

The background of the entire page is a photograph of a modern grey naval ship, likely a German frigate, sailing on the water. The ship has the number 'F222' visible on its hull. Overlaid on the ship and the sky are faint, light blue line-art diagrams of industrial machinery, including what looks like a turbine or engine component. In the top left corner, there is a white rectangular box containing the Siemens logo and tagline.

**SIEMENS**

*Ingenuity for life*

## SINAVY Power and SINAVY Drive MV

Reliability, high performance,  
and cost-efficient operation

[siemens.com/marine](https://www.siemens.com/marine)



# A perfect combination:

Power and drive solutions from a single source

## The challenge

Rising fuel prices and growing environmental awareness place new demands on navies all over the world to improve their fleets' performance in terms of both emissions and operating costs. While a huge number of submarines and commercial ships have been fitted with electric propulsion by Siemens since 1886, navies have only just begun to consider electric drives for their future surface fleets as well.

They do so for good reasons, as electric propulsion systems offer great advantages if integrated into an entirely optimized system of drive and power supply. System reliability and availability are prerequisites; however, the superior performance characteristics of electric propulsion systems are equally important.

## The solution

An integrated solution for electric propulsion, power generation, and distribution is Siemens' solution to these challenges. And "integrated" means a solution in which every component is perfectly adapted to its specific function, its functional environment, and the overarching management system to fulfill all operational, functional, and tactical requirements of naval surface vessels.

In our integrated solution, SINAVY Drive MV offers outstanding electric drives in combination with diesel

engines or gas turbines. SINAVY Power MV forms the robust and safe medium-voltage infrastructure for reliable power supply, while SINAVY Power LV takes care of secure power distribution and the required power management. It goes without saying that all system components are thoroughly tested and ideally equipped for the widest variety of environmental conditions (EMC, shock stability, short-circuit protection).

## Customer benefits

Thanks to their flexibility and versatility, electric propulsion systems can easily be customized to meet all demands of naval surface vessels. Their energy efficiency at all speeds stands out, as well as their extraordinary response characteristics, from zero to maximum propeller speed, since the propeller can be operated at maximum torque over the entire speed range. In addition, SINAVY Drive MV drives are extremely quiet and low in vibration, and offer extremely low life cycle costs.

However, optimum system operation is achieved through the intelligent combination of electric drive (SINAVY Drive MV), power generation, and power distribution, both in medium and low-voltage levels (SINAVY Power MV and LV). Optimized interfaces and our type-tested, robust, and freely combinable standardized components guarantee a high level of availability and reliability right from the start.



# SINAVY Power LV

## Intelligent, comprehensive power generation and distribution solutions from a single source

A versatile, flexibly adaptable, and comprehensive low-voltage power solution from a single source guarantees system integrity and lower costs through simplified operation and a high degree of availability. Siemens systems have been well proven in the German, Argentine, Turkish, Portuguese, Greek, Australian, New Zealand, and South African navies, among others.

### SINAVY Power LV – Proven technology

SINAVY Power LV from Siemens is a comprehensive solution for the safe and efficient onboard generation and distribution of electrical energy for naval surface vessels. The overall system integrates all components to avoid interface problems, save costs, and fulfill the vessel's special operational, functional, and tactical requirements. For highest availability, the modular low-voltage switchgear system is especially reinforced and equipped for the widest variety of environmental conditions (EMC, shock stability, short-circuit protection).

SINAVY Power LV consists of brushless synchronous generators, a naval switchgear system, and a power management system, as well as transformers and converters as required for other voltages. Through integrated protection elements, it offers a high degree of safety and availability.

### The system contains:

- Open generator power switches for up to 4,000 A
- Generator protection devices
- Power generation system (PGS)
- Differential protection
- Manual or motorized open power switches, fixed or removable, for the 630 to 4,000 A range
- Compact power switches, fixed or removable, for the range between 16 and 1,250 A
- Optional motor-controlled power switches

### SINAVY Power LV – Safe and efficient power at all times

As part of the switchgear system, the SINAVY Power LV power management system ensures the continuous supply of energy required for a particular operational state very economically and cost-efficiently. Depending on the current demand, the system connects the generators according to predefined parameters to the onboard network, and disconnects them again when no more power is needed. Among other advantages, the power management system offers these basic functions:

- Multiple operating modes
- Programmable start priorities
- Load-dependent start/stop function
- Synchronization and load sharing
- Control of open power switches for generators, bus bar clutch, shore connection, etc.
- Load shedding and disconnection of unneeded consumer devices or consumer groups

The system is rounded off by an extensive package of integrated safety features such as automatic blackout start and standby-start/stop.



### Five good reasons for SINAVY Power LV:

- High degree of reliability, operational safety, and availability for naval surface vessels
- Modular, flexible design consisting of standardized components is cost-effective and avoids interface problems
- Type-tested, robust, and freely combinable standardized components guarantee a high level of availability right from the start
- Compact design
- Design meets conventional standardized norms such as DIN, VDE, and German military design regulations

# SINAVY Drive MV

## Efficiency and performance in detail

For an almost unlimited performance range, Siemens offers highly efficient, fully electric or hybrid drive systems that combine higher reliability, availability, and performance, as well as reduced signatures, lower emissions, less maintenance, and lower life cycle costs.

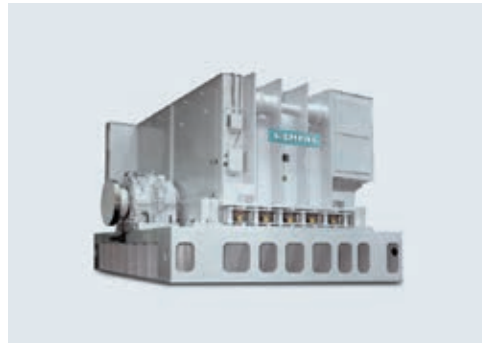
### **SINAVY Drive MV SINAMICS GL150 – Load-commutated inverter with synchronous motor**

The SINAVY Drive MV SINAMICS GL150 most closely resembles a familiar DC drive and consists of a rectifier, a connection to the power source, an inverter as well as the synchronous motor. Supported by the ROTOS control, the SINAVY Drive MV SINAMICS GL150 demonstrates the characteristic properties of a DC drive.

### **SINAVY Drive MV SINAMICS GM150 – Pulse-modulated converter with synchronous or asynchronous motor**

The medium-voltage version of the SINAVY Drive MV SINAMICS GM150 is available for voltage ranges of up to 4,160 V. The standard version comprises a 12-pulse diode-rectifier input bridge and IGBTs or ICGTs are utilized as performance semiconductors in the medium-voltage converters.

The highly reliable SINAVY Drive MV SINAMICS GM150 converters can be air or freshwater cooled. Thanks to their simple construction and flexible compact design, they are easy to integrate into the existing environment aboard vessels.



### **Agile and maintenance-friendly**

All propulsion systems of the SINAVY Drive MV family stand out in terms of their extraordinary response characteristics, as the propeller can be operated at maximum torque over the entire speed range. Even reverse maneuvers can quickly be accomplished. And despite their enormous performance levels, SINAVY Drive MV drives are extremely quiet and low in vibration.

Thanks to the optimized operation of the combustion engines at constant speed and optimum torque, downtimes, maintenance expenditures and fuel costs are reduced with SINAVY Drive MV drives. The modular design of the system also facilitates required repair tasks. Redundant components ensure that SINAVY Drive MV drives remain functional in the event of damage.

### **Eight good reasons for SINAVY Drive MV at a glance:**

- Signature reduction
- Shock-proof
- Highest efficiency at all speeds
- Flexible and needs-oriented utilization of the diesel or gas turbine generators
- Redundant design ensures the availability of the drive
- Maintenance-friendly, modular design
- Longer service intervals reduce maintenance costs and downtimes
- Reduced pollution emission of the combustion engines through optimum speed and optimum load range operation



# SINAVY Power MV

## Medium-voltage generators, switchgear system, and power management

The compact and modular SINAVY Power MV medium-voltage plant is our answer to onboard power generation and distribution, conforming to current qualification requirements. Adapted to the special environmental conditions and functional requirements on board naval combat vessels, all systems are controlled by an integrated power management system.

### SINAVY Power MV – Powerful and reliable

SINAVY Power MV fulfills the special operational, functional, and tactical requirements for naval surface vessels and has been qualified for shock and vibration in accordance with German Navy standards. This results in outstanding performance and excellent operational reliability, especially suited for vessels with high energy consumption such as destroyers, frigates, or aircraft carriers.

The air-isolated systems are available for performance ranges up to 24 kV, 50/60 Hz.

Medium-voltage generators are the primary source of electric energy on board. For the supply of the low-voltage network, transformers are used as necessary.

SINAVY Power MV ensures maximum availability, reliability, and maintainability (ARM) in combination with the highest level of human and operational safety.

### Technologies for safe operation

A housing of sendzimir zinc-coated tin, upward pressure relief, a pressure-proof high-voltage door, and pressure-proof bulkhead walls to the terminal and bus bar room are the key features of the SINAVY Power MV bulkhead room switchgear systems. The mimic diagrams show the actual power switch position even with high-voltage doors closed. In addition, the system offers clear allocation of the activation openings and operating elements for the respective switch position displays. The system consists of maintenance-free vacuum power switches for separation and grounding, a transact-electrical converter for electrical measurements, and capacitive surge acquisition. It additionally comprises safety mechanisms with integrated control, communications, operation, and monitoring functions.

### Special safety measures

Special mechanical safety features ensure the highest level of safety possible. In the event of an internal fault (arc fault) in a compartment, the effects of the fault remain confined to the compartment. Safety features include:

- No burn-through of partition walls to adjacent compartments
- No burn-through of separation walls to adjacent feeders
- Pressure resistance to adjacent compartments and panels
- No reignition of arc fault within adjacent compartments or panels
- Hot gases are directed through the special pressure relief duct away from the operator



### Five good reasons for SINAVY Power MV:

- Supply reliability through type-tested and environmentally qualified systems
- High level of operational safety through utilization of widely standardized components
- State-of-the-art technology that fulfills functional, operational, and special requirements
- System engineering and system responsibility from a single source
- Environmentally friendly through utilization of modern vacuum switches

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