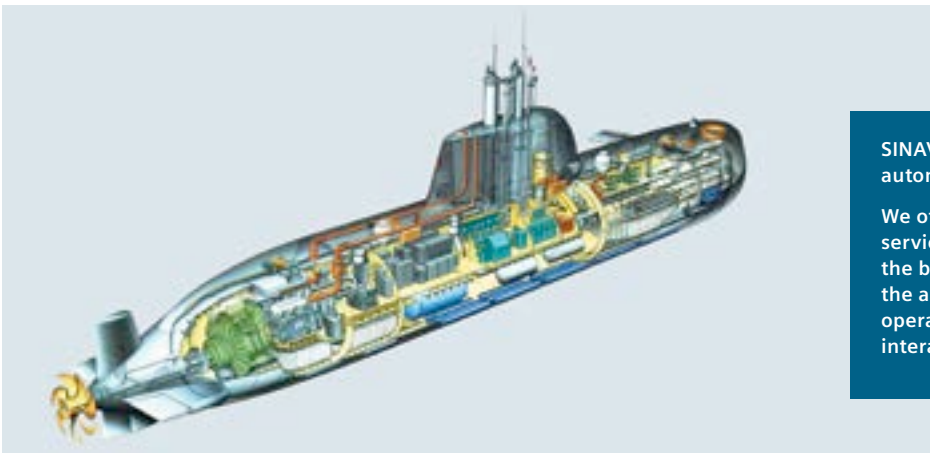
Automation solutions for submarines

The engineering and monitoring control system (EMCS) for submarines allows central control of all subsystems using a single overall concept. This makes it much easier for the operator to run process information and monitor the onboard systems. And because operators always have all operating data at their fingertips, time-consuming routine tasks are eliminated. At the same time, they can count on the lasting availability of their system; after all, every production step, from planning to system acceptance and beyond, is in the hands of a single vendor. That’s not only efficient and a reduced risk for the shipyard, but it also significantly increases operational safety. A comprehensive service package with service offerings worldwide, up to and including midlife conversions, additionally ensures that all systems are always kept up to current technical standards.

SINAVY OBTS and LBTS – Realistic and practical:

Training on board and ashore

Siemens Marine’s training system specifically designed for vessels is the ideal training solution for vessel operators. Conceived as a training option for operators and other users, this practical training tool conveys a realistic sense of how the vessel’s processes work. The combination of the original automation software and the same human-machine interface used in the onboard systems allows both standard situations and crisis situations to be initiated and “played through” in a practical fashion. A simulation computer re-generates the technical and physical onboard processes. To allow the maximum possible flexibility, the training tool is available in two versions: The on board training system (SINAVY OBTS) and the land-based training system (SINAVY LBTS). This allows affordable and appropriate crew training to take place both in port and at sea.

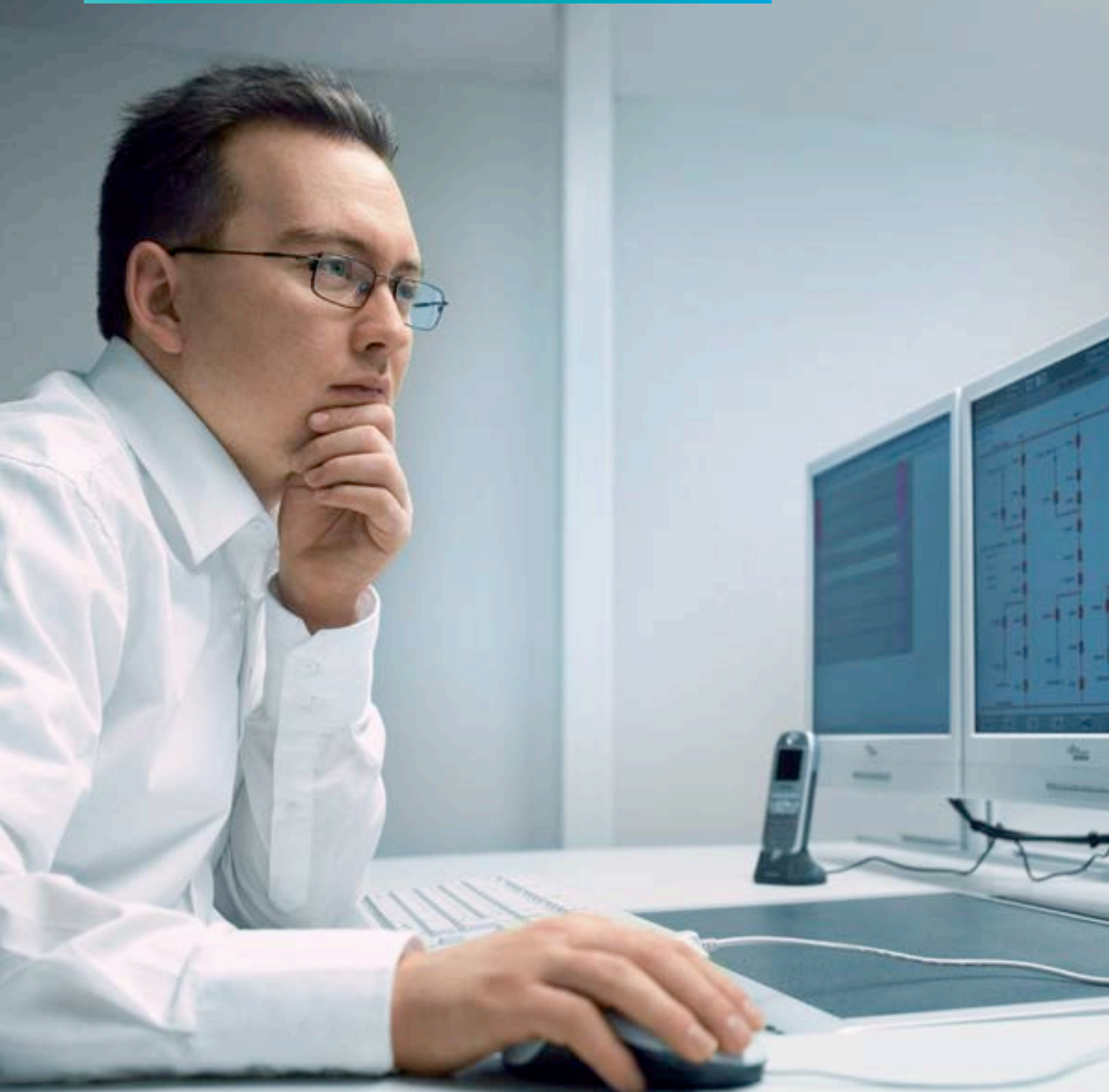


SINAVY – Connecting all IT and automation levels:

We offer SINAVY products, solutions, and services that effectively link the vessel, the bridge, and naval command, giving the assurance of secure and reliable operational integrity, with more effective interaction of all processes.

Reliability, availability, and readiness

Throughout the vessel's entire life cycle



Services for the fleet

The total cost of ownership of surface vessels or submarines become evident over the vessel's entire life cycle. Key questions are: How much operating and maintenance cost will burden future operators' budgets? How much of the budget should be allocated to spare parts, planned and unplanned maintenance, retrofit, training, modernization, and upgrade? How much growth potential for retrofit, upgrade, and modernization has been anticipated in the vessel design?

Our life cycle management services cover the whole life cycle of naval vessels, based on three pillars: service, migration, and value preservation, including training programs.

LCM – Support throughout the life cycle:

This component of our integrated SINAVY solutions refers to services that we are able to provide over the entire life cycle of surface and subsurface vessels. The SINAVY services ensure that the solutions are adapted specifically to meet the needs of naval vessels, just like the modernization, retrofit, and upgrade services that we use to keep the electrical equipment, systems, and solutions of vessels operative at optimum levels.



Value preservation was recently instituted in order to keep the value of the asset vessel compatible with the dynamic regulatory changes of today's life. It covers – among several aspects – areas like energy/emission management, technical condition surveys, etc. Siemens Marine is the service provider offering comprehensive answers to our customers' questions. We offer a unique combination of cutting-edge technology, trendsetting engineering, R&D, and experience from a single source.

Knowing the needs of the navies and their specific logistics processes, over the decades Siemens Marine has gained a reputation for responding to the needs of our customers in the most effective and best suitable way.

The results of this integrated approach speak for themselves. Our impressive reference lists demonstrate the confidence of many navies that entrust us daily with the fate of their crew and the security of their country.

The support service packages for long-term performance

Maintenance and overhaul measures do not need to be excessively expensive. Our life cycle management service packages are able to keep naval fleets up to date with the latest technical developments and at full operational readiness – at reasonable cost.

Siemens Marine's comprehensive services represent all the advantages of a one-stop service provider: perfectly matched systems and components free of interface problems, with competently organized maintenance, repair, and modernization performed by experts.

Siemens Marine works closely with our clients to plan and coordinate all necessary procedures and to provide professional support and quick response activities when required.

Our closely linked global network can provide support whenever and wherever needed. The crew and maintenance personnel can receive any kind of training for the various vessel systems in port or at sea.



Advantages of comprehensive Life-Cycle Management services

Virtually any vessel has features that benefit from modernization, so technical upgrades of current products, systems, or solutions based on typical naval applications may be suitable.

Such investments soon begin to show fruition by saving money and safeguarding the functionalities of the system for the long term.

For customers requesting ultimate rapid response and highest levels of operability we offer maintenance and service contracts. These contracts can be tailored to the many individual needs of our global customers and will be provided through our global Siemens network. In order to enable best use of the significant number of individualization options, we suggest contacting Siemens Marine for individual discussions.



Surface vessels and submarines in perfect shape – with comprehensive life cycle services.

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Process Industries and Drives Division
Marine
Lindenplatz 2
20099 Hamburg, Germany

E-mail: marine@siemens.com
siemens.com/marine

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